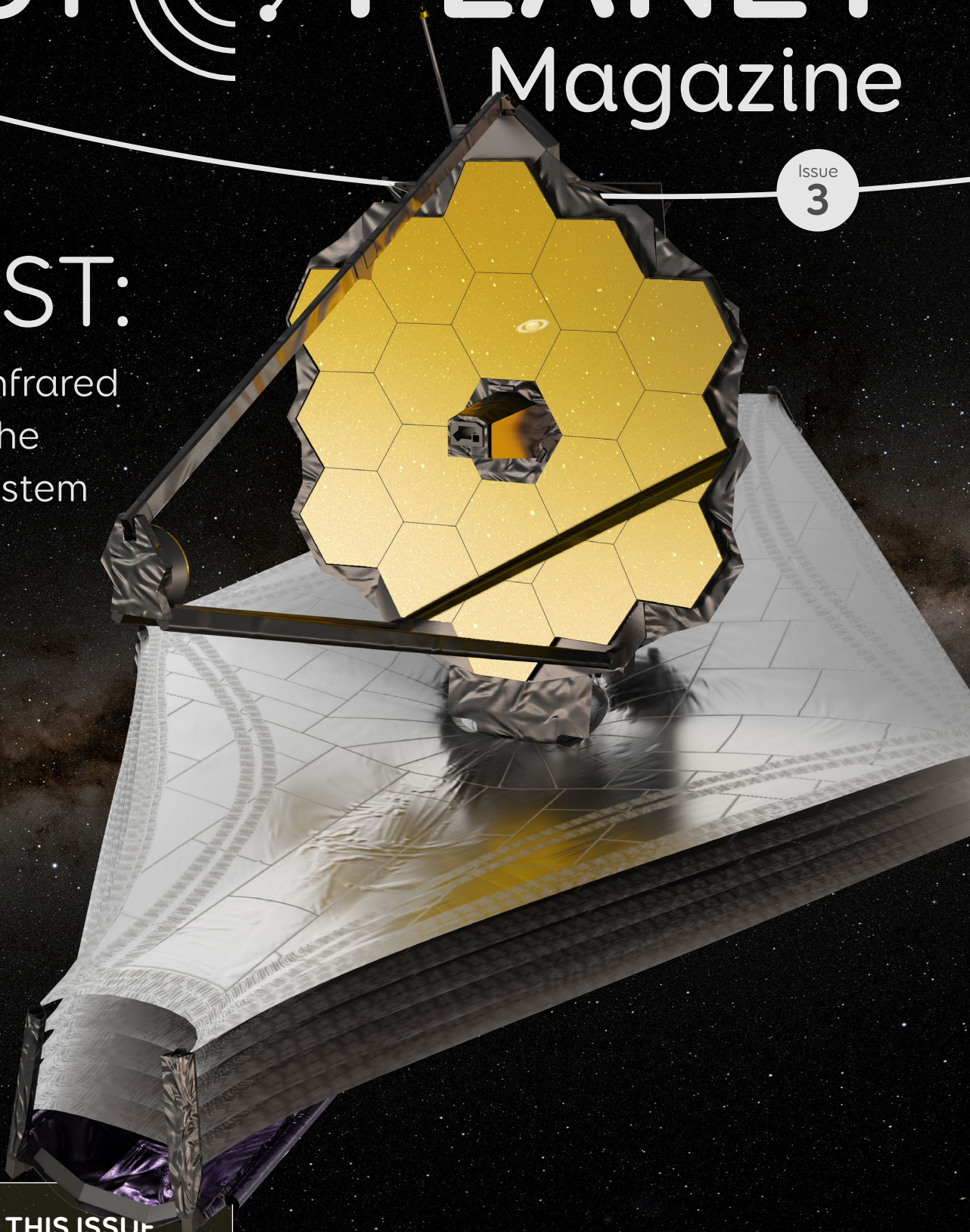
europlanet Magazine

Issue 3

JWST:

A New Infrared Eye on the Solar System



ALSO IN THIS ISSUE

- Mentorship - two years on
- Taking on the data challenge
- Building the Europlanet brand

Support for Ukraine

Europlanet support schemes

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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Design and artwork Pixooma Ltd

Europlanet 2024 RI has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871149.

Take off

The spring of 2022 has a mixed outlook. On the positive side, the situation with Covid-19 is easing in many places in Europe and, with the start of the conference season, we finally have opportunities to meet again face-to-face. On the negative side, the war in Ukraine is ongoing and bringing us daily stories of tragedy, horrors and disruption.

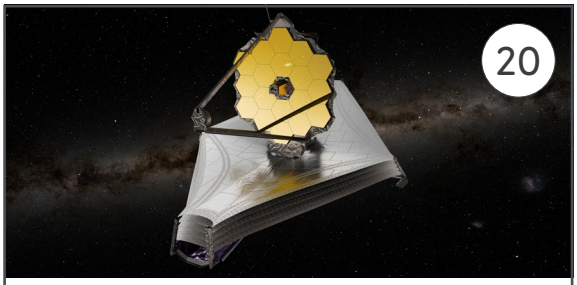
In this third issue of the Europlanet Magazine, we look back to mourn the loss of two much loved and valued colleagues, and look ahead to exciting opportunities for our community as the James Webb Space Telescope begins operations.

At midway through the Europlanet 2024 Research Infrastructure (RI) project, we report on recent workshops, expert exchanges and emerging impacts from our mentorship programme. We also look at some of the creative ways that artificial intelligence and machine learning are being adopted by the planetary science community.

Throughout this issue, you will see multiple ways to get involved in Europlanet activities and opportunities to shape the community, particularly at the Europlanet Science Congress (EPSC) 2022 in September. We look forward to seeing you in Granada!

Anita Heward

Editor



In focus

As travel restrictions lift in Spring 2022, there are numerous opportunities for the planetary community to meet virtually and face-to-face.

EPSC

Meet us in Granada at EPSC2022!

The Alhambra, Granada, Spain.

Registration is now open for the Europlanet Science Congress (EPSC) 2022 at the Palacio de Congresos de Granada from 18-23 September. The Congress will be held in-person for the first time since the joint meeting with the American Astronomical Society's Division of Planetary Sciences in Geneva in 2019. EPSC2022 has received nearly 1200 abstracts for over 60 sessions. In response to feedback over the past two years, some innovations from the virtual meeting will be retained, including morning briefings, keynote talks and a Slack online discussion forum. This year's meeting will be held jointly with the European Astrobiology Network Association (EANA) Conference 2022, so will have a strong focus on astrobiology. Register for earlybird rates by 31 July: https://www.epsc2022.eu

EUROPLANET SCIENCE CONGRESS EPSC2022

Society

Monthly Webinar Series for Society Members

The Europlanet Society is holding an ongoing series of webinars for its members on the last Tuesday of each month. The hour-long sessions aim to support our community by providing opportunities to contribute to policy consultations, learn about sources of funding, share experiences, develop skills, and find out what's going on in planetary science. Recordings of sessions and slides are available on the Members' Area of the website. Topics discussed include up-coming calls in Horizon Europe, ESA strategy, pro-am collaborations, mentoring, outreach and much more. Each session includes time for discussion, and post-event feedback and follow-ups are encouraged. If you are yet to join the Europlanet Society, or want to find out more about the webinars, visit the Europlanet website. https://bit.ly/EuroplanetWebinars

Europlanet 2024 RI

Europlanet Pro-Am Comet Community Workshop

As part of Europlanet's activities to foster collaborations between professional and amateur astronomers, a hybrid workshop will be held on 10-12 June 2022 for the pro-am community studying comets. Participants from Europe and around the world will find out about recent progress in comet observation and analysis, share methodologies, consider ways that data can be properly archived, accessed and standardised, and explore opportunities for education, outreach and community building. The physical event is being hosted by Planetum Prague and the Czech cometary science community (SMPH), with support from the Europlanet 2024 Research Infrastructure (RI) and the British Astronomical Association. All sessions and materials will be available online and reported at EPSC2022. https://bit.ly/ProAmComets

Štefánik's Observatory, Prague, the venue for the workshop.

Europlanet 2024 RI

Fast Track Transnational Access

The results have been announced of a "Fast Track" programme to mitigate the impact of the pandemic on Europlanet 2024 RI's Transnational Access (TA) research visits.

The TA programme offers free access to over 40 planetary analogue field sites and facilities for simulation and analysis. Travel restrictions over the past two years have meant that many of the facilities have accumulated a large backlog of TA visits, and the next full call for applications has been delayed to the autumn of 2022.

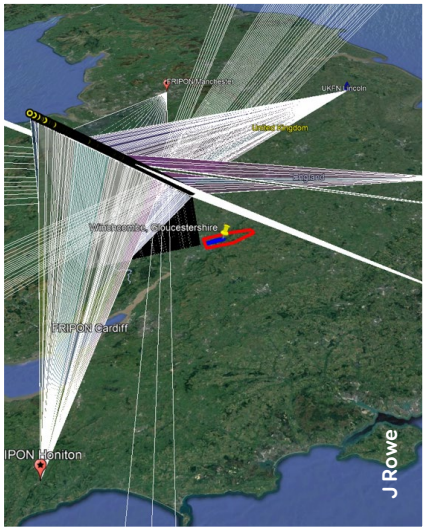
The Fast Track TA programme has provided interim support for "emergency applications" to allow high impact science, career-impact projects (related to PhD or postdocs contracts) or time-restricted field work to take place over the summer of 2022. Out of 30 applications, 27 were ruled eligible, 20 have been awarded funding, and the first visits have now taken place, including two to the new planetary analogue field sites in Argentina.[1] We look forward to seeing the results.

Find out more: https://bit.ly/europlanet2024ri-ta

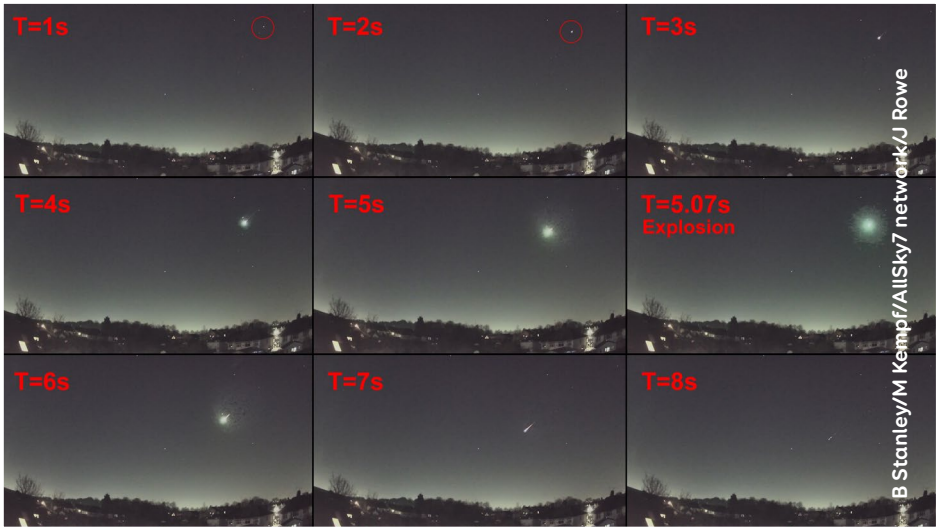
[1]. https://bit.ly/EuroplanetArgentina

Europlanet 2024 RI

Fire in the Sky



Reconstruction of the trajectory of the Winchcombe fireball.



Montage from AllSky7 Fireball Network footage of the Winchcombe fireball.

Fireballs are the more spectacular "big siblings" of shooting stars and are monitored, not only for their beautiful visual displays, but also as part of the campaign to watch out for objects that might hit the Earth and cause damage.

During the first weekend of February 2022, the Europlanet 2024 RI project organised the second in a series of workshops bringing different networks of fireball observers and machine learning experts together. Due to the ongoing pandemic the workshop was held virtually, and this online format enabled interested observers from as far away as Brazil, Australia and New Zealand to take part. Workshop participants introduced various fireball observation networks around the globe and discussed progress since the last event in June 2021. An important outcome of the first workshop has been the introduction of a common format for observation data, which has been derived from a template developed by the University of Aberystwyth (UK) during a previous EU-funded Europlanet project.

This allows for a much faster exchange of data, the benefits of which were demonstrated by the recent recovery of the Winchcombe meteorite. The combination of observations of the fireball from different networks enabled the rapid discovery of pristine fragments of the meteorite on the ground.[1] Other presentations during the workshop included an interesting report by the Australian Desert Fireball Network on how drones and machine learning algorithms can also be used to locate meteorites on the ground, enabling a much larger area to be covered, particularly in challenging terrains such as the Australian outback.

The third workshop in the series will be held in conjunction with the 85th Annual Meeting of The Meteoritical Society in Glasgow from 14–19 August 2022.[2]

Meeting report by Ute Amerstorfer and Günter Kargl (IWF-Graz).

References

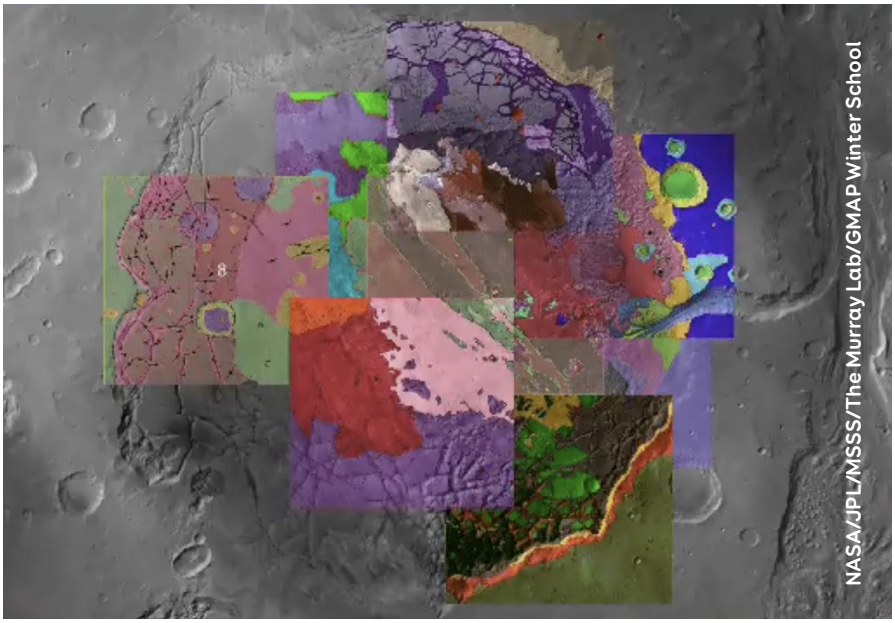
1. Russell, 2021. https://bit.ly/EuroplanetMagazine-1-Winchcombe
2. https://bit.ly/FireballMLWorkshop3

EUROPLANET TELESCOPE NETWORK

MACHINE LEARNING

Europlanet 2024 RI

Planetary Mapping Winter School



Collage of some geographical maps produced by the students during the school's hands-on exercises.

The Planetary Mapping Winter School aims to introduce scientists and amateur enthusiasts to geological mapping of other planetary bodies. Following a successful inaugural event in 2021, a second virtual edition of the Winter School was organised from 7-11 February 2022 by the Europlanet 2024 RI project's GMAP team.

As well as providing general training for a new, inclusive generation of planetary mappers, the second Winter School focused on learning about mapping techniques and open source software. The school attracted more than 200 participants from all around the world. More than half the attendees took part in live sessions, with the rest accessing teaching resources and recorded lessons asynchronously. The first day of the school kicked off with an introduction to mapping and remote sensing principles, with the following days focused on mapping the Moon, Mercury and Mars. Each planetary body has distinctive features that need to be taken into account for geological mapping, such as crater chronology, tectonic deformations, surface composition and stratigraphic relationships. During hands-on exercises, supported by more than 20 dedicated instructors, the trainees mapped large areas of planetary surfaces subdivided into "tiles", with the goal of producing comprehensive mapping products. Seminars by experts from different universities, geological surveys and research centres complemented the practical mapping tour of the inner Solar System.

Meeting report by Riccardo Pozzobon, Matteo Massironi and Luca Penasa (University of Padua).

https://www.planetarymapping.eu

GMAP Geological Mapping

Get Involved in EXPLORE

The EXPLORE project gathers experts from different science domains and technological fields to develop new tools that will enable and promote the exploitation of space-science data. With many shared partners and areas of interest, EXPLORE is a close collaborator of Europlanet 2024 RI. The project has now released prototype versions of six EXPLORE Scientific Data Applications (SDA) on the EXPLORE platform, and invites the community to participate in beta-testing. The SDAs include two lunar-related applications: L-Explo, which supports the identification of subtle differences within lunar orbital data to enhance geological mapping of the Moon, and L-Hex, which supports human and robotic exploration of the Moon by providing access to historic and recent lunar data. The SDAs will be presented at EPSC2022.

Also launching soon will be the first EXPLORE Data Challenges, which celebrate the 50th anniversary of the Apollo 17 mission - the last time humans set foot on the Moon. Planetary scientists and the machine learning community are challenged to label features and plot a traverse on the surface of the Moon. A Junior Data Challenge has also been designed for schools.

https://explore-platform.eu

EXPLORE DATA CHALLENGES

Europlanet 2024 RI

Europlanet Telescope Network Science Workshop

The first Europlanet Telescope Network Science Workshop was held virtually on 6-11 February 2022. The goal of this workshop was to encourage submissions of community-led proposals and to highlight scientific results achieved to date with Europlanet Telescope Network facilities and with other medium size and small telescopes.

The Europlanet Telescope Network, which was launched in June 2020, is composed of 16 telescope facilities around the world (diameters around 0.5-2 metres) to support observational campaigns related to planetary science.[1] For this workshop, interested astronomers, planetary scientists and amateurs were invited to participate, to learn more about the instruments offered, their capabilities and scientific potential. Sessions were distributed over three half days and were dedicated to Solar System planets, exoplanets, and minor Solar System bodies. The meeting attracted participants from 43 countries (including 11 EU under-represented and 23 non-EU states). Among the 210 participants, were 63 early career researchers, 80 amateurs, 22 educators, and 43 senior researchers, with an overall 30% of the participants being female.

During the first year of the Europlanet Telescope Network's activities, nine applications have been granted observing time. Four projects have been dedicated to investigations of exoplanet transits and planet-hosting stars; four more targeted asteroid spins, shapes, or thermal parameter determinations. A further successful application was dedicated to protostar formation.

The workshop participants have demonstrated that relatively small telescopes can produce first-rate results in planetary science and that both professional and amateur astronomers can make valuable contributions. All the presentations have been recorded and are accessible via the workshop webpage and the YouTube channel of the Moletai Astronomical Observatory.[2,3]

Report by Gražina Tautvaišienė (Vilnius University).

References

1. https://bit.ly/EuroplanetTelescopeNetwork
2. http://mao.tfai.vu.lt/europlanet2022
3. https://www.youtube.com/channel/UC5_rYbqQ-L2MnFb31pwYbdQ

EPEC

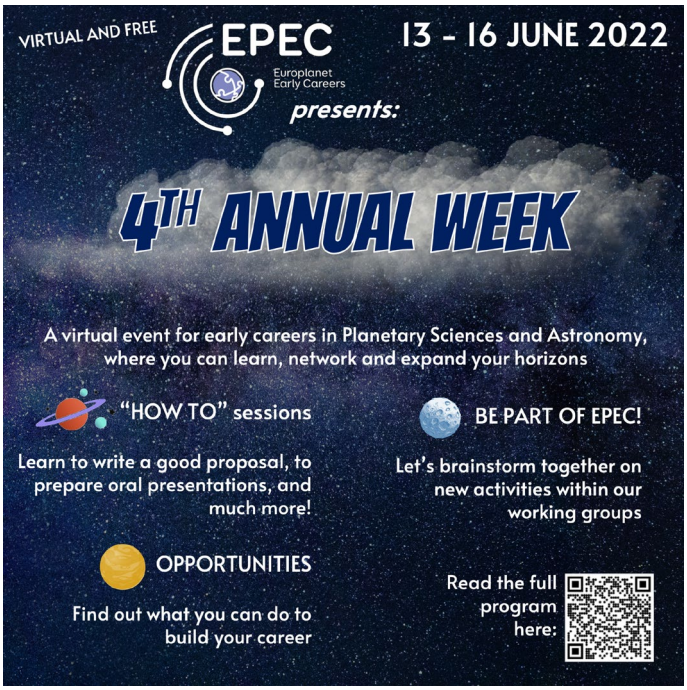
EPEC Annual Week 2022

The 4th Europlanet Early Career (EPEC) Annual Week will be held virtually from 13-16 June 2022. Early careers working in planetary sciences, astronomy or in space-related fields, from all around the world, will participate.

This year, in addition to the usual "How to..." sessions, where early careers can learn practical skills for working in academia, we will also discuss topics including the impostor syndrome, science communication, how to look for funding and fellowships, and much more.

Networking is a core value of the Annual Week, so the programme includes time to get to know each other, discuss our research and non-research issues, as well as opportunities to have fun and learn from one another in a friendly environment.

https://bit.ly/EPECAW2022



EPEC

#PlanetaryScience4All EPEC-EPSC Video Contest 2022

Submit your entries now for the third #PlanetaryScience4all video contest, organised in collaboration with the Europlanet Early Career (EPEC) network and the Europlanet Science Congress (EPSC) 2022. PhD candidates and students involved in any topic related to planetary science can send a 4-minute video to present their research project. Any type of creative video format is welcome, from Lego movies and animations to more formal presentations. The content should be aimed at a general audience. All videos submitted will be shared via Europlanet and EPEC social media channels, giving visibility for entrants within Europlanet's worldwide network of planetary researchers, and supporting outreach and science communication. Winners will receive free registration and a travel grant for the DPS-EPSC Joint Meeting 2023 in San Antonio, Texas, or EPSC2024 in Helsinki.

https://bit.ly/planetaryscience4all

EPEC

Stay Tuned for a Stairway to Space

As planetary scientists, we are lucky to have the chance to be involved in one of the most inspiring human endeavours - the exploration of outer space. From the celestial bodies that were seen by our ancestors as distant companions, to today's planetary research, this field has an eternal fascination. Beyond science, we are also fortunate to be part of a community of people who share the same passion to study, build knowledge and develop the techniques needed to make this endeavour a reality. To do this successfully, we need to communicate with each other, as well as with a broader community of people who are interested in both how science works and how scientists work.

The Europlanet Early Career (EPEC) network, as an active branch of the Europlanet Society, aims to unite and support students, PhD candidates and postdocs working in our field across the European continent and beyond. EPEC offers the opportunity to share our experiences as we find our way in the academic and industrial sectors of planetary science, and to discuss how we can cooperate, evolve personally and achieve collective goals. EPEC is now preparing to launch "Stairway to Space", a podcast that aims to amplify our voice around the planet to reach other early careers with the same goals, the same interests, and the same needs for scientific development. Our objectives are to build a 'trusted companion' for all the members of our community, strengthen our networks, communicate our activities, and provide a forum for deeper reflection and discussion about the needs of the next generation of planetary scientists in Europe.

Listeners can expect a mix of interviews with guests, reports on events, updates on the recent activity of the EPEC working groups and coverage of projects supported by the Europlanet Society. Stairway to Space will soon be "on-air" (or should we say "on-space"). Stay tuned to climb this stairway along with us!

- Subscribe to our mailing list
- Become an active member of one or more Working Groups
- Join our Slack channel: epec-network.slack.com
- Follow us on our social media pages
  - Facebook: epec.epn
  - Twitter: epec_epn
- Join the EPEC Annual Week
- Check the volunteer vacancies on our website:

https://bit.ly/EuroplanetEarlyCareers

EPEC reports by Erica Luzzi, Melissa Mirino and Foivos Karakostas.

New Look for EPEC

EPEC has a new logo! The design is part of a review and update of Europlanet branding (page 38).

Outreach

Europlanet Outreach Funding Scheme and Prize 2022

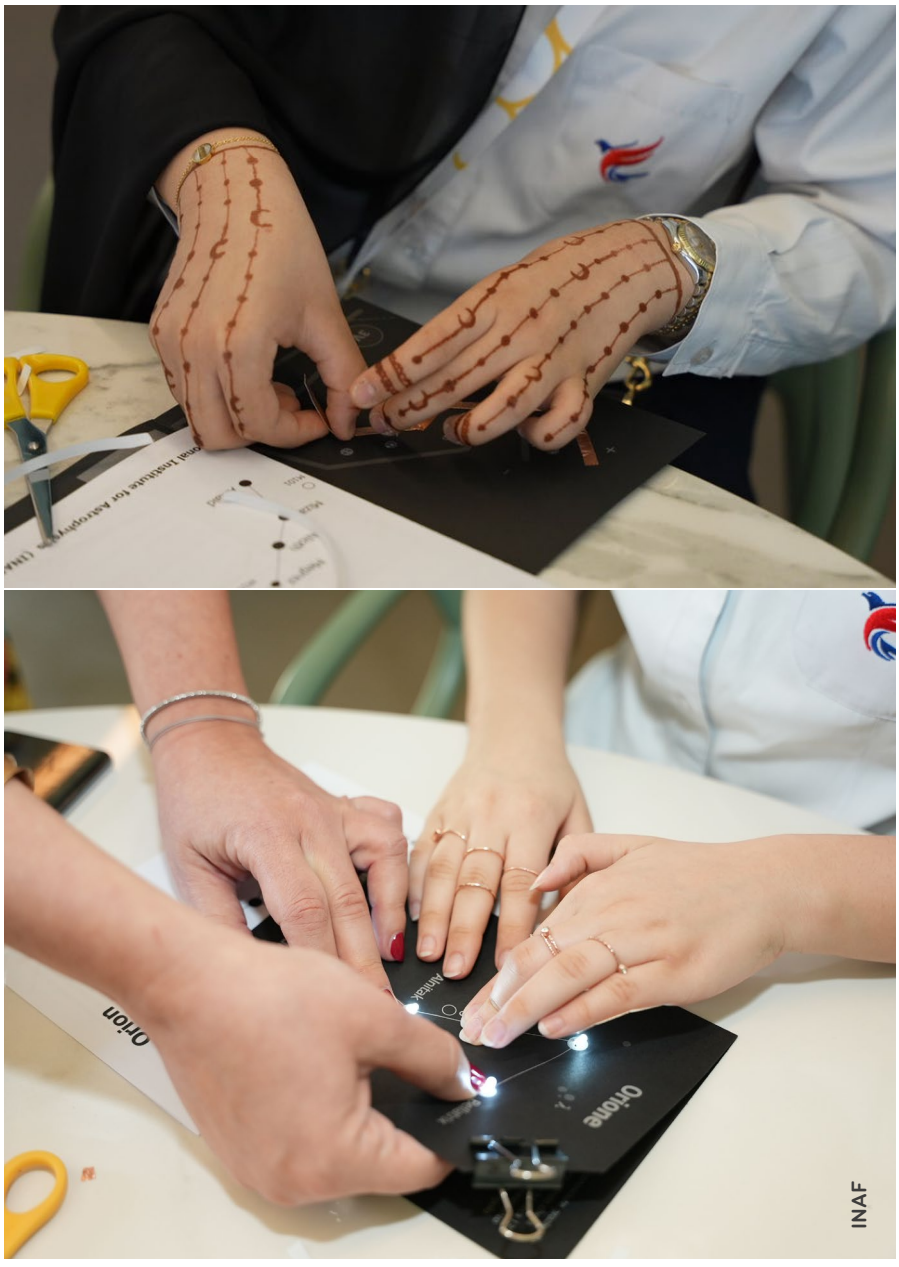
Are you looking for funding to kickstart an outreach or education project related to planetary science? Or have you run a successful public engagement project for which you deserve some recognition? The Europlanet Prize for Public Engagement recognises achievements in engaging citizens with planetary science. The Prize of 1 500 Euros is awarded annually to individuals or groups who have developed innovative and socially impactful practices in planetary science communication and education. Europlanet also awards grants of between 1 000 and 5 000 Euros to fund projects to engage the public with planetary science. Through the funding scheme, Europlanet aims to encourage new ways of sharing planetary science with different kinds of audiences across Europe (and beyond) to create socially impactful initiatives that combine research, learning, innovation and social development. Submit a nomination for the prize or application for funding before 15 June 2022: https://bit.ly/Prize-Funding-Call-2022

Italian Hub

Lighting Up the Skies of World Expo

The Italian Pavilion of the World Expo in Dubai had an ambitious aim - "Let's light up the skies of the world"- with help from the International Astronomical Union's Office for Astronomy Education Center Italy and the Italian National Institute for Astrophysics (INAF). On 16 March 2022, a hands-on laboratory was led by INAF and two teachers. About twenty girls from the GEMS Al Khaleej International School in Dubai lit up "stars" with LEDs and paper circuits, inventing constellations and connecting them to the legends and myths of different cultures of the world.

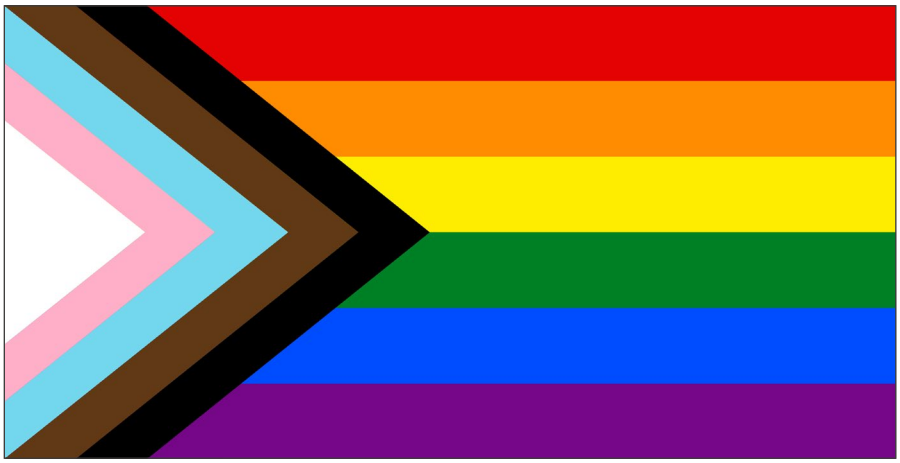
This was followed by a roundtable discussion on "Astronomy for Teaching: From Theory to Practice" with astronomy education experts from the IAU, Europe and the United Arab Emirates, which was also live-streamed. Visitors to the Italian Pavilion were also offered a 360° virtual reality experience of the Apollo 11 Moon landing. https://bit.ly/ItalianSkiesExpoDubai



"Let's light up the skies of the world!" at the Italian Pavilion at Expo Dubai.

Diversity

Pride in Planetary Sciences



In celebration of Pride month in June, Europlanet would like to highlight some resources that provide support and visibility for lesbian, gay, bisexual, transgender, queer, intersex, asexual, and other gender/sexual/romantic minorities (LGBTQIA+) members and allies in our community.

QUeers In Planetary Sciences (QUIPS) was created in February 2017 for LGBTQIA+ members of the planetary science community to network online and in-person at conferences. The group is a platform to raise concerns, to discuss and share experiences, news and best practices, and to support each other. The QUIPS Facebook group is set to 'secret' in order to protect the privacy and identity of its members who are not fully out. It can be joined by sending a request to joinquips@gmail.com and is open to allies too. As a majority of the members are US-based, QUIPS looks forward to welcoming more Europe-based planetary scientists.

The Astronomy and Astrophysics Outlist aims to give visibility to LGBTQIA+ professionals working in the field and reach out to those who still feel that it is not yet safe for them to be public. It compiles a list of astronomers, astrophysicists and staff who are publicly out or allies, encompassing all career levels and experiences. Through the Outlist, LGBTQIA+ professionals in planetary science facing issues can find and contact nearby allies or members of the community for advice and support. If you are yourself publicly LGBTQIA+ or an ally, consider joining the list in order to serve as a professional role model every day, and to promote a safe, accepting and supportive environment in all workplaces.

Finally, don't forget that the upcoming Europlanet Science Congress (EPSC) in Granada in September 2022 will include a session, ODAA2, dedicated to Diversity and Inclusiveness in Planetary Sciences. The session focuses on under-representation in all its forms, and will be an opportunity to foster discussion on best practices and solutions to address the barriers to equality in our community.

Links

Joining QUIPS: joinquips@gmail.com

The Astronomy and Astrophysics Outlist: https://astro-outlist.github.io

EPSC 2022 ODAA2 session: https://bit.ly/EPSC-ODAA2

Europlanet 2024 Research Infrastructure

ESFRI Celebrates 20 Years

The European Strategy Forum on Research Infrastructures (ESFRI) has launched a new Stakeholder Forum to promote regular discussion among the different European research infrastructures (RIs) and their stakeholders. The launch of the forum on 24 March was followed up with a one-day conference in Paris to celebrate ESFRI's 20th anniversary, as well as a two-day online workshop on the research and innovation needs of RIs. The Europlanet management team represented the planetary community at these events and is proactively engaging with ESFRI as part of its strategic planning for upcoming funding calls for RIs in the European Commission's Horizon Europe programme, which are anticipated to open in 2023-24. https://bit.ly/ESFRI20

French Hub

Togo Under the Stars

Raphaël Peralta (SpaceBus France) reports on going on tour in Togo.

Above left: The first day with the students of Kara High School. Above right: Solar observations with the public in Atakpamé. Below: The locations visited by SpaceBus France during "Togo Under the Stars".

Astronomy outreach came to the roads of Togo this spring with "Togo Under the Stars", a collaboration between the Togolese association SG2D (Geological Science for Sustainable Development) and the French association, SpaceBus France.

During two weeks from 16-22 March 2022, a team of six Togolese geologists and four French astronomers travelled around the country, visiting schools, villages and public squares. Science workshops on the theme of space and astronomy were organised in six cities across Togo, from Kara in the central northeast, and descending through Sokodé, Atakpamé and Kpalimé down to Aného and Lomé on the south coast.

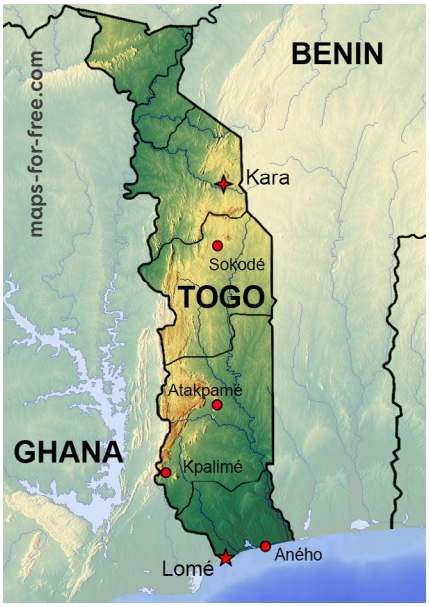
SpaceBus France provided fun and interactive activities, including demonstrations with a 3D-printed scale model of the Solar System, observing the Sun and the night sky with telescopes, and presentations on the Space Race and rocket science. Participants finding out about meteorites and geology were given different kinds of meteorites and terrestrial rocks to handle and to help learn how to recognise them. In the capital city, Lomé, the team provided basic astronomy training for teachers of all levels, using educational tools developed by various research institutions. All the resources presented to teach astronomy in the classroom are easy-to-use and available free on the Internet.

"Togo Under the Stars" has been a great success on all levels, reaching over 10,000 Togolese in total and providing students with an opportunity to meet and exchange with astrophysicists.

The feedback has been extremely positive. Financial support from the Europlanet 2024 RI programme has helped to make this project a reality and to break new ground with this major astronomy outreach event in Togo.

https://www.spacebusfrance.fr

https://www.facebook.com/ongsg2d



MOMSTER, a Mobile Meteor Detection Station for Education and Outreach

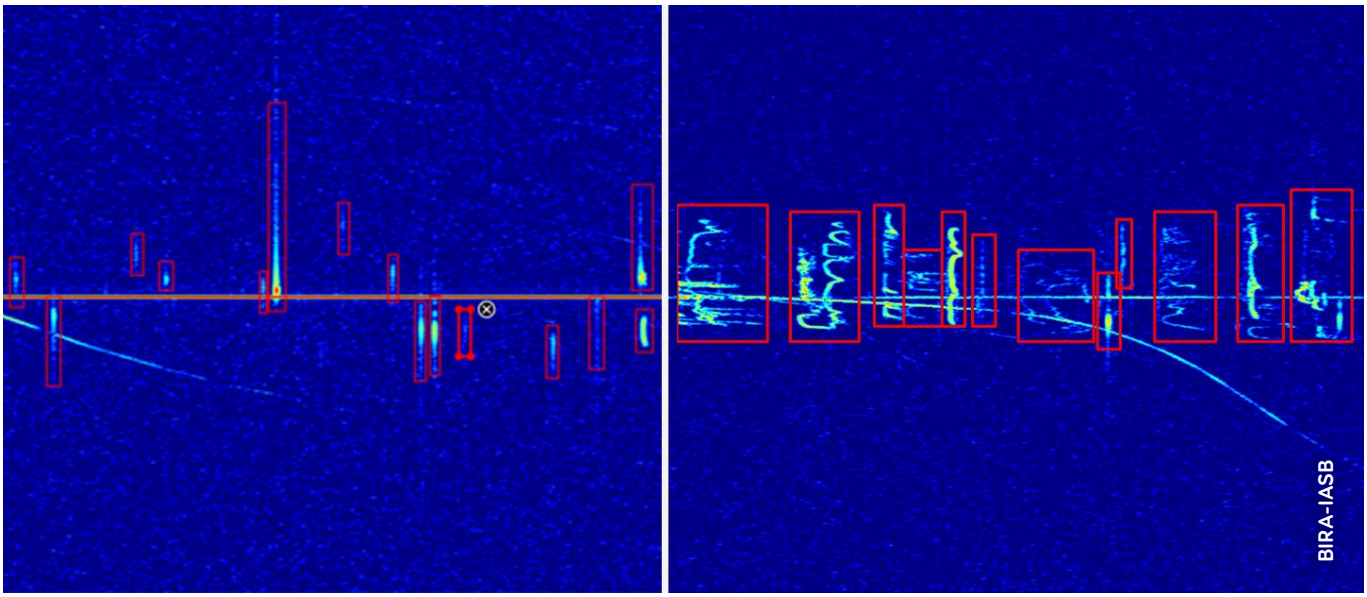
Karolien Lefever, Stijn Calders and Hervé Lamy (BIRA-IASB) describe how schools are becoming involved in meteor research.

Every day, about 100 tonnes of rubble or dust from space enters the Earth's atmosphere. Most meteors are too small to be seen from the ground as shooting stars, yet they can be traced through radio techniques - even in cloudy skies and during the day!

In the lower ionosphere, an atmospheric layer about 80-120 kilometres above the Earth's surface, the rocky or metallic fragments heat up, burn and collide with molecules and atoms, releasing one or more electrons. The resulting 'ionisation' trail along the meteor's path can, under certain geometrical conditions, reflect radio signals and be used for meteor tracking. A meteor detected in this way is called a radio meteor or meteor echo.

Scientists at the Royal Belgian Institute for Space Aeronomy (BIRA-IASB) have been using this technique to study meteors since 2010 using the Belgian RAdio Meteor Stations (BRAMS) network.[1] BRAMS consists of about 40 radio receivers placed at the homes of participating amateur astronomers, radio amateurs, schools, universities and public observatories/science centres spread throughout Belgium and just beyond its borders. A single radio transmitter, located in Dourbes in southwest Belgium, continuously sends radio waves with a fixed frequency (49.97 MHz) vertically skywards. Radio signals reflected by the ionisation trails of meteors are received by one or more receivers tuned to the BRAMS frequency, with thousands of meteor echoes registered every day.

The BRAMS data are usually displayed as visual representations of frequency, called spectrograms. Most of the meteor echoes appear



Left: Typical BRAMS spectrogram with mostly underdense meteor echoes. Right: BRAMS spectrogram obtained during a meteor shower with mostly overdense meteor echoes.

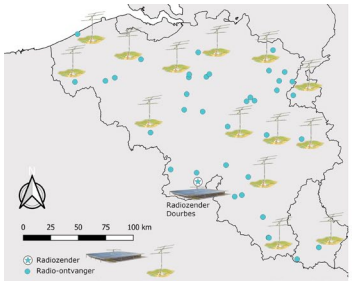
as vertical lines and correspond to small particles, which form the bulk of meteors detected by the BRAMS network. However, some bigger and rarer objects create more complex shapes in the spectrograms, known as 'overdense' meteor echoes.

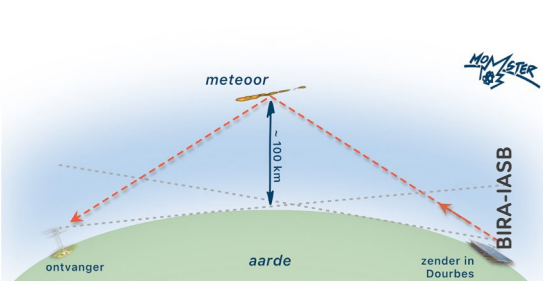
Automatic detection algorithms struggle to detect the overdense radio meteor echoes correctly, especially during meteor showers, and the human eye remains the best detector. Thus, in collaboration with Zooniverse,[2] the BRAMS team started a citizen science project in 2016 called Radio Meteor Zoo.[3]

After an initial introduction and a small amount of training, volunteers are invited to draw boxes in the spectrograms around signals they identify as meteor echoes and/or overdense echoes. With this information, researchers can study the characteristics and the time-evolution of meteor showers' activity, as well as obtain different properties of meteoroids (the fragments that caused meteors) like their mass, speed and trajectory.

As part of the EU-funded Erasmus+ project, BRITEC[4] (Bringing Research Into ThE Classroom) BIRA-IASB researchers visited a number of secondary schools and introduced pupils to Radio Meteor Zoo, the wonderful world of the Solar System, and the origins of meteors. The project proved a hit! Pupils responded positively to the direct contact with the researchers and to the contribution they could themselves make to science. An idea started to grow to permanently embed Radio Meteor Zoo in an educational context and allow pupils to make their own radio meteor observations supported by an 'educational buffet' for teachers to bring the theme of meteors and radio astronomy in the classroom.

The artwork on the cover of the MOMSTER box, which contains the antenna and receiver, is the winning entry from the art and design contest for schools.





Top left: Map showing locations of the BRAMS transmitter and radio receivers. Top Right: Illustration of how the meteors are detected. Above: Demonstrating MOMSTER in the classroom. The winning infographic from the arts contest is in the background.

The MOMSTER (MObile Meteor STation for Education & outReach) project was born![5]

A year later, with funding from Europlanet, three MOMSTER boxes were developed. Each kit includes a mobile, easy-to-use radio meteor station consisting of a short dipole antenna and a receiving box, as well as a computer programmed to visualise the stream of data recorded by the system. The accompanying educational package contains material about meteors, their importance and their impact on the atmosphere and the planet as a whole, linked to all STEAM (Science, Technology, Engineering, Arts, Mathematics) related subjects and targeted at students aged 16-18.

In a pilot phase, three Belgian schools (two Dutch speaking and one French speaking) tested the MOMSTER kits and gave their feedback. The educational resources will continue to grow in response to teachers' experiences in the classroom.

Schools can adopt a MOMSTER kit for a few weeks, to receive and interpret meteor data in their own school and demonstrate the radio technology to their students.[6] After a quick and easy set-up, they can detect meteor echoes within a few minutes, making it immediately rewarding for the students involved in the project. This way, students not only learn about dust in our Solar System, but also about the technology behind the science.

The MOMSTER project kicked off with the organisation of an art and design competition for high school students, and received more than 30 submissions. The competition was won by two 14-year-old pupils. The boxes now travel from school to school, decorated by the winning artwork, and accompanied by a roll-up banner with a winning infographic that explains the difference between meteoroids, meteors and meteorites.

As a subject that triggers the imagination, the study of meteors clearly has the potential to raise interest in STEAM disciplines and increase science engagement by linking with art and citizen science. Indeed, using STEAM education broadens our target group towards less scientifically oriented students. As such, we hope to inspire many more pupils and their teachers and convey a fascination for the ephemeral beauty and complexity of these natural light-shows.

MOMSTER was supported by the 2020 round of the Europlanet Public Engagement Funding Scheme.

The Call for the 2022 round is now open: https://bit.ly/EuroplanetOutreachFunding

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G Tautvaišienė

Planetary Perspectives

Gražina Tautvaišienė, Director of the Institute of Theoretical Physics and Astronomy at Vilnius University (Lithuania), uses spectroscopy to measure the abundances of elements in stars to understand the chemical evolution of the Milky Way galaxy and study the parent stars of exoplanets. In the Europlanet 2024 Research Infrastructure project, Gražina is responsible for tasks to support early career researchers, and is Deputy Coordinator of the Europlanet Telescope Network. She is also leading a new Europlanet programme to support researchers in Ukraine.

How did you first become interested in astronomy?

I've always enjoyed sciences where the emphasis is on understanding rather than memorising. Physics is just such a science, and I achieved good results in student contests at an early age. After graduating from elementary school, I received a letter inviting me to attend a specialist school for teaching physics and mathematics. While studying there, I wondered what branch of physical sciences would be most interesting – and came to the conclusion that it was astronomy. The final decision was made after participating in the congress of the Lithuanian Astronomical Union, where I won a place in a team to participate in the meeting of young astronomers of the Soviet Union. At this point, I started studying astronomy intensively and established a club of amateur astronomers in my hometown of Kaunas. I think that young people choose the activities they do best, but are also oriented by the people around them towards the activities in which they can best perform.

How has astronomy in Lithuania developed since independence in March 1990?

Although the Soviet Union united a number of countries, we were separated from the rest of the world by the 'iron curtain'. There were few foreign scientific journals in local libraries, and copies of articles from the library in Moscow had to be ordered. Most of our scientific articles were written in Russian, a language that many foreigners did not understand. Some journals provided translations into English,

Gražina during observations at the Teide Observatory.

but did not check those translations with the authors. My colleagues and I managed to submit articles to international journals as well, because we had interesting results obtained with a 6-metre telescope in the Caucasus - at the time the world's largest telescope. We also used computer programs and stellar atmosphere models developed in the USA for our research.

When Lithuania became independent in 1990, collaboration with scientists from all over the world opened up, as well as opportunities to participate in international conferences. However, it took many years to overcome a difficult period of economic and scientific blockade by Russia. Fortunately, Lithuanian researchers were greatly helped by the democratic world community, and I am glad that we have been able to earn the trust and establish fruitful cooperations. Since I was engaged in spectral studies of the chemical composition of stars, I first began working with scientists at the Uppsala Observatory, led by Prof Bengt Gustafsson, and to conduct astronomical observations with the Nordic Optical Telescope. Through the Nordic Institute of Theoretical Physics in Copenhagen, I also started a decade-long collaboration with Prof Bernard Pagel.

How important has international collaboration been in your career?

As I started a new field of research in Lithuania with my dissertation topic – spectroscopic studies of the chemical composition of stars – scientific cooperation was especially important. I am extremely glad that astronomers from Denmark, Finland, Germany, Italy, Poland, Sweden, the UK, the USA, and other countries have contributed to my research programs. Thanks to the European Commission and the European Southern Observatory, I and the scientific team I lead have been - and can be - involved in major collaborative projects such as BalticGrid I and II, the Europlanet 2020 and 2024 Research Infrastructure projects, Gaia-ESO Survey, 4MOST and others. Astronomy is a highly international science, and the ever-increasing data-flows provided by space missions and ground-based surveys can only be comprehensively explored through extensive collaboration.

What practical steps can the Europlanet community take to support colleagues in Ukraine?

Europlanet and the global astronomical community must help colleagues and Ukraine in general, to defend themselves against the Russian aggression and move towards democracy along with other European countries.

Colleagues who have left Ukraine during the war are being hired for temporary employment in astronomical institutions in other countries. For those who have had to stay in the country and are displaced from their workplaces, Europlanet is developing a support programme and is offering astronomical observations with the Europlanet Telescope Network equipment. The war in Ukraine is a major challenge for the research community that

Gražina with the James Webb Space Telescope model during the IAU General Assembly in Prague.

needs to be overcome. I would also like to see Russian scientists making a contribution to finding peace.

You have a very strong commitment to providing training for young scientists and supporting the career development of early career researchers in your group. What led you to start running summer schools and courses?

We have already held more than 20 different summer schools and courses organised at our Molėtai Astronomical Observatory of Vilnius University. Educating and passing on the experience to the younger generation is very important. At universities, students are often confined to lecturing from local researchers and may have no opportunity to be trained in working on a professional telescope. It is important for young astronomers to hear lectures by foreign scientists, learn new research methods, and broaden their horizons. Asteroseimic research on stars and, in recent years, research on exoplanets have been initiated in Lithuania through visits from the international community. It's great when young people can meet and start collaborating at an early age. The growing popularity of our summer schools has encouraged us to continue this activity. The Europlanet virtual summer school for asteroid research, organised in 2021, was attended by lecturers and participants from 32 countries around the world. Observations were made remotely during the virtual event. We plan to dedicate the next summer school to exoplanet research. I look forward to seeing the happy faces of our future researchers again.

What advice would you give young people considering a career in astronomy?

Astronomy is an extremely interesting science! Research questions come in a very wide and dynamic range; the Universe around us still hides many secrets and it is very important to uncover them.

Find out more: Europlanet Early Careers Training, Education and Mentorship Portal:

http://www.europlanet.tfai.vu.lt/

Europlanet Telescope Network:

https://bit.ly/EuroplanetTelescopeNetwork

Gražina Tautvaišienė was one of the pioneers of modelling the production of chemical elements in the Milky Way and the Large and Small Magellanic Clouds. She has held numerous positions at the International Astronomical Union, including President of the IAU Commission "Local Universe", IAU National Outreach Coordinator, Vice-president of the International Union of Pure and Applied Physics and Chair of IUPAP Commission on Astrophysics. She was awarded the National Science Prize of Lithuania in 2003 and is President of Lithuanian Physical Society.

Support for Ukraine

We ask for the planetary community's help to share information and identify support schemes for colleagues in Ukraine and displaced researchers.

The news of the outbreak of war within the European continent was undoubtedly shocking to us all. Europlanet has established many collaborations with Ukrainian scientists, especially through the three facilities in the Europlanet Telescope Network that are located in Ukraine. We express our solidarity with the Ukrainian people in general and our colleagues in the planetary science community in particular, and condemn the invasion by Russia in the strongest possible terms.

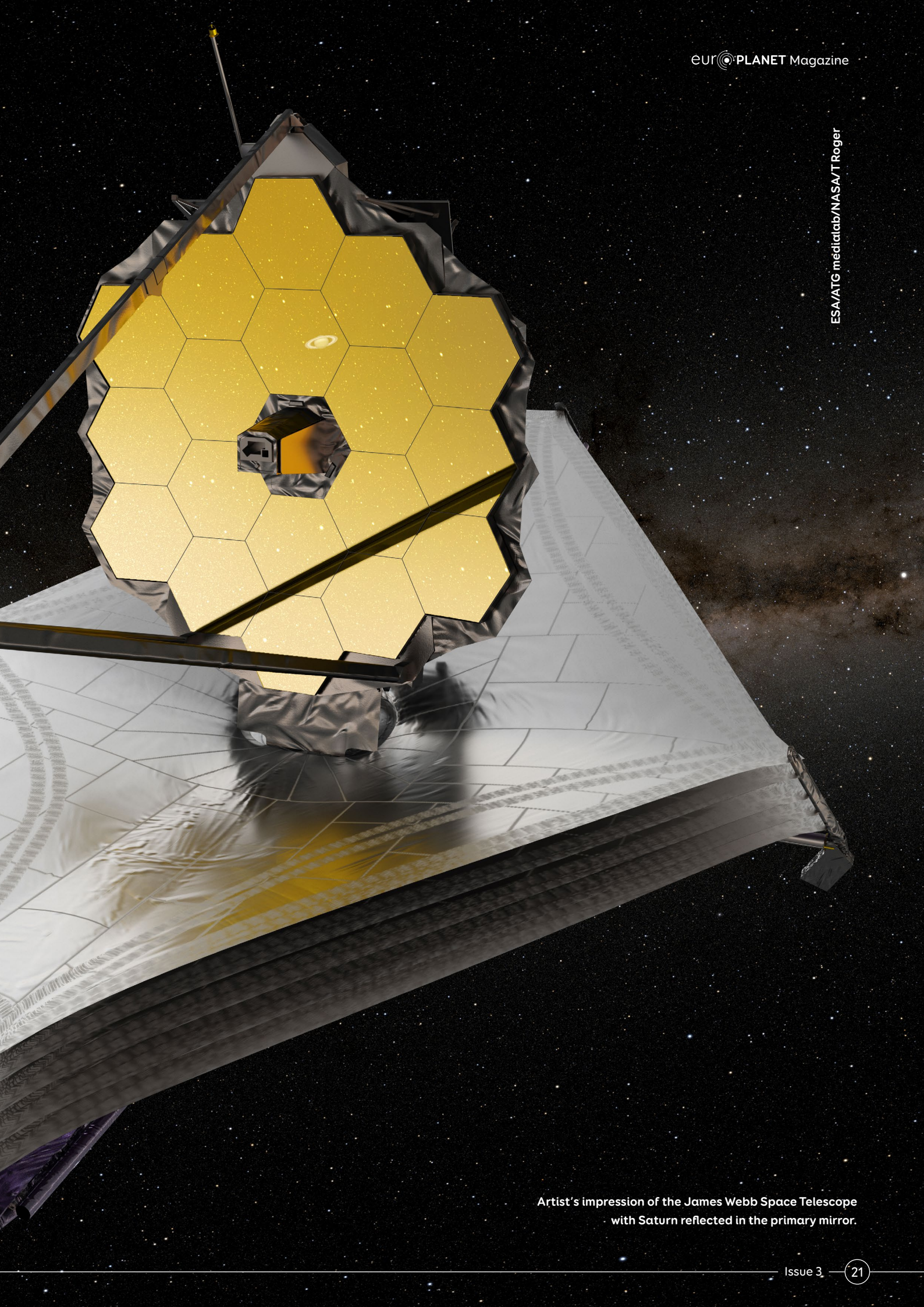
For displaced colleagues needing support to travel within the EU, Europlanet can offer some short-term positions, bursaries and mobility grants. Researchers who are citizens or residents of Ukraine are also welcome to apply for support for visits inside Ukraine, lasting up to 30 days, with the aim of continuing research, building new collaborations related to planetary science and developing additional skills. Europlanet also encourages researchers in Ukraine to apply for astronomical observations with the Europlanet Telescope Network. For details, please contact ukraine@europlanet-society.org.

We have compiled and are updating a page listing support schemes offered by the European Union, as well as individual countries, funding bodies, institutions and organisations. If there are other schemes and activities we should add to the list, please let us know.

https://www.europlanet-society.org/support-for-ukraine/

JWST: A New Infrared Eye on the Solar System

Leigh Fletcher, Professor of Planetary Science at the University of Leicester (UK), reveals how the world's most sophisticated infrared space telescope will provide exciting new opportunities for the exploration of our Solar System.



ESA/ATG medialab/NASA/T Roger

Artist's impression of the James Webb Space Telescope with Saturn reflected in the primary mirror.

It is fair to say that nerves were a little strained as the Ariane-5 rocket rumbled skyward on 25 December 2021, carrying the most powerful space observatory ever built: the James Webb Space Telescope (JWST). Delicately folded within the Ariane fairing were the 18 segments of the enormous gold-coated hexagonal mirror, a collection of the most challenging instruments designed to date, and the multi-layered sunshield needed to shade the telescope and its cold instruments from the Sun.

After a near-perfect launch from the European spaceport of Kourou in French Guiana, astronomers, engineers, funding agencies and the public all shared an agonising month-long wait as the telescope and sunshield unfurled in space, a choreographed dance requiring more than 300 individual deployments.

In a feat of engineering that will go down in the history books, the unfolding of JWST proceeded without issues. By the end of January 2022, the new observatory was 1.5 million kilometres from home, orbiting a gravitational parking spot called the Second Lagrange Point (L2), hidden from the Sun and the Earth behind a sunshade and slowly cooling to the operating temperature of about 40 Kelvin (-233 degrees Celsius), required to make sharp infrared observations. By the end of April 2022, JWST had been aligned and focused, ready for the commissioning of the science instruments.

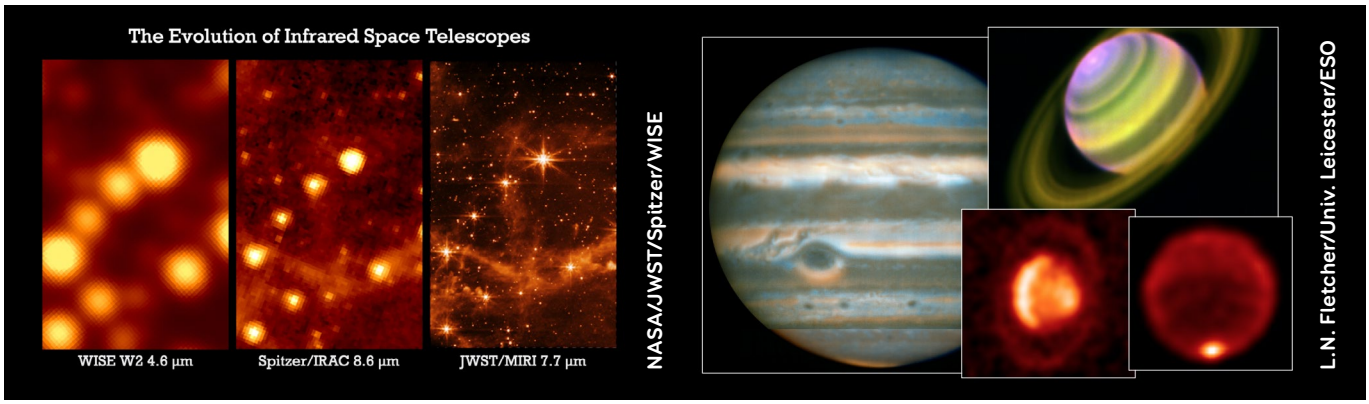
Infrared light allows astronomers to access realms that were previously hidden from view, being too distant, too cold, or too faint for previous generations of space- and ground-based telescopes. In the months and years ahead, an astronomical abundance awaits. JWST will peer back through cosmic history, using its exquisite infrared sensitivity to probe the earliest stars and galaxies, dive into dust-enshrouded nurseries for stars and planets, and probe the environments and atmospheres of a myriad of worlds within and beyond our Solar System.

Planetary Exploration with JWST

Early-on during the 25-year development of JWST, planetary scientists recognised the value of space-based infrared spectroscopy from this new facility. The observatory combines the spatial resolution of a 6.5-metre primary mirror, the extreme sensitivity of modern infrared detectors, and the ability to provide spatially-resolved spectroscopy from the near infrared up to the beginning of the far infrared. This enables JWST to span the spectral realms of reflected sunlight and thermal emission to investigate many vital molecules, ices and minerals, without the interference from the Earth's atmosphere that plagues ground-based telescopes. This broad spectral coverage complements the instrumentation carried by missions

The launch of JWST.

ESA-CNES-ARIANESPACE/Optique Video du CSG/JM Guillon



Above left: This comparison of the same region of space photographed by previous infrared space telescopes, WISE and Spitzer, shows the tremendous increase of precision possible with JWST. Above right: Montage of the best-available mid-infrared (7-20 μm) giant planet imaging from ESO's Very Large Telescope VISIR instrument.

visiting planetary bodies in our Solar System. JWST's spectral capabilities are enhanced by technologies that include 'integral field units' (IFUs) within NIRSpec and MIRI. IFUs speed up spectral analysis of planetary scenes by slicing the view into lots of smaller components and obtaining a spectrum for each component simultaneously. NIRCam and MIRI have filter wheels to capture images at different wavelength ranges, as well as coronagraphs to block bright sources and reveal faint objects nearby. An aperture mask on NIRISS turns JWST into an interferometric array and enables it to capture more details of very bright objects.

JWST can track moving objects in our Solar System, such as comets and asteroids. However, because of the need to keep the observatory shaded, it can only view targets in certain parts of the sky and at certain times of year. The observatory orbits around the Sun in sync with the Earth, and the telescope points at an approximate right angle compared to its sunshield. This means it cannot look at planets at opposition (i.e. directly outwards along the Sun-Earth line), nor can it look towards the inner Solar System. It has two opportunities per year to view planetary targets like Mars or the Outer Planets, when they appear at roughly 90 degrees to the Sun from Earth (Figure 1, overleaf).

With this arsenal of capabilities, planetary scientists had no shortage of ideas for how to put JWST to good use in the telescope's first year of official scientific observations, 'Cycle 1', which starts in June 2022. In order to showcase the possibilities offered by JWST, and to help pave the way for future cycles, Guaranteed-Time Observations (GTO) were awarded to interdisciplinary scientists and mission specialists, who assembled teams to lead the development of some 18 individual GTO programmes that span the Solar System.[1] These were reinforced in 2017 by the selection of Early-Release Science (ERS) programmes, which are designed to test and demonstrate JWST capabilities, and will be executed as soon as possible after the 6-month commissioning period and made immediately available to the scientific community.[2] The Jupiter system, with its bright central planet, diverse satellites, and faint ring system, was selected as an ideal testbed.[3]

Following the GTO and ERS allocations, more than 1000 proposals were submitted in 2020 for General Observer time (GO), of which 32% of principal investigators were from ESA member states.[4] Solar System science was one of 18 topical panels, allocating more than 200 hours to 17 additional Solar System astronomy projects. At the time of writing, all these approved projects have been designed with the Astronomer's Proposal Tool (APT), and are awaiting news of scheduling during Cycle 1 (2022-23).[5]

The Realm of the Giants

The Gas Giants, Jupiter and Saturn, provide extended, bright, rotating and moving objects that will test JWST's capabilities to create spectroscopic maps of their dynamic atmospheres. Indeed, both planets are so bright in the mid-infrared that MIRI spectroscopy is expected to saturate at the longest wavelengths, providing a challenge for calibration. The IFUs have fields of view almost an order of magnitude smaller than the diameter of Jupiter. JWST will therefore target specific phenomena.

A mosaic of Jupiter's Great Red Spot and its surrounding environment will help to understand the distribution of gases and colourful hazes within the storm. Mapping of the south polar region will help to determine how auroral heating affects the deeper stratosphere and polar vortices. Mapping Saturn's northern summertime hemisphere – including the famous hexagon and central polar cyclone – will support studies of

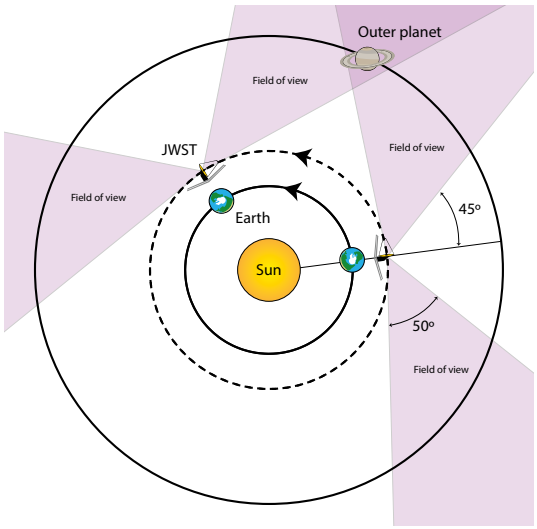
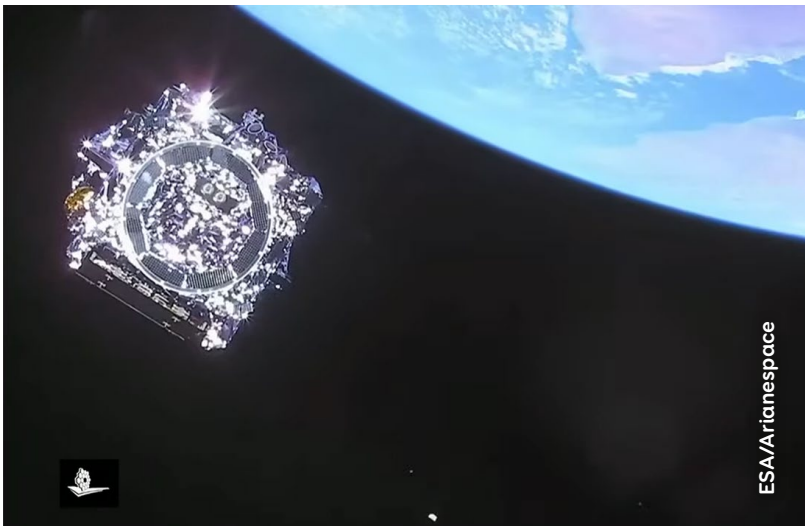


Figure 1: Mars and the outer planets of the Solar System come into JWST's field of view twice per year, when they are roughly at right angles to the Sun and the Earth.



JWST following separation from the Ariane-5 launcher.

seasonal evolution on the gas giant, some five years after the demise of the Cassini mission.

Further out, the Ice Giants, Uranus and Neptune, fit perfectly within the JWST fields of view, so that global maps of both worlds can be generated as the planets complete their daily rotations every 16-17 hours. Having been visited only once by Voyager-2 in the 1980s, there is still much that remains a mystery about their frigid environments. Earth-based studies of Uranus and Neptune from 8-metre class observatories have been restricted by the planets' extreme distance and low temperatures, producing infrared signals that are so weak that our knowledge of their middle and upper atmospheres (e.g. the stratosphere and ionosphere) remains in its infancy. JWST will provide access to these previously hidden regions, opening a new programme of research for this unique category of planetary object ahead of future missions visiting the Ice Giants.

JWST will explore the space surrounding the giant planets themselves, providing a survey of their diverse satellite systems. NIRSpec investigations of the jets emanating from the subsurface layers of Europa and Enceladus may provide access to the chemical composition of their deep, hidden oceans, probing the processes at work beneath their icy crusts to assess their potential habitability.

The exosphere, surface composition and thermal emission of Ganymede will be mapped by NIRSpec and MIRI, whilst also searching for Ganymede's auroral emission during a jovian eclipse. Io's volcanic hotspots will be mapped during eclipse to determine lava temperatures and to understand the control of the thin atmosphere by the volcanic activity. The distributions of carbon- and nitrogen-rich species on Callisto will be revealed via NIRSpec mapping, whilst searching for 'pure CO_2' ices within giant impact basins.

Spatial mapping of the surfaces of these satellites will also help to identify unique terrains and active regions, which will be an invaluable guide for future missions like NASA's Europa Clipper and ESA's JUpiter ICy moons Explorer (JUICE).

Spectral maps of Titan, using both NIRSpec and MIRI, will build on the legacy of Cassini to study clouds, hazes and gases during Titan's northern summer, and will use MIRI's high spectral resolution to search for previously-undetected species in its chemically-rich stratosphere.

NIRCam observations of the jovian and saturnian ring systems will provide a sensitive search for new clumps or moonlets, whilst also providing a test of JWST scattered light capabilities close to the central planets. Not to be outdone, the Ice Giants' systems will be explored via NIRSpec observations of Uranus's classical satellites (Ariel, Umbriel, Titania and Oberon), as well as Neptune's captured moon Triton, to reveal the possible presence of ammonia-rich species, organics and carbonates on their volatile-ice-rich surfaces, providing hints of past ocean-world activity on these moons.

Building Blocks of Planets

JWST will explore the remnants of Solar System formation and planetary migration, from large asteroids (e.g. Ceres, Pallas, Hygiea), to Jupiter

Trojan asteroids (Patroclus, Eurybates, and other targets of NASA's Lucy mission), providing compositional information from NIRSpec and MIRI to extend the wavelength coverage beyond the capabilities of Lucy.[6] In addition, JWST will characterise the composition and potential presence of water on the surface of (16) Psyche – a representative metallic asteroid that could be the exposed core of a primordial differentiated object, and the target of NASA's Psyche discovery mission. Alongside these M-type asteroids, JWST will also investigate the existence of calcium-aluminium inclusions (CAIs) on rare L-type asteroids, which hint at a potentially ancient origin, and test the distribution of materials in the early Solar System.

Closer to home, JWST will provide infrared observations of the Near-Earth Objects Phaethon (linked to the Geminids meteor shower and target of the DESTINY+ mission)[7] and Didymos (target for the DART mission)[8] to provide insights into the nature of the near-Earth population, examining their composition and searching for any signs of activity.

The gas and dust (silicate and carbonaceous materials) within the inner comas and nuclei of comets – including a main belt comet, a Jupiter-family comet, and potentially a new dynamic comet (if a suitable example is discovered during Cycle 1) – will be mapped to understand how comets may have delivered pre-biotic materials from the outer Solar System to the evolving terrestrial planets. JWST will also capture an unprecedented new view of the Oort-cloud comet, C/1995 O1 (Hale-Bopp), while it is 46 Astronomical Units (nearly 7 billion kilometres) from the Sun and at such a low temperature that most of the ices will be stable on the surface. Future observations of cometary nuclei and comas at different heliocentric distances will build a census of these objects,

Instruments on JWST

JWST carries four main instruments, with multiple subsystems, enabling the observatory to investigate astronomical targets at a range of wavelengths:

- Near-Infrared Camera (NIRCam) is the observatory's primary imager, covering the infrared wavelength range from 0.6 to 5 micrometres. NIRCam is provided by the University of Arizona.[9]
- Near-Infrared Spectrograph (NIRSpec) enables low, medium and high-resolution spectroscopic observations in the near-infrared from 0.6-5.3 micrometres. NIRCAM is provided by the European Space Agency (ESA), with components provided by NASA Goddard Space Flight Centre.[10]
- Mid-Infrared Instrument (MIRI) studies mid-infrared light from 4.9-28.8 micrometres, via imaging and spectroscopy at slightly longer wavelengths than the other JWST instruments, and is also equipped with a coronagraph to mask very bright features and reveal dimmer objects around them. MIRI is provided by the European Consortium with ESA, and by the NASA Jet Propulsion Laboratory (JPL).[11]
- Fine Guidance Sensor/Near InfraRed Imager and Slitless Spectrograph (FGS/NIRISS). The FGS acts as the telescope's eyes, allowing it to point at and focus on objects of interest. NIRISS can both take pictures and gather spectra. FGS/NIRISS are provided by the Canadian Space Agency.[12]

beyond the single-target observations of individual spacecraft missions.

Worlds Beyond Neptune

The composition of even the largest Trans-Neptunian Objects (TNOs) and Kuiper Belt Objects (KBOs) remain poorly constrained, yet understanding their chemical make-up could reveal the end-state of accretional processes in the outer Solar System and subsequent evolution via collisions and migration (e.g. Centaurs and scattered objects). JWST can characterise almost every KBO and TNO discovered to date, and will be determining the surface composition

of a large sample of almost 60 TNOs, as well as searching for some of the faintest 10-kilometre sized TNOs. The exquisite NIRSpec and MIRI sensitivity will reveal new insights into their icy surface composition, temperatures and thermal inertias, crystallinity and grain sizes, as well as enable a search for potential organic species.

Cycle-1 targets include the dwarf planet Makemake, the Haumea collisional family, and the KBOs Varuna, Sedna, Eris, and Quaoar. JWST spectroscopy will bring new insights into Centaurs (small bodies that display properties both of comets and asteroids), including the processes shaping their colours (i.e. reddening) and how Centaurs display cometary activity as they move inwards from the 'Scattered Disc' beyond Neptune to join the short-period Jupiter-family comets. Cycle-1 will also provide an inventory of volatile compounds on the TNOs Orcus and 2003 AZ84 (both similar to Pluto's companion, Charon), to understand the consequences of possible past cryovolcanism (and the influence of ammonia as an anti-freeze). The composition of Centaurs will be compared to that of Neptune's Trojan asteroids to understand how reddening of planetary bodies is linked to composition, irradiation and grain size distributions. Occultations of background stars by foreground TNOs or Centaurs will be used to study the size, shape, and potential atmospheres/rings of these objects.

Finally, the Pluto and Charon system will be studied with MIRI and NIRSpec spectroscopy, building on the discoveries of the New Horizons flyby to explore Pluto's climate evolution, plus the thermal and compositional properties of their surfaces.

Monitoring Mars

Moving closer to home, JWST will also be able to provide new insights on Mars. From its vantage point at L2, JWST will be able to make spectroscopic measurements across the full observable disc of Mars and study short-term and seasonal effects. It will map the atmospheric composition of Mars and investigate the deuterium/hydrogen ratio (an important marker for the history of water on Mars), methane, trace gases, and the CO_2 emissions from the martian mesosphere (enabling a high-resolution picture of this region of Mars's atmosphere for the first time). JWST will also study the variability of dust and ice clouds, and the hydrated minerals on the surface.[13]

Expect the Unexpected

The descriptions in this article deal with objects where a long-term plan of observations is possible. But what about those dynamic Solar System events that are hard to predict in advance?

JWST allows proposals for 'targets of opportunity', so that regular observations can be interrupted under extreme circumstances, such as for large-scale cometary or asteroid impacts on Jupiter or Saturn, a spectacular new comet journeying towards the Sun, or possibly even the discovery of a new interstellar object passing through our Solar System. JWST is ready for each of these eventualities and, potentially, the most exciting new revelations will come from phenomena that cannot be predicted in advance.

Exciting Times

When commissioning ends and JWST science begins, planetary scientists can expect a treasure trove of new discoveries spanning our Solar System. These will reveal new insights into the origins and properties of planetary systems, allowing us to assess how the building blocks of habitable worlds might have formed, and how these shaped the ability of our fragile home to sustain the emergence of life. Exciting times are ahead!

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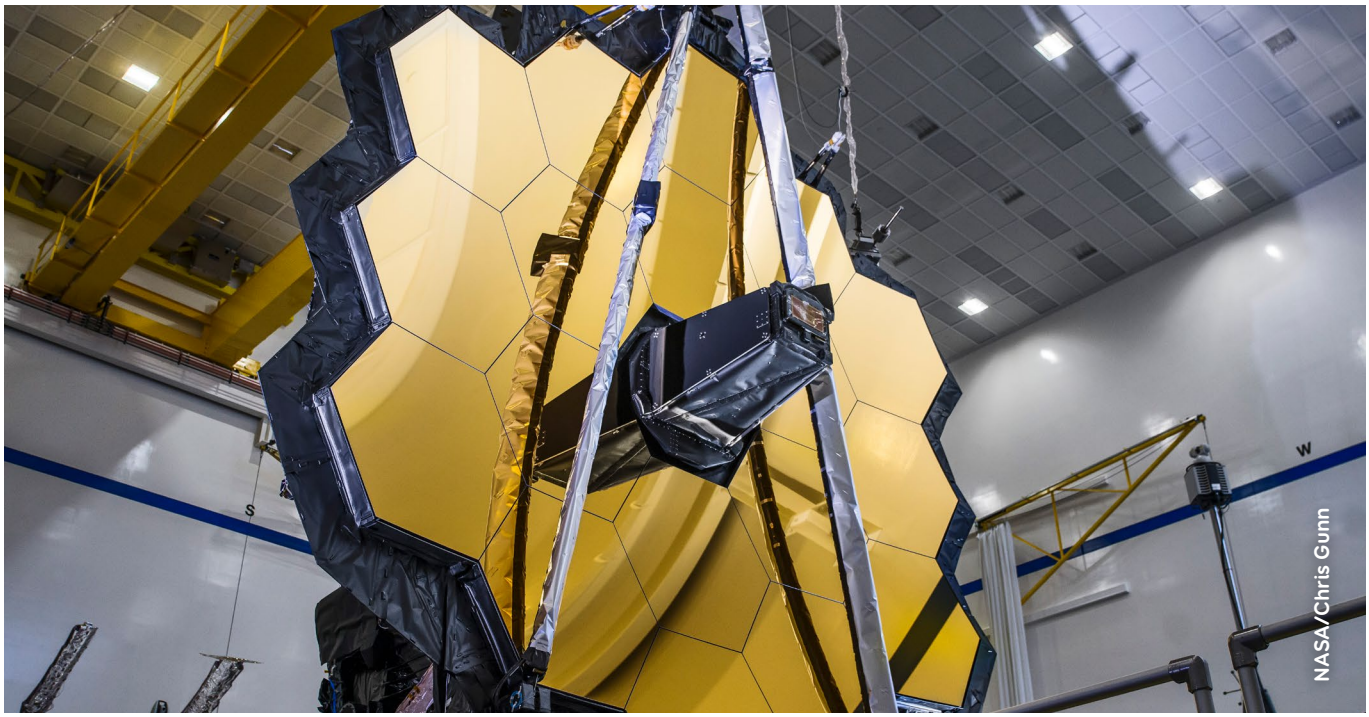
JWST: An Eye on Exoplanets

Brett Morris and Clémence Fontanive of the Universität Bern/National Centre of Competence in Research (NCCR) PlanetS (Switzerland) look at how the James Webb Space Telescope (JWST) is set to revolutionise exoplanet research.



JWST after a deployment test of its primary mirror in the cleanroom.

More than 5,000 planets orbiting distant stars other than the Sun have been found to date, with more being discovered each day. However, we still know relatively little about the properties of these exoplanets or whether Earth and our neighbours in the Solar System are typical or unusual planetary specimens. Now, with its powerful instrumentation and vantage point unhindered by Earth's atmosphere, JWST offers an opportunity to start building a clearer picture of the 'planetary zoo'. Exoplanets come in a bewildering variety of sizes, temperatures, and system architectures. Since most current discovery methods are biased towards finding planets that are close-in to their stars, we have found many worlds unlike those in our Solar System. With JWST, we can start to try to understand these exotic planets, such as hot Jupiter-like gas giants that orbit their stars every few hours, or lava-planets - where the scorching temperatures can melt rock. The most numerous types of planet discovered to date fall into the categories of super-Earths and mini-Neptunes, which cover the spectrum of rocky planets more massive than Earth to hydrogen/helium-rich ice giants smaller than Neptune. JWST will also look at mysterious objects called brown dwarfs, which straddle the line between the smallest stars and the biggest planets.

Atmospheric insights

JWST's instruments will analyse the infrared light reflected and emitted from the surfaces or cloud-tops of planets and brown dwarfs to measure their temperatures. The telescope's spectrographs will be able to investigate the presence and composition of atmospheres and clouds during transits, where a substellar body (planet or brown dwarf) passes in front of its star along JWST's line of sight. Starlight filtered through the atmosphere of the transiting body carries the spectral fingerprints of atoms and molecules encountered, and this technique will be used to give new atmospheric insights across the population, from brown dwarfs and hot-Jupiters to mini-Neptunes and super-Earths.

Several JWST programmes will target the famous TRAPPIST-1 system, in which a cool star – hardly larger than Jupiter but 94 times its mass – is orbited by seven Earth-sized planets. The masses and radii of these planets, well-measured by existing missions and ground-based facilities, are strikingly similar to Earth's. However, the question of whether they have atmospheres has been beyond our capabilities to date, as the spectroscopic imprint of an Earth-like atmosphere would often be partially obscured by clouds and thus very small. JWST may be able to determine whether or not these planets have atmospheres and help to understand whether any or all of the TRAPPIST-1 planets could be considered a 'true' analogue for Earth.

By observing light reflected from planets before and after they move behind their star, JWST observations will be able to produce crude temperature maps and weather forecasts of exoplanets – something that is very difficult to do from the ground. Although the temperature uncertainties will be tens or hundreds of degrees, this is still precise enough to reveal a wealth of information on chemical processes and climates occurring in a planet's atmosphere.

When a gas giant or brown dwarf orbits far enough away from its host star, we can sometimes obtain pictures of the body itself. JWST's powerful spectroscopic capabilities combined with coronagraphs, which block the overwhelming glare of the star, will enable it to capture light emitted directly by the body's thermal radiation in the infrared. In particular, a dedicated Early Release Science programme will allow astronomers to study the formation and atmospheric structure and dynamics of some known large-separation substellar bodies in more detail than has ever been possible to date.

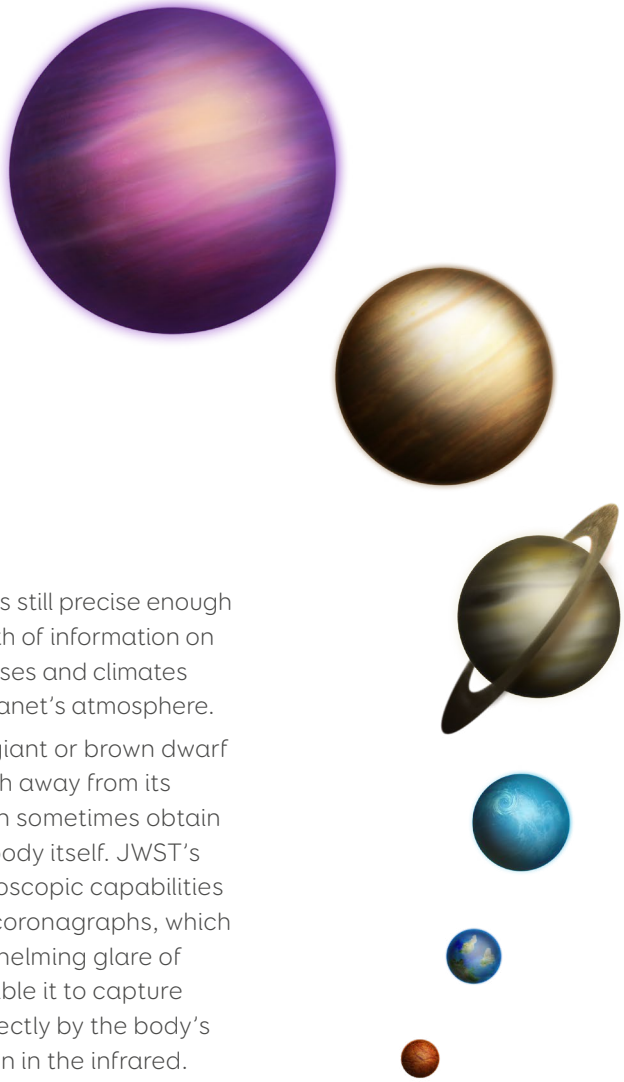


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Illustration of the range of sub-stellar species observable by JWST, from terrestrial planets (bottom), through super-Earths, sub-Neptunes and giant plants, to brown dwarfs (top).

Rogue wanderers

The lightest and coldest brown dwarfs are similar in many ways to giant planets like Jupiter. Though they are sometimes found orbiting stars, many wander through space with no parent star, as can some planets. Such star-less bodies are described as "rogue". Pushing the limits of what has been detectable until now, some JWST General Observers programmes will attempt to uncover new rogue planets and brown dwarfs, either in isolation or as companions to more massive brown dwarfs.

As JWST begins operations, we look forward to seeing it excel at the complicated game of exoplanet observation and enlighten our knowledge of star, brown dwarf and planet formation processes.

Europlanet Mentorship Programme: Two Years After Launch

Edita Stonkutė of Vilnius University (Lithuania) and Jen DeWitt, Evaluation Officer for Europlanet 2024 RI (UK), examine how mentoring can support the planetary community.

Increasing diversity in science is an ongoing challenge, and the fields of geo- and planetary research are no exception. Evidence suggests that mentoring programmes have a role to play in encouraging individuals from a range of backgrounds to continue in STEM.[1,2] One way in which mentoring can exert its effect is by supporting the development of a sense of 'science identity', through which people are being able to see themselves as belonging in science and are recognised by others as belonging.[3,4]

The Europlanet Mentorship programme was established in 2020

with the aim of giving early career professionals in planetary science and related fields support to become collaborative and open-minded colleagues and leaders, and enabling them to pursue their chosen career paths.[5]

Potential mentees and mentors can sign up and be connected via the Europlanet Mentorship Platform, which provides a range of tips and tools for a successful mentorship experience. Through the programme, early career scientists can develop expertise, ask questions and discuss career plans with more established members of the planetary community. The programme is flexible and can be arranged to suit the individual working environments of mentors and mentees. Mentees make initial contact with their assigned mentor via e-mail. The focus of the mentorship is agreed at the start, and could include support around developing research skills, writing CVs, or interview techniques, or writing for publication.

Progress so far

Following positive feedback on a pilot of ten matched pairs of mentors and mentees, which launched in August 2020, the programme has expanded. It now covers a wide geographical spread, with participants from more than 20 countries. To date, 42 pairs have been matched and several mentees are waiting for suitable mentors. Because we aim to find synergies between a mentor's areas of strength and a mentee's mentoring needs, it can take time to identify suitable matches.

Feedback

To continue to develop the programme, we are using a survey to gather feedback from mentors and mentees, and we are also following-up with participants informally through chats and e-mails. The feedback so far has been positive and points to the potential effectiveness of the programme in supporting the paths of early career researchers. For example, one mentor-mentee pair began to collaborate scientifically, and they have since published a paper together about meteoroid orbits. The same mentor is now working on questions related to fireballs with a second mentee. The impact of the mentorship is expanding further as the two mentees are also starting to collaborate and are planning to visit each other's scientific communities in Romania and Brazil. Another mentee has been offered a postdoctoral fellowship at the European Space Agency (ESA), and credits advice from the mentor as being helpful in securing the position.

"Overall, I found the conversation and discussion to be beneficial. Some of the topics we discussed have already made an impact in my daily schedule and habits and I'm looking forward to our next meeting."
— Mentee.

"Mentoring is one of the possible ways available to us to encourage the next generation of researchers to blossom. Sharing our respective passions for science leads to a fruitful interaction for both parties. Let us all play our part and contribute to a better world."
— Mentor.

Next steps

Our next steps are to continue matching pairs and to use feedback to improve and grow the programme further. The success of the mentorship programme so far highlights the need for this support and the potential role it can play in developing the individuals within our community who will advance planetary science over the coming years. It also flags the important practical benefits of embedding mentorship within Europlanet and how it can contribute to the long-term sustainability of the research infrastructure.

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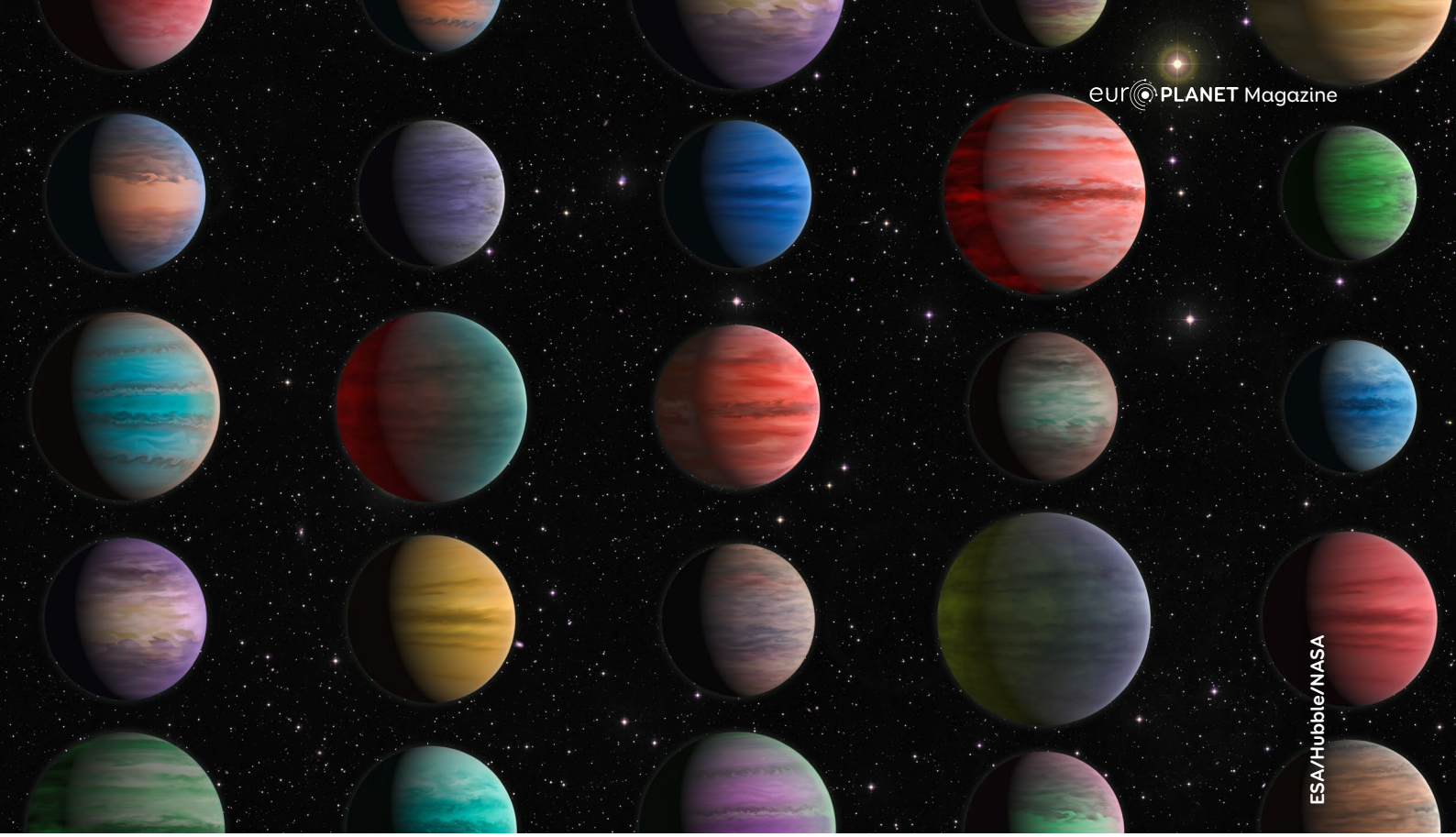

ESA/Hubble/NASA

Taking on the Data Challenge

Ingo Waldmann of UCL (UK) explains how launching a data challenge linked to the Ariel mission has led to new approaches and collaborations.

It is fair to say that machine learning, and in particular deep learning, has revolutionised data analysis in many fields of science and industry. Planetary science and exoplanet research are no exception; though our community may have been a little late in joining the party, the number of planetary science publications using machine learning is now increasing exponentially.

Papers on theoretical machine learning, potentially relevant to our field, are also being published at a similar rate. Keeping abreast of two rapidly moving subjects is nearly impossible and this is perhaps one of the main challenges faced today by interdisciplinary researchers.

Fortunately, we don't have to be seasoned experts ourselves and can collaborate instead. However, finding the right person with the right data analysis expertise is reminiscent of searching for the proverbial needle in a haystack, particularly if you require a fresh perspective on long-standing issues and are not quite sure what you are looking for. From the machine learning community's perspective, astronomy and planetary sciences can often be perceived as complex and challenging, so there is not much incentive to get involved.

As part of the team behind the European Space Agency's Ariel mission, we have grappled with these issues for a while and, in 2019, we had an idea. What if we could package an unresolved problem into a data challenge aimed at a machine learning audience? By focusing on a smaller, bite-sized aspect of a larger problem, we could make the general subject of exoplanets more accessible. The data challenge is not designed to solve our data analysis

Definitions

Artificial Intelligence (AI) - a broad term for any machine or programme that can exhibit intelligent behaviour and solve problems.

Machine Learning - a subset of Artificial Intelligence in which algorithms can be trained to learn and improve automatically without being explicitly programmed.

Deep Learning - a subset of Machine Learning in which neural networks analyse data in a way that mimics the human neural system.

issues outright, but to provide a forum that encourages future collaborations and hopefully bring new perspectives to the table.

Ariel will observe the atmospheres of approximately 1000 planets around stars other than our Sun. The mission aims to determine how exoplanets form and evolve, and put our own Solar System into context. Detecting starlight filtered through the atmosphere of a planet that may be hundreds of lightyears away is a challenge, particularly when signals from the star and the spacecraft itself can cause distortions.

In our first challenge, we chose to focus on the issue of separating out the stellar signal from the detections of the exoplanet's atmosphere. Although some analytical approaches exist, it remains an inherently complex problem due to the ever-changing nature of the stellar and planetary signals under scrutiny. Instead of jumping in at the deep end with real-world observations, we built a more sanitised version first: a scalable simulation that captures some of the main issues of disentangling the data. We ran our simple star-planet simulation through the ESA Ariel mission simulator, built a competition website, and submitted a proposal to Europe's leading machine learning conference: the somewhat clunkily named European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML-PKDD).[1] Much to our delight, we were selected as one of their official 'Discovery Challenges'.

So, what lessons have we learned from running a data challenge? Well, first, we were very surprised by the interest in taking part. In the first year, we had over 100 teams participating globally. When we repeated the challenge in 2021, with a more complex simulation, we hit 130 teams. We became one of the biggest challenges of the conference in recent years. It seems that people like studying planets (but perhaps offering a cash prize also helped a little). Another pleasant surprise was the significant media interest the challenge enjoyed. The name of the 2021 winner, Luís Simões (running his own AI company, ML Analytics) was featured in the Portuguese quiz show 'Joker' as the answer to the final question. The contestant won the jackpot as he had read about the challenge in the news.

Scientifically it resulted in what we hoped for - new collaborations and some novel approaches to long-standing issues. The results were presented at two dedicated workshops at ECML-PKDD and the Europlanet Science Congress (EPSC), and also published in peer-reviewed journals.[2] Of course, there's no such thing as a free ride. Going into this, somewhat naïvely, we quickly realised that designing and running the challenge is equivalent in workload to organising a small conference. The need for careful planning was a lesson learned the hard way!

In spite of the time and effort to organise something on this scale, we have decided to run a data challenge or hackathon every year until the Ariel mission launches in 2029. It is surprisingly enjoyable watching the leaderboard evolve each day. In my opinion, it is one of the best ways to build interdisciplinary bridges and get the machine learning community excited about planetary sciences. This year we have proposed a challenge to the Neural Information Processing Systems (NeurIPS) conference 2022. The start date is the 15th of June. Hope to see you on the leaderboard!

Website link: https://www.ariel-datachallenge.space

The winner of the Ariel Data Challenge 2021, Luís Simões, presenting his solution.

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Exchanging Expertise

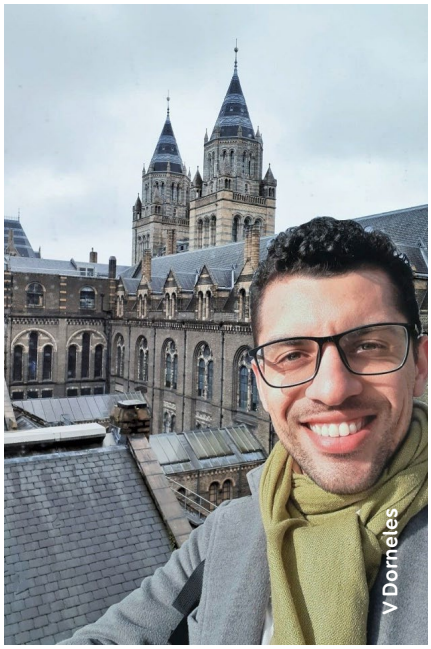
Maria Genzer of the Finnish Meteorological Institute (Finland) reports on how Europlanet's Expert Exchange Programme is supporting skill-sharing within the planetary community.

In any area of science, collaboration and personal connections are key to transferring knowledge and building capacity for the future. Through a series of Expert Exchange programmes dating back more than a decade, Europlanet has supported the mobilisation of the planetary community to share expertise and best practices.

In the current programme, researchers or industrial partners can apply to the Europlanet 2024 Research Infrastructure for funding to make a short visit of up to one week to another institution. At a project level, the main objectives are to improve the facilities and services offered to the scientific community by Europlanet, and provide training for potential users of the research infrastructure. At a community level, the Europlanet Expert Exchanges support early career researchers in developing professional skills, and provide opportunities to widen participation from under-represented countries and from countries outside Europe.

After a slow start due to the Covid-19 pandemic, the Expert Exchange programme has now ramped up its pace. So far, we have approved more than 10 applications involving over 10 different institutes or laboratories.

Four visits have already taken place and submitted their reports, and the rest of the approved visits are scheduled for the summer or early autumn of 2022. The first three completed visits, involving researchers from the CNRS Centre for Molecular Biophysics in Orléans, France, the Natural History Museum (NHM) in London, UK, and the University of Bologna, Italy, have all been linked. Looking at the reports



Victor Dorneles visited the Natural History Museum (NHM) London (above and previous page) during a Europlanet Expert Exchange visit.

submitted together, we can see an excellent practical example of how the Expert Exchange programme can achieve its objectives of sharing knowledge and developing skills in the community.

The three visits were instigated by the acquisition of a WITec Alpha 300 Raman microscope by a team led by Prof Barbara Cavalazzi at the University of Bologna. Raman spectroscopy is a versatile technique used to detect and identify organic molecules and minerals in many fields of research, from biology to Earth sciences. The technique is based on detecting changes to the wavelength of light from a laser when it interacts with the chemical bonds within a target material. Raman spectroscopy is a key instrument for astrobiological studies of ancient and active traces of life on Earth, and for the detection of possible traces of life on Mars. Advances in miniaturisation of components and the development of Raman microscopy imaging has led to its use in multiple space

Travel, Training and Teaching

Keyron Hickman-Lewis of the NHM, London (UK), reports on his experience of participating in a Europlanet Expert Exchange visit.

Taking part in a training course on high-resolution Raman microspectroscopy with Dr Frédéric Foucher (also visiting Bologna through the Expert Exchange Programme) provided me with important insights into instrumentation and techniques unavailable at the Natural History Museum (NHM) in London. The course was an excellent refresher in using Raman systems, and allowed me to familiarise myself with the WiTEC Raman system at Bologna and techniques for data treatment. Following the course, I performed several initial analyses of microbialite samples. I hope to make further use of the Raman instrument at Bologna in the future, through a follow-up Expert Exchange visit, since it will complement the analysis techniques I use at my home institution.

My exchange visit also contributed to a major ongoing collaborative project for understanding the geobiological and astrobiological potentials of fossil-bearing stromatolites from the East African Rift system. These microbial structures are known to have developed in extreme environments that may resemble Mars during its early history, when water may have been abundant on its surface. As such, these stromatolites are prime targets for biosignature detection and astrobiology. I assisted the team at the University of Bologna in the selection and preparation of specific samples for high-resolution analyses. In particular, I advised on the preparation of samples for micro-CT 3D study at the NHM, as I have a lot of experience in this technique. We studied and selected potentially interesting fragments of stromatolites with appropriate dimensions for micro-CT scanning, using photography and stereo microscopy, and acquired comprehensive pre-analytical imaging of the corresponding thin sections using optical microscopy. The samples are particularly fragile, by virtue of their void-filled carbonate composition, so they needed to be prepared on site in Bologna and carefully carried back to London as hand-luggage. I subsequently spent several weeks making geochemical and morphological studies of the samples with our analytical facilities at the NHM.

During the exchange, I also contributed to the project supervision of a doctoral candidate, Victor Amir Cardoso Dorneles, with whom I will work closely (as co-supervisor) throughout the course of his thesis. We discussed his project direction, the availability and use of samples in both my own collections and those at the University of Bologna, and possibilities for fieldwork and sample acquisition throughout 2022. This experience of student supervision has been invaluable, given my own status as an early career researcher. Victor has now visited the NHM in London through another Europlanet Expert Exchange to be trained on various techniques using the samples that we prepared together.

Overall, my exchange visit was very successful from a scientific perspective and a valuable opportunity to develop professional skills and relationships.

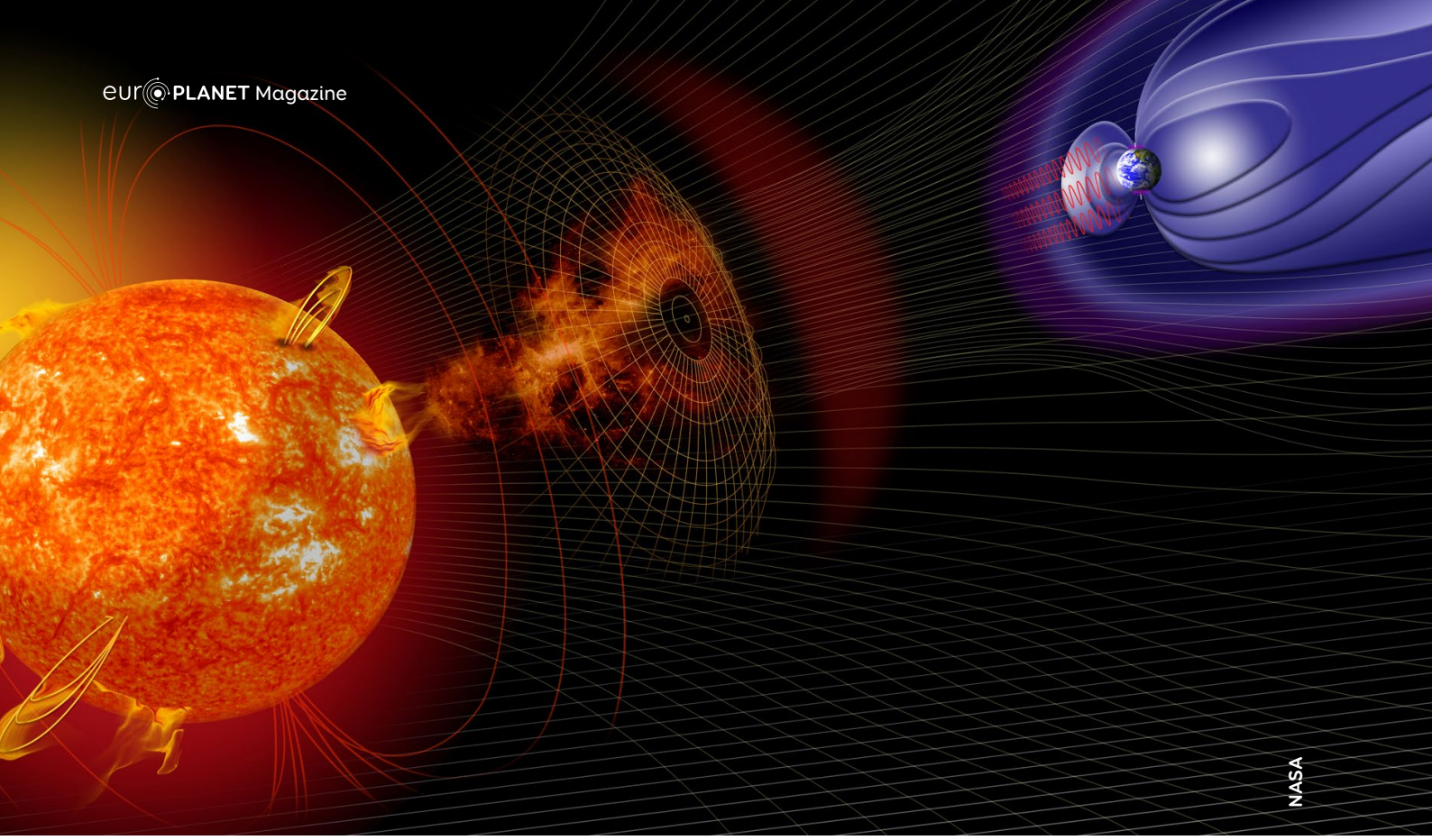
exploration missions, including NASA's Perseverance rover, which is equipped with two Raman spectrometers (SuperCam and SHERLOC). Dr Frédéric Foucher has been in charge of a WITec system at the CNRS Centre for Molecular Biophysics since January 2009. As one of the first researchers in Europe to use the instrument, he is now recognised as a specialist and has published several articles and book chapters on the subject during the last decade. In June last year, Barbara invited Frédéric to visit Bologna through the Europlanet Expert Exchange programme to support development of the Bologna lab facility and to provide training on theoretical and practical aspects of Raman microscopy, imaging and data processing.

The actual visit to the University of Bologna took place over five days in November 2021. Frédéric ran a fully-subscribed course for 20 researchers, students and technicians. Feedback from participants in the workshop was very positive, and the expert exchange reinforced links between the exobiology group in Orléans and the team in Bologna. Collaborations will continue in the future, and Frédéric and Barbara report that it is probable that some of the students that took part in the training will visit Frédéric's lab in Orléans in the framework of their Master's or PhD thesis. Among the participants on the course were Dr Keyron Hickman-Lewis, an early career postdoctoral researcher at the NHM in London, and Victor Amir Cardoso Dorneles, a doctoral candidate at the University of Bologna. Keyron was attending the course as part of the second Expert Exchange supported by Europlanet (see the panel on previous page). Victor followed up with the third visit in April 2022 to the NHM, where he received practical training in various analytical techniques, including X-ray micro-computed tomography (micro-CT), Fourier-transform infrared spectroscopy (FTIR), scanning thin sections under an optical microscope, and scanning electron microscopy with energy dispersive X-ray spectroscopy (SEM-EDS). Victor is studying modern stromatolites (layered deposits formed by photosynthetic micro-organisms) gathered in extreme environments in the East African Rift system. The characterisation of samples carried out during his exchange visit to the NHM, and the possible identification of related biosignatures via the non-invasive and non-destructive analytical approaches he learned, will help him complete his PhD thesis on 'Biosignatures of Extreme Environments as Targets of Astrobiological Exploration' and feed into more general preparations by the planetary community for future Mars sample return missions.

At the moment, the call for applications for the Expert Exchange Programme is permanently open, meaning that we welcome applications at any time without strict application periods or deadlines. We are looking forward to supporting more applications in the following months. For more information, see the Europlanet website or contact us.

https://bit.ly/EuroplanetExpertExchange

Above: Frédéric Foucher (second right) leads a training workshop at the University of Bologna.



Using AI to Predict the Danger of Solar Storms for Earth

Hannah Rüdisser of the Know-Center (Austria) and Ute Amerstorfer of the Space Research Institute (Austria) show how machine learning and artificial intelligence can help protect us from damage caused by solar storms.

The Sun is a source of light and energy for life on our planet but, nonetheless, our nearest star can present some hazards to Earth's inhabitants. When magnetic field lines at the visible surface of the Sun become tangled and break, large quantities of electrically charged particles can be released into space. If directed at Earth, these 'solar storms' can interact with Earth's magnetic field and have serious effects on power grids, radio networks and satellites, that are key to our daily life.

Solar activity fluctuates every eleven years between quiet and active phases, and we are currently in an active phase that is expected to reach its peak in 2025. In most cases, Earth's magnetic field and atmosphere can protect us from solar storms, with effects limited to perhaps spectacular auroral light displays at the poles. However, a strong solar storm could cause around ten percent of all satellites to

fail, and this could cause problems in areas where precise positioning is required, such as shipping and air traffic. Induced currents during geomagnetic storms can cause surges in transformer voltages and damage to undersea cables, leading to widespread electricity and Internet outages. A severe example in 1989 caused blackouts for nine hours across Quebec. In our digitally dependent world, a reliable space weather forecast is an increasingly vital resource.

Several spacecraft have been launched to study the Sun and measure the solar wind, and these can transmit data back to Earth within minutes to give us advanced warning of incoming space weather. However, even if we know a solar storm is heading our way, to date, it has been very difficult to estimate the potential impact of the storm when it hits Earth.

Machine Learning for Better Forecasts

The use of Artificial Intelligence (AI) to analyse and classify planetary datasets is still relatively new, but is becoming increasingly important. Machine learning enables algorithms to be trained to analyse huge amounts of data and derive predictions and new solutions from them. Over the past decade, potential applications of machine learning in planetary science have exploded, but tools tailored to this area of research are still rare.

The Europlanet 2024 Research Infrastructure (RI) Machine Learning activity aims to extract knowledge from the vast treasure-trove of data from space missions, simulations and laboratory experiments. By developing a series of machine learning tools that support planetary scientists in their work, Europlanet aims to promote a broader use of machine learning technologies in data-driven space research. At the Know-Center and the Space Research Institute in Graz, Austria, we have been working to deploy machine learning to help improve our predictions of the potential risk from solar storms to infrastructure.

Predicting the Strength of Solar Storms

In extreme cases, solar storms can reach Earth in less than a day. The amount of energy transferred from the solar storm to Earth's magnetic field depends largely on the relative orientation of the storm's magnetic field, in particular its north-south 'B_z magnetic field component'. The larger the southward B_z component, the greater the risk of a massive geomagnetic storm that could cause damage. Using machine learning, we have developed a tool to predict the B_z magnetic field component within the first few hours of an in-situ observation of a solar storm, to help give advance warning before it reaches Earth. The tool has been trained and tested with data collected by the Wind, STEREO-A and STEREO-B spacecraft for 348 different solar storms since 2007. To evaluate how well the prediction tool works in real time, we have simulated a continuous feed of measurements from spacecraft and monitored how the accuracy of the forecast improves as it receives new information.

In results recently published in the journal, Space Weather, we have shown that our forecasting tool can predict the orientation of the magnetic field well, particularly when using data from the four hours that follow the first signs of the solar storm in the in-situ spacecraft data.[1]

At present, we still need human eyes to manually spot when a solar storm is occurring, so the next step of our research project will be to use additional AI methods to help automatically detect solar storms

Artist's impression of a solar storm.

in real-time. New space missions will provide even more data in the coming years, further increasing the accuracy of the predictions. However, our prediction tool already shows the great potential of machine learning to improve space weather forecasting and, in the event of a massive solar storm, to provide early warning to affected areas and prevent major damage.

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Rytis Babianskas.

Inspired by a Contest

Rytis Babianskas.

Helen Usher of the Faulkes Telescope Project (UK) describes how a Europlanet arts contest has led to collaborations with a young Lithuanian astronomer, Rytis Babianskas.

When we set up the #InspiredByOtherWorlds arts competition, initially as part of the virtual Europlanet Science Congress (EPSC) in 2020, we hoped it would stimulate interest in planetary science and lead to new collaborations.[1] We are so pleased that this is proving to be the case. Rytis Babianskas, a 12-year-old from the Juozas Urbšys School in Kaunas, Lithuania, was a winner of the #InspiredByOtherWorlds contest in 2020 with flipbooks about aliens and Jupiter's moons, and he also participated in the 2021 competition with simulations of exoplanets.

Over the past year, I have had the pleasure of working with Rytis, along with his dad, Carlos. According to Rytis, the Europlanet award has been a source of inspiration and encouragement, and he has been keen to move forward with his interest in astronomy. Rytis clearly has a passion for the subject and great programming ability too!

I work with the Faulkes Telescope Project,[2] which gives remote access for educational purposes to the research-grade telescopes of the Las Cumbres Observatory (LCO) global network.[3] Rytis has now made a series of observations of the universe using the LCO remotely-operated robotic telescopes, and presented them at his school in an exhibition entitled 'The Universe from my Room'.

The exhibition was on display at the school for two months, and Rytis was also invited to present it at the Neveronys Gymnasium in April and at Vytautas Magnus University Ugnė Karvelis Gymnasium in May 2022. Through 14 images taken over a period of five months, the exhibition shows various celestial objects, including asteroids and comets, stellar associations (loose star clusters), binary stars, nebulae, supernovae and galaxies.

The images include some current targets of interest, such as the asteroid (7482) 1994 PC1 that passed close to Earth in January 2022, the main-belt asteroid (248370) 2005 QN137, Supernova 2021aefx in NGC 1566, and comet 67P/Churyumov-Gerasimenko, which had its closest approach to Earth in November 2021. As well as making pictures to inspire others, Rytis has also been gathering data for scientific purposes as part of the Comet Chasers project, which links professional and amateur astronomers with schools.[4]

Comet 67P is the comet visited by the European Space Agency's Rosetta mission and is the subject of my research. Rytis had earlier coded a simulation of the orbit of 67P and so it seemed natural to collaborate with him to make observations of the comet for my research.[5] To aid researchers in the LCO Outbursting Objects Key (LOOK) Project, Rytis also made observations of some other interesting comets, including to see if Comet 108P was breaking up. I'm very pleased he is sharing what he has been doing with both his classmates and other local schools. When his observations are used in research publications, they will be credited too. Congratulations Rytis!

If you are a teacher, amateur astronomer or researcher interested in the Comet Chasers project then please contact helen.usher@open.ac.uk. You can access the Faulkes Telescope facilities via the Europlanet Telescope Network.[6]

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European Space Agency, ESA/ESOC

An Interplanetary Journey in Design

- Building the Europlanet Brand

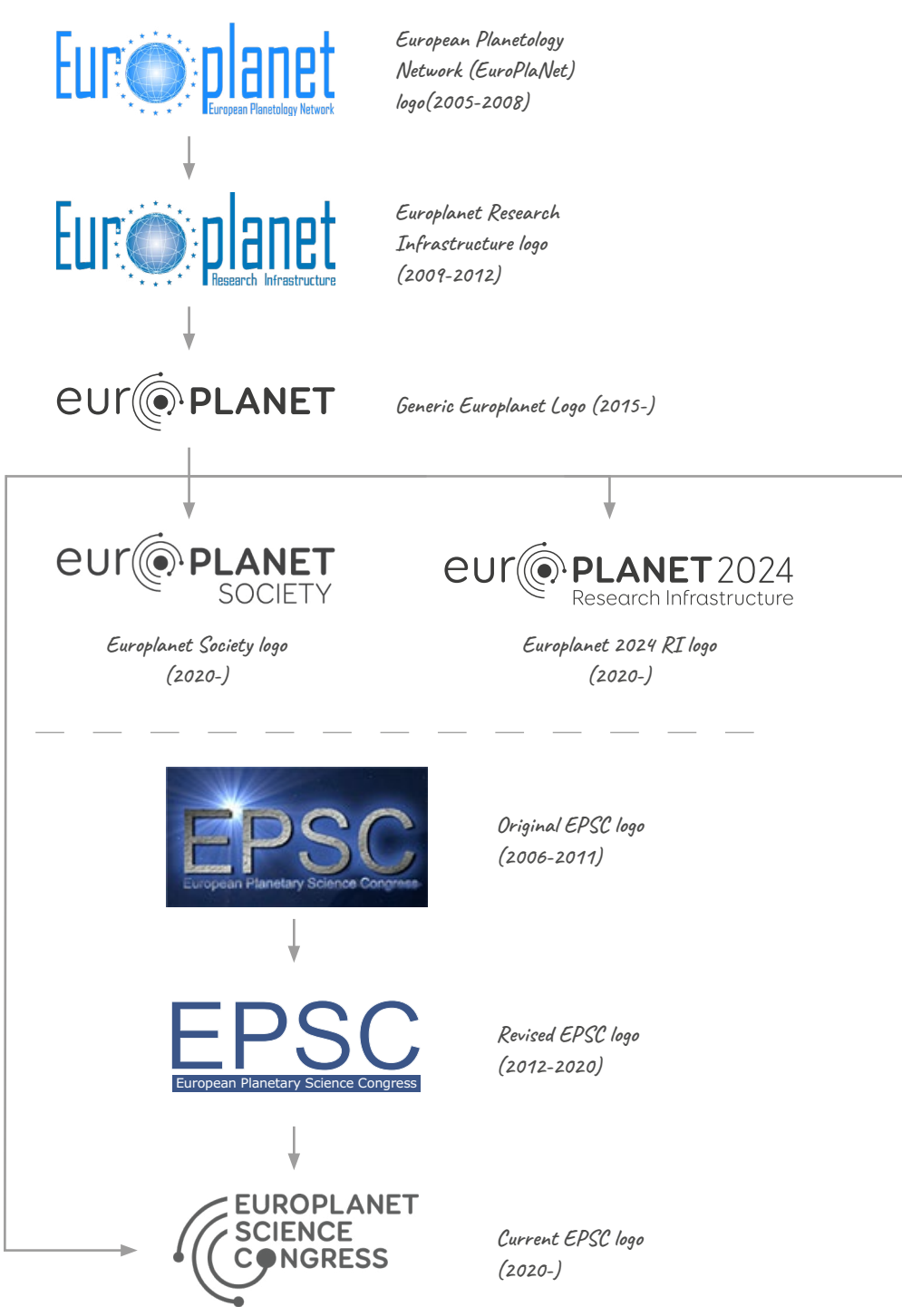
Vix Southgate (Europlanet 2024 RI Communications Team) describes some of the creative steps (and missteps) in nearly two decades of the Europlanet brand.

From its origins as a network to bring the European planetary community together, Europlanet has evolved greatly over the past 17 years. Today's multi-faceted Europlanet 'umbrella' covers not only a research infrastructure and membership society, but all kinds of projects, events, hubs, groups and programmes within the planetary community. Inevitably, the branding associated with Europlanet has also evolved but, until 2015, when Science Office designed the current Europlanet logo and elements, there was no consistency that pulled all the facets of Europlanet together.[1] Since 2020, we have been undergoing a further transformation to appraise and build on our core logo to develop a coherent and sustainable brand in-house that can support our expanding community in the future.

Europlanet Branding Through the Ages

The European Planetology Network (EuroPlaNet) was launched in 2005 with funding from the European Commission's Framework 6 Programme and, as with all new ventures, branding was an important consideration. The original logo, commissioned by the management team at CNRS, referenced the planetary theme with a 3D sphere, as well as the EU funding with a surrounding ring of stars. With minor modifications to colour and wording, the logo was retained through several phases of the project, including the Europlanet Research Infrastructure (2009-2012) and the Europlanet Consortium (2013-14).

Advances in online visibility, social media and, ultimately, the expanding competition of information on the internet, have meant that a strong brand has become an essential requirement of every organisation. After a decade, Europlanet needed a new look. In 2015 Science Office began the process of coordinating and stylising the Europlanet brand and making it purposeful and unique. They came up with a clearly recognisable design that uses the letter 'o' to depict a sun with three orbiting spheres, as a representation of a planetary system. This main logo is widely used today for cross-cutting Europlanet activities and where sustainability beyond the lifetime of any particular funded project is important. Variations on the main logo are used for Europlanet's major structures, including the Europlanet Society and the Europlanet 2024 Research Infrastructure.

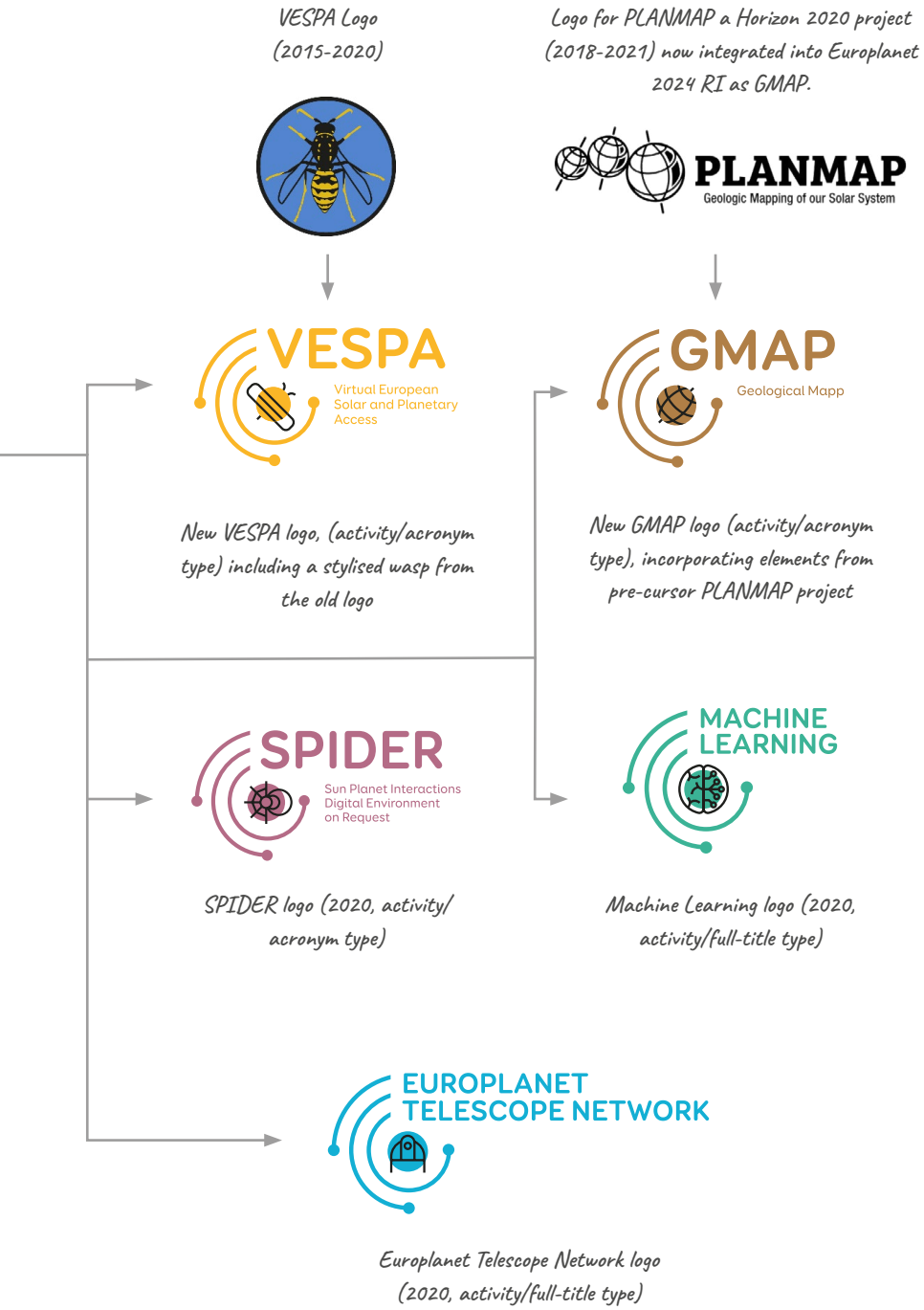


Evolution of EPSC logos

In the early days of Europlanet, the teams running activities and events tended to create their own logos independently, with no overall coordination from a design perspective. As a result, the logo for the European Planetary Science Congress (EPSC), which was inaugurated in 2006 as part of the EuroPlaNet project, contained no links to the main Europlanet brand. The original EPSC logo was refreshed in 2012 with a cleaner version and transparent background, but this still did not feature any common visual language that connected it to Europlanet.

As the major annual meeting on planetary science in Europe, EPSC currently attracts around 800-1000 participants each year and is an important fixture in the planetary community's calendar. When the Europlanet Society was formed in 2018, and became the parent organisation of EPSC, one of the first decisions taken by the Executive Board was to clarify the link and rename the meeting as the Europlanet Science Congress (retaining the EPSC acronym for continuity). A new logo was required, and it was this rebranding exercise that initiated the development of a flexible design architecture that could be applied to the wider Europlanet family.

The redesigned EPSC logo incorporates Europlanet's top-level use of replacing the letter 'o' with an element in the design. A cutaway version of the 'orbits' motif creates a space that enables the event's own identity to be highlighted.



Adapting to Activities

Following on from the EPSC rebrand, design elements from the core logo have been tailored to coordinate and differentiate between the 'top-level' branding, and sub-brands related to 'activities' and 'events'. This enables a distinctive visual architecture that is immediately recognisable as being part of Europlanet, but also allows elements to develop their own identities. This structured approach gives the ability to add more logos to Europlanet's ever-growing network.

'Activity-type' branding is used for the services and programmes carried out by Europlanet, including the Europlanet Telescope Network, VESPA, SPIDER, GMAP and Machine Learning. Like in the 'events-type' brand, an 'activity-type' logo includes the characteristic Europlanet orbits element in cutaway form. However, it also incorporates a motif that represents the activity's distinct identity, which is reinforced by a distinguishing colour.

As many of the activities have been running for some years, either as a part of Europlanet or as separate projects that have since come under the Europlanet umbrella, the motif is a mechanism to include features of former logos into the new Europlanet sub-branding. The format is flexible enough to adapt to different situations, such as where an acronym is the main identifier, or where a name needs to be written in full.

Europlanet Branding 2022

In 2021, I was tasked with starting an in-house analysis of all Europlanet branding, with a view to coordinating, developing, and future-proofing the design elements. This review highlighted the need for the redrawing of many existing logos that had been stretched or altered during multiple iterations. Although the logos themselves look almost identical to their former versions, subtle changes ensure continuity-of-structure across all branding.

As well as standardising the essential elements across all the logos, we also identified other areas of Europlanet functions that needed sub-brands. Everything is summarised in the Europlanet Branding Guidelines Overview, a document that includes all logos and explanations of their purpose within the Europlanet brand, as well as more specific guidelines for the use of sub-brands by the communities running the activities or events.

New Logos on the Block

The 2022 update has included the creation of several new logos for previously unbranded functions of Europlanet. Using a variation on the top-level branding style, the 10 Regional Hubs now have a specific logo that incorporates the region name into the Europlanet Society brand.

The **Europlanet Early Careers (EPEC)** network, which launched in 2017, has until recently, had a logo that incorporated the orbits of the main Europlanet main logo into the acronym. Under the new guidelines the logo would have read as EOPEC, which is, of course, incorrect.

Using the activities-style logo template, the new EPEC logo incorporates four jigsaw pieces to symbolise the interconnectedness, within the early careers network, and the joining together of a community.

Transnational Access (TA), a programme that supports research visits to facilities and planetary analogue sites, has been an essential part of Europlanet since 2009 but, to date, did not have its own branding. Using the 'activity-style' design template, the TAs have been given a logo in pale green that highlights the lab and field elements of the programme within the central motif.

Europlanet Industry activities promote the benefits of collaboration between academia and the commercial sector. A new Industry logo in orange incorporates a technological theme in the design.

Overall, we hope that the new branding will help reinforce connections in the Europlanet Community, highlight its activities and strengthen the Europlanet brand. All the logos and guidelines can be found on the Europlanet website: https://bit.ly/EuroplanetLogos.

1. http://scienceoffice.org

Old EPEC logo (2017-2022)

New EPEC logo (2022)

Templates for the future

Design templates have been created that categorise the logo elements into three styles, which will make future design easier to assess and develop:

- Top-level branding is used for anything that requires the use of the elements in the main Europlanet logo. Wherever this main logo is used, the solar system design element will always take the place of the letter 'o'.
- Activity branding is used for all Europlanet activities and programmes. This logo type includes two distinct templates: acronym and full title.
- Event branding follows the same lines as the activity branding, whilst also using the same rule of replacing the letter 'o' with part of the design elements. This distinguishes these logos as 'events-type' and creates a connection, signifying the meeting of Europlanet activities.

Europlanet Society Regional Hub logos

Industry Insights

Marcell Tessenyi (BSSL Ltd) and Jeronimo Bernard-Salas (ACRI-ST) present results from a community survey on academic-industry collaboration.

Collaborations between industry and academia are becoming increasingly important to policymakers and grant-giving organisations. This is particularly evident in the European Commission's ambitious and demanding requirements for demonstrating the impact of Horizon Europe projects on European science, the economy and wider society. If we are to ensure planetary science remains attractive to funders, it is pertinent for our community members to increase attention on industry-academia relationships and have a good understanding of the attitudes, experiences and insights of our peers.

From August to October 2021, Europlanet's industry team began a consultation that aims to capture the perspectives of the planetary science community on working with industry. A survey was designed to include both statistical information and qualitative feedback relating to overall themes and observations. A link to the survey was circulated via the Europlanet mailing list (audience around 2000), and approximately 40 responses were received. The survey will be re-issued yearly to monitor and track the evolution in the responses.

The low response rate in this first iteration of the survey is, perhaps, a result in itself. However, the information gathered is already very valuable and will help Europlanet's industry and policy teams to focus efforts in developing effective approaches in supporting industry-academic collaboration. The distribution of the career stages of the respondents (Figure 1) indicated that the interest in the survey increased with the academic career stage.

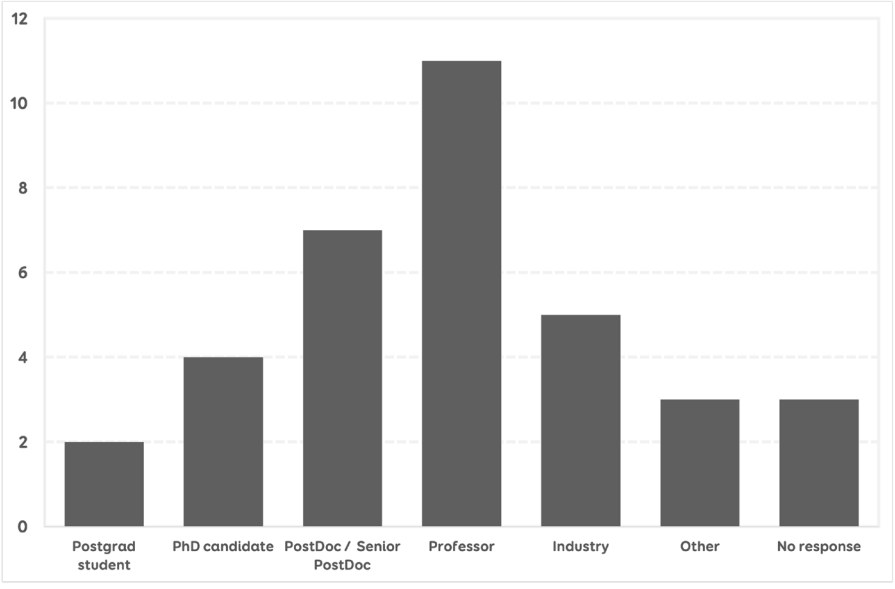


Figure 1: Career stage of respondents.

The respondents showed a range of experiences of collaborating with industry (Figure 2), with many having worked with small-sized companies, and a fairly even split between hardware and software-orientated organisations.

We asked the respondents who had worked with companies about the trigger that initiated their collaborations. We also asked them to share what was positive or negative about their experiences and what added-value they thought industry-related activities could bring to their scientific objectives. The highest responses for positive experiences and perceptions about collaborating with industry related to maximising research impact and career opportunities (Figure 3). Other positives identified in the qualitative feedback related to the way that industry works, including rigour in defining projects, quality standards and procedures, and precision in discussions and requests. The flexibility of Small to Medium Enterprises (SMEs), opportunities to commercialise technology that universities are not able to develop, and finding new applications of research or potential sources of interesting scientific problems, were also mentioned as positives. Further perceived benefits related to professional development, such as finding alternatives to academic jobs, breaking down the misconception that one must stay permanently within either academia or industry, skill-sharing, and identifying new sources of funding.

Consortium meeting of the EXPLORE project, an 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's Horizon 20202 programme to develop apps to exploit space data.

These responses showed a wide range of positives for industry engagement that seemed to be beneficial to a career in academia. Highlighting such positives could have an impact on perceptions in the wider community about the benefits of collaboration with industry. We also asked the respondents for reasons that they may not have worked with industry, and tried to capture some of the negative perceptions (Figure 4).

Top of the list of reasons for lack of industry experience was that the occasion never came up, followed by a limited awareness of industry capabilities in research. This is perhaps the most valuable response from the survey, in that it shows where Europlanet and its network of industry and policy officers can help raise awareness and foster opportunities for such collaborations to take place.

Individual responses on negative perceptions highlighted differences in timescales and ways of working, issues with defining mutual benefits, and differing standards and procedures. Patents and other Intellectual Property Rights (IPRs) – particularly relating to what can be published in science articles – were also mentioned as concerns. Companies are product oriented and researchers care about science and publishing, so these (and other) cultural differences can require both parties to adjust their mindset. Structural issues around the lack of flexibility in larger companies, the need to recognise companies' financial needs, and administrative complications on the academic side were also cited as negatives.

As career opportunities have often been raised as a good reason to work with industry, we asked respondents about their perception of what fraction of researchers they think remain exclusively in academia throughout their career (Figure 5). Most respondents indicated that they think the majority of academics shift from research to the private sector at some point, a likely result of the lack of permanent opportunities in academia.

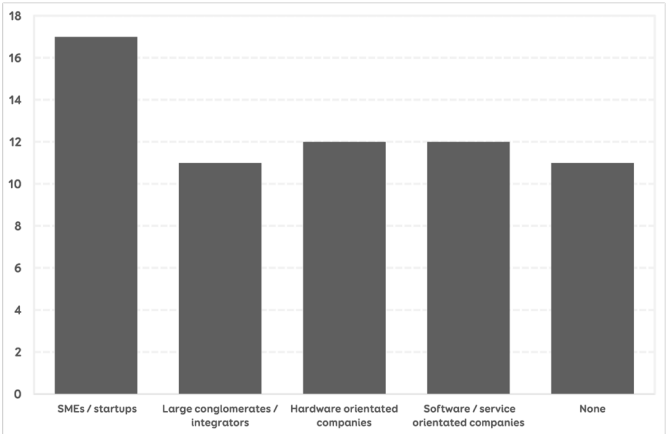


Figure 2: Types of industry worked with.

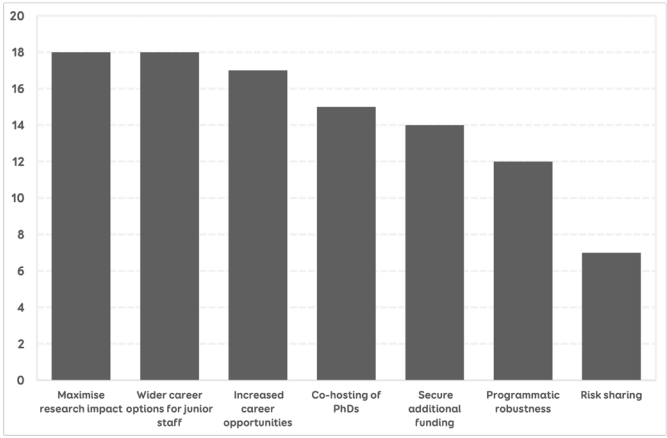


Figure 3: Perceived benefits of working with industry.

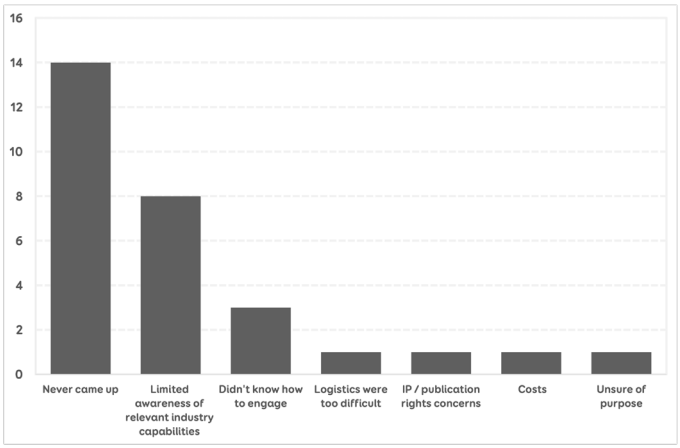


Figure 4: Reasons for not engaging with industry.

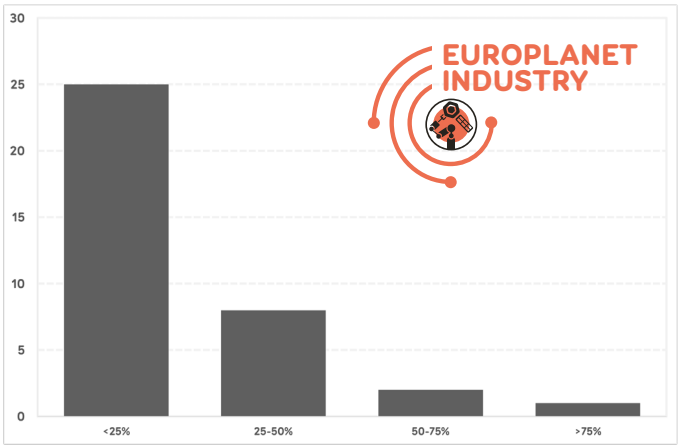


Figure 5: Percentage of students/post-docs perceived to remain in academia.

Finally, we asked respondents about their awareness of funding opportunities. Most respondents were familiar with European opportunities e.g. through Horizon Europe, but there seems to be a generalised unawareness that there may be increased opportunities when involving industrial partners. This lack of information could be hampering the start of academic-industry collaborations, and is an area where we need to take action. A practical next step would be to compile lists of funding opportunities with the help of the community, both at a national and international level, which could be accessed by the Europlanet membership.

Conclusion

Most respondents acknowledged that industry-academic collaborations resulted in an increase in the impact of research, and say that they are interested in hearing more about such possibilities. While some of the negative perceptions of working with industry are legitimate concern points (e.g. issues relating to IPR), others come from a lack of familiarity, or a rarity of known success stories for industry-academia collaborations.

We look forward to continuing this survey and gathering more knowledge about the community and its perceptions. If you have any comments and feedback on how to improve either the survey or activities to help promote the positives of industry-academia collaborations, please get in touch with us at industry@europlanet-society.org.

In Memorium

Maria Teresa Capria and Károly Szegő

The first few months of 2022 has seen the passing of two of the key founder members of the Europlanet programme. Michel Blanc, Coordinator of Europlanet from 2005-2012, reflects on their contribution and legacy.

The loss of **Maria Teresa Capria** is particularly painful for the Europlanet Community. She was part of the founding team of Europlanet from the very beginning and devoted countless efforts to promoting the project. Maria Teresa was convinced of the importance of building a European planetary science community to support the ESA Science programme and the major investments made by ESO and other European institutions for astronomy. She believed deeply in the value of dialogue among scientists and in the importance of free exchange of scientific data of all types, including space data, ground-based observations, laboratory experiments and numerical simulations.

It was with this motivation that she led the development of the Integrated and Distributed Information Service (IDIS) in the original European Planetology Network (EuroPlaNet) project from 2005-2008 and the first Europlanet Research Infrastructure (RI) from 2009-2012. For her, IDIS was the tool that would connect all European scientists across borders, not only between nations, but also between disciplines and techniques. Thanks to her constant support, hard work and commitment, IDIS evolved into the Virtual European Solar and Planetary Access (VESPA) in the Europlanet 2020 and 2024 RI projects (2015-). This wonderful online tool for science collaboration and production of new scientific knowledge owes a lot to her talent and dedication.

Maria Teresa Capria (second row, second left), Károly Szegő (back row, right end) and Michel Blanc (front row, centre) at the launch of the Europlanet Research Infrastructure (RI) , 3 March 2009, CNRS, Paris.

I have particularly warm memories of Maria Teresa the Chair of the Local Organising Committee of the European Planetary Science Congress (EPSC) in Rome in 2010, held at the beautiful Angelicum Centrum. Always taking time to give a word of welcome and encouragement to participants, she was a brilliant host to the "Eternal City", turning a scientific meeting into an unforgettable feast of European planetary science. Her unique smile, touching humour and warm friendship will continue to enlighten our journeys to the planets for a long time to come.

Károly Szegő played a key role from the very first days of Europlanet's foundation. Károly was one of the European space scientists who worked successively with Soviet, NASA and ESA missions. This is one of the reasons why his contribution in the building and development of Europlanet was so precious.

Károly was a committed supporter of Europe and an strong advocate of science. Europlanet was, for him, a unique opportunity to connect these two passions, while serving the science community. He played

a pivotal role as the first leader of the Personnel Exchange Activity in the original European Planetology Network between 2005 and 2008, and in the Networking Activities of the following contracts of the Europlanet RI. As the Inclusiveness Officer of Europlanet, Károly used his deep knowledge of European institutions and member states to engage many planetary scientists from new EU countries into the diverse activities of Europlanet. His personal role in the shaping and expansion with time of our community has been outstanding. Today's European planetary science community, its international visibility, and its unique role in planetary exploration owe a lot to Károly's talent and dedication. His memory will always be with us!

Maria Teresa Capria


Family of MT Capria

Maria Teresa Capria passed away on Friday 15 April after a 5-year long illness that she faced with the dignity, determination and tenacity that characterised her as a person and a scientist.

She began her scientific career in the early 1980s as a young graduate in computer science at the Institute of Space Astrophysics, a node in the Italian National Research Council (CNR) computing network that served all research institutes in southern Italy.

This was followed by some years in Oberpfaffenhofen at DLR, the German Aerospace Centre, working with Gerhard Neukum, one of the pioneers of planetary science in Germany. Here, Teresa received her introduction to image analysis, applying state-of- the-art remote sensing software to planetary data. This experience strengthened her collaboration with the IAS Planetology group, working on the small bodies of the Solar System that would later become the core of her scientific activity.

At the beginning of the 1990s, under the guidance of Angioletta Coradini, the IAS Planetology group began to participate in space missions. Teresa offered to take on the responsibility of data archiving, starting with the VIRTIS instrument on board the European Space Agency's Rosetta probe. Teresa also worked on high-resolution spectroscopy of comets. In the early 2000s she collaborated with Japanese colleagues, who hosted her for a few months at the National Astronomical Observatory of Japan in Tokyo. The experience Teresa gained within the Rosetta mission paved the way for a new collaboration with Padua Observatory, working on the stereo cameras of the SIMBIO-SYS instrument suite on the BepiColombo mission to Mercury.

Teresa's scientific preparation, perseverance, serenity, clear vision and fair-minded judgments made her a highly valued member of committees and working groups. Among her many roles, she was a member of the INAF Scientific Council from 2016 to 2020, a member of the EU-funded Astrobiology and Planetary Exploration Road Mapping (AstRoMap) team,and was the Italian manager of Europlanet in successive EU-funded projects. She played a leading role in the management structure of Cospar (COmmittee for SPAce Research) as Chair of the Scientific Commission B: Space Studies of the Earth-Moon System, Planets, and Small Bodies of the Solar System. Finally, she was the driving force behind the Italian Society of Planetary Sciences, formed a few months ago, of which she was the President. Teresa was a welcoming and reassuring figure for young researchers, generous with suggestions and advice, always willing to collaborate, never unkind, and passionate about her work. These aspects of her teaching will live on. We will miss her.

Abridged and translated from obituary by INAF:

https://bit.ly/MTCapria

Károly Szegő

Károly Szegő DSc, Scientific Advisor and Professor Emeritus of the Wigner Research Centre, died unexpectedly on 22 January 2022, at the age of 78.

Károly began his career as a theoretical particle physicist investigating the applications of group theory methods. His interest turned towards space physics in the early 1980s and he made important contributions to understanding the interaction between the solar wind and Solar System bodies, including several planets and comets.

Károly was a co-lead in the VEGA Space Mission (1986), a Soviet-led international effort that was launched to investigate comet Halley up close. Through this mission, the first ever picture of an active cometary nucleus was taken, the size and rotation of the nucleus were determined, and a model of the surface activity of the comet was established. Four of Károly's scientific publications published in the period 1980-87 are among the seven most cited publications in the field of Solar System research worldwide. His achievements were recognised with the State Prize of Hungary in 1986.

Later, Károly was a guest researcher on NASA's Pioneer-Venus Orbiter mission and he achieved significant results in the study of Venus. He was a co-investigator participating in the plasma physics experiments of the Phobos-2 mission, launched in 1988 to study Mars and its environment. He was a co-investigator in the plasma physics experiments of the Cassini mission launched by NASA to study Saturn, and he also participated as a co-investigator in the plasma experiments of the ESA Rosetta comet-chaser mission, which performed the first ever soft landing on a cometary nucleus in 2014 and investigated the surface and environment of comet 67P/Churyumov-Gerasimenko. In recent years he participated in the SERENA plasma experiment of the ESA BepiColombo mission, which has been sent to investigate Mercury.

Károly was the first director of the KFKI Research Institute for Particle and Nuclear Physics of the Hungarian Academy of Sciences (the predecessor of Wigner RCP) from its establishment in 1975 until 2002. Between 2002 and 2012 he organised and supported the work of the Hungarian academic research network as the Head of the Department of Research Institutes of the Hungarian Academy of Sciences. He was an internationally recognised scientist and scientific organiser, and a major presence in the Hungarian space research community, educating and mentoring many students and postdocs, always approachable and always helping colleagues.

Rest in peace, Károly, we will keep your memory alive.

Obituary by Péter Lévai Director General of Wigner Research Centre for Physics (original version: https://bit.ly/KarolySzego)

CommKit

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

It took a magician such as Georges Méliès to create the 1902 exhilarating tale, "A Trip to the Moon", now considered the first-ever science fiction film. Méliès's contribution to science fiction narration has evolved to today's golden age of science communication, where more thought-provoking science stories and creative tools exist than ever before.

Since its foundation back in 2005, Europlanet has been committed to communicating planetary science stories, and the Europlanet Magazine is living proof. Video is becoming an increasingly important medium for us to share science,[1] whether through our professionally-produced series of short animations around hot topics in planetary science, through recorded interviews and training sessions, or through DIY animated content for social media, using platforms like Powtoon.[2]

We aspire to amplify planetary science communication ideas through PlanetaryScience4All, a 4-minute video contest competition organised by the Europlanet Early Career (EPEC) Communications Working Group.[3] The competition is open to PhD students and early career researchers, and this year's submissions will be highlighted during the Europlanet Science Congress 2022 in September.

The winner of the Europlanet Society's Prize for Public Engagement 2021, Dr James O'Donoghue, is a modern-day master of using animation to communicate space sciences.[4] His goal is simple: to paint an accurate picture of the Solar System in people's minds and, at the same time, highlight its features in an intuitive way. His short and content-rich social media animations now have more than 200 million views.

Accessible science communication is an ever-growing priority for researchers worldwide. "Dumbing down ideas" has ruffled the feathers of many scientists. However, synthesising and distilling your research can be very beneficial. It can help you grow your network and shape your personal identity as a researcher. The best way to become a better science communicator is to start asking why your field matters to you and what changes you aspire to make.

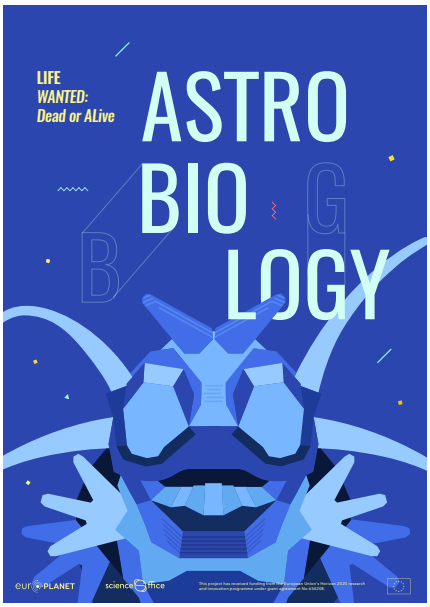
Planetarily yours,

Shorouk

Links:

1. Europlanet YouTube: https://www.youtube.com/europlanetmedia
2. Powtoon: https://www.powtoon.com/
3. PlanetaryScience4All: https://bit.ly/planetaryscience4all
4. James O'Donoghue: https://www.youtube.com/user/jayphys85

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



Poster for Europlanet's astrobiology animation.

The Last Word

A Strategic Opportunity

Nigel Mason, President of the Europlanet Society, highlights opportunities to shape the future of Space Research Infrastructures in Europe

There are currently two ongoing key strategic discussions that should be of particular interest to the Europlanet community. The European Space Agency (ESA) is preparing for the Ministerial Council meeting in Paris in November 2022, where decisions will be made on its strategy and budget for the next three years. At the European Commission, work programmes for Horizon Europe funding calls in 2023-2024 are being developed, informed by input from the European Strategy Forum on Research Infrastructures (ESFRI).

While the ESA strategy and the ESFRI discussions are taking place in parallel, there are clear overlaps in European resources and scientific goals that are relevant to planetary science. The concept and methodology of a Research Infrastructure (RI) is largely unique to European science. The ESFRI Roadmap 2021 provides a vision to deliver cutting-edge research in six domains that range from 'Health and Food' to 'Social and Cultural Innovation'. ESFRI's Physical Sciences and Engineering (PSE) domain supports RIs that address fundamental questions for the progress of human knowledge, including the origin of the Universe, the conditions for life, and the nature of dark matter and dark energy.

Scientific challenges identified within the PSE domain include understanding the formation of stars and planets, the search for planetary systems, studies of the Solar System and extrasolar planets, the search for life, and understanding the conditions enabling life. These scientific questions are not only of immense interest to scientists and the public, but are also central to the ESA strategy review. It is, therefore, important to ensure that there is good communication between ESA and ESFRI, and here Europlanet can provide a bridge to facilitate alignment between the two strategies.

The launch of the ESFRI Stakeholders Forum in March suggests that there is a new willingness and awareness by ESFRI of a need to engage with a broad community of scientists and stakeholders. Historically, ESFRI has had a structural bias towards 'top down' large-scale infrastructures like the Extremely Large Telescope (ELT) or the Square Kilometre Array Organisation (SKAO). As a result, the 'bottom up' distributed research infrastructures (like Europlanet), which coordinate access to a more flexible range of laboratory and field site facilities and services, have been under-represented within successive ESFRI Roadmaps. To help build a stronger voice, Europlanet has taken a lead in co-convening a workshop for distributed RIs in 2021 and is planning follow-up meetings in 2022 and 2023.

The ESFRI Roadmap and Horizon Europe programme both emphasise that European RIs are evolving towards a consolidated ecosystem, where the priority is on upgrading and clustering existing RIs rather than creating new ones. In looking to Europlanet's future, we believe this means broadening our community's remit to be inclusive of astrochemistry, astrobiology and origins of life on Earth. To engage fully with ESA's emerging Science in the Space Environment (SciSpacE) programme, we also need to include lunar studies and the exploitation (as well as exploration) of space, which means embracing the Space 4.0 concept and closer ties to industry.

Overall, by mobilising our community to proactively engage with ESFRI and ESA at this critical time, Europlanet has a unique opportunity to showcase the vital role that distributed RIs play in the research landscape, particularly in curiosity-driven research.

Prof Nigel Mason, OBE, is Professor of Molecular Physics, President of the Europlanet Society and Coordinator of the Europlanet 2024 Research Infrastructure.

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 17 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:

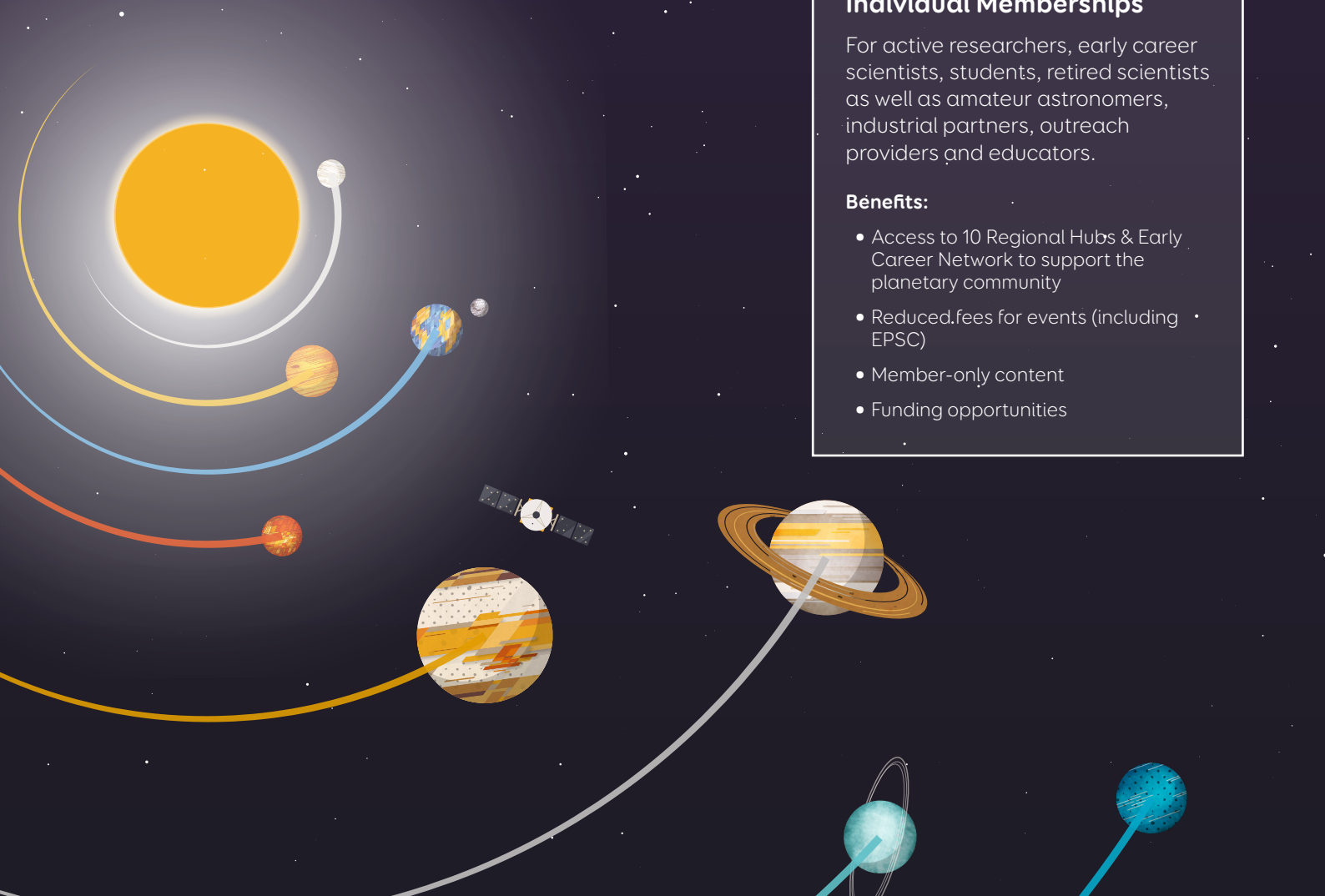
- Representation at the General Assembly
- Reduced fees for events (including EPSC)
- Member-only content
- Can include up to 10 individual memberships

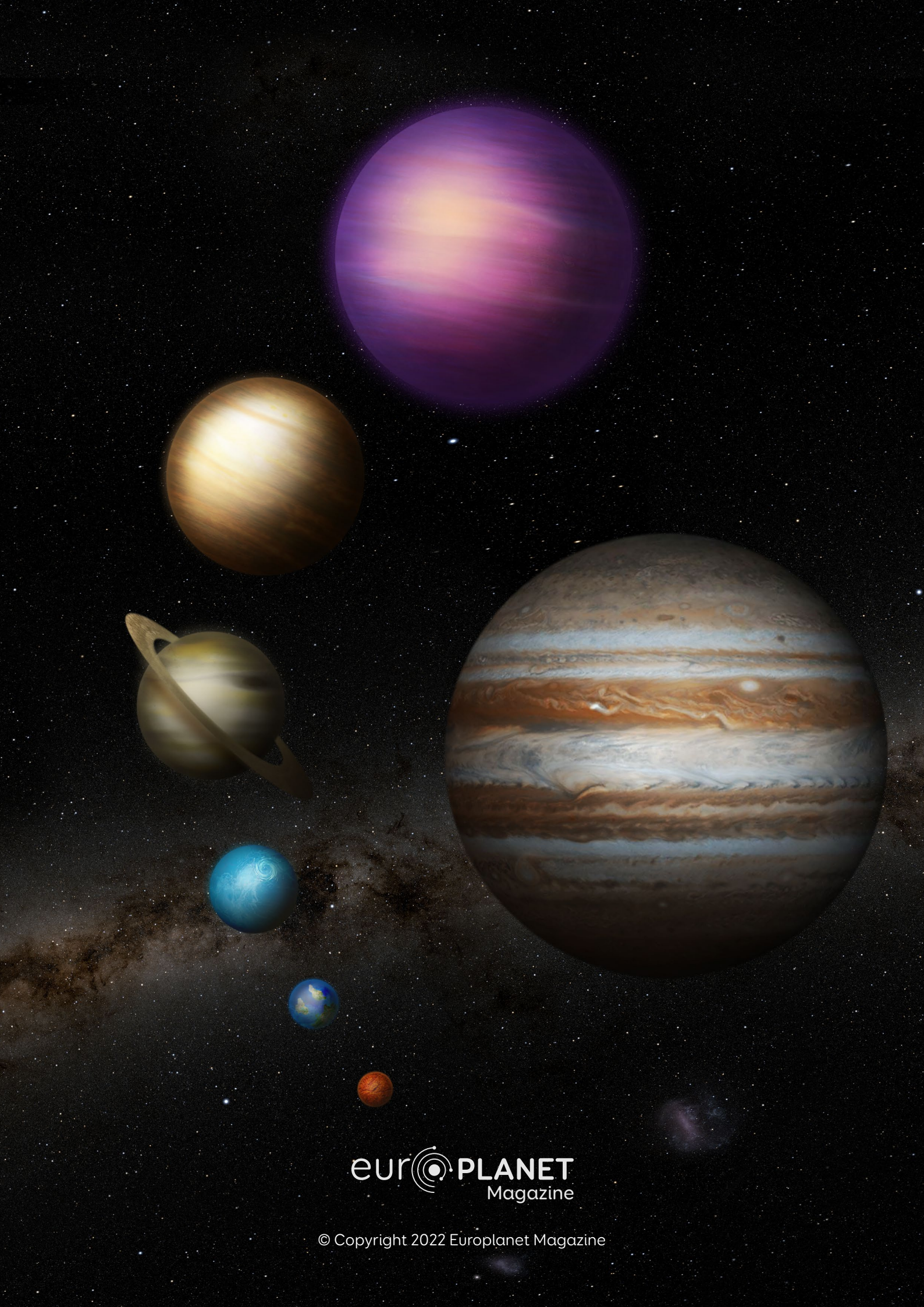
Individual Memberships

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





Europlanet Magazine