



# SPACE STUDIES PROGRAM

Oeiras, Portugal | Online  
27 June - 26 August 2022

## SSP22 RETROSPECTIVE

**Prepared By:**

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# ABOUT ISU

The International Space University (ISU) was founded in 1987 by Peter H. Diamandis, Todd B. Hawley, and Robert D. Richards, with the vision to study, explore and develop space for the benefit of Humanity. ISU provides a distinctive brand of space education that space agencies, the private sector, and research institutions around the world look after. True to its founding principles, ISU's education focuses on the three "I"s — International, Interdisciplinary, and Intercultural. Over the past 34 years, ISU has graduated more than 5,200 students from 110 countries.



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# ABOUT SSP



ISU provides several programs for distinct demographics, ranging from short-term executive programs to a one to two-year Master's program. However, the Space Studies Program (SSP) is the university's longstanding, pioneering program.

The SSP offers an intensive nine-week course hosted each year in the period of June-August in different locations worldwide. The SSP provides courses in all space disciplines, as well as hands-on education through workshops and professional visits. The SSP offers a unique curriculum designed for professionals starting or changing direction in their space careers.

During the SSP, participants work on team projects to address current and future challenges in the space sector. Since 1988, the SSP program has exposed participants to broad new perspectives on the world's space activities. 2020 made International Space University replan the program and adjust it to be online, and since then there is an effort to keep the hybrid version, allowing people who cannot attend in person to be part of this amazing experience.

The year 2022 marks the 35th anniversary of ISU. The onsite program took place at Instituto Superior Técnico (IST), in Taguspark, in Oeiras, Portugal. It was hosted by the Portuguese Space Agency (PT Space), IST and Oeiras Valley, and along with it also the online version took place.



# DIRECTOR'S RETROSPECTIVE

This year, we were very happy to conduct our 34th Space Studies Program (SSP) as a full-fledged program in Oeiras-Portugal after the interruptions due to the COVID-19 pandemic. This year's session brought 107 participants representing 37 nationalities together, including the very first ISU participant from the Maldives. We were also glad to see 47% of our class represented by female participants.

This year's curriculum was specially designed to emphasize NewSpace business and entrepreneurship and all our Team Projects have a potential for post-program continuation. Space for non-Space, Space-Ocean-Climate Interactions, Microgravity Business and International Cooperation on the use of the Chinese Space Stations are all hot topics that bring the opportunity to establish companies on the pillars of the findings of the research performed during this summer, making society benefits even more from the space sector.

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# DIRECTOR'S RETROSPECTIVE

As in previous years, the SSP was possible thanks to the voluntary contribution of many of our faculty members, visiting, and local lecturers who have generously invested their time and shared their knowledge. The International Space University (ISU) is very thankful for those who were with us, in person or virtually, and we really believe that, together, we are building the new generation of space specialists that will work to bring benefits to humankind. We also hope that the local community in Oeiras and Lisbon has benefitted from the public events we have conducted throughout the summer and enjoyed the discussions about space science and science fiction. This year's ISU Alumni Conference gathered more than 200 alumni in Portugal, reunited not only to see the old friends, but also offering a perfect environment for networking and connecting to potential collaborators.

Hereby, I would like to take the opportunity to thank our hosts, Portuguese Space Agency, Instituto Superior Técnico - Taguspark, and Oeiras Valley Municipality, for making our staff and participants feel very welcome during their stay.

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# DIRECTOR'S RETROSPECTIVE

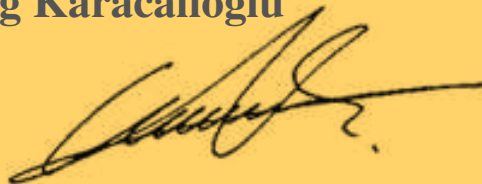
I would also like to extend our thanks to the sponsors of our Team Projects, Amazon Web Services, and the Chinese Academy of Sciences, Technology and Engineering Center for Space Utilization (CSU, CAD), for their generous support.

To conclude, I would like to highlight that the SSP aims to give its participants the opportunity to take advantage of many resources, but they are the core of this program. One of the most important outcomes of this nine-week journey is the friendships that were initiated and grew here; which will allow them to work in collaboration on many other projects in the future, knowing the importance of culture, diversity, and mutual respect.

As this year's session ends, we thank you for being with us on this journey and we look forward to seeing you for SSP23 in Brazil.

Mr. Arif Göktuğ Karacalıoğlu

SSP22 Director



# PARTICIPANTS



The class of SSP22 was composed of 107 participants representing 37 countries from all continents. It was great to have here 47% female and 53% participants, almost achieving equality in numbers. 40% of our participants held a BSc degree, 52% a MSc and 8% were PhDs or equivalent. The average age was 31 years and 43% of them had non-engineering backgrounds. They made an amazing class who were capable of delivering high quality works and exchanging lots of knowledge.



# FACULTY & STAFF



Welcomed by Dr. Niamh Shaw, Dr. James Green and Michael Simpson as main chairs, the experts and professionals involved in onsite SSP22 could deliver expressive content regarding different areas in space affairs. The core lecturers aimed to explain the interdisciplinarity aspect of the activities covered by the program, as well as set up a common ground for the participants to work together. Speakers like Pascale Ehrenfreund, Walter Peeters, Scott Madry, Jeffrey Hoffman and Hansjörg Dittus were present, delivering knowledge to the participants and helping the participants to understand different aspects of Space Exploration. The same Core Lectures were streamed to online participants.

Fundamental Workshops also brought great names to contribute to the program, considering human relations and team building, but also getting the participants to work together and learn hands-on how to deal with situations that can arise while working as a group. Those activities could count on names as Soyeon Yi and Paolo Nespoli, two of the three astronauts (along with Jeffrey Hoffman) that made this event was even more interesting, as participants could listen first hand their experiences in challenging situations.

The online program could learn on the well being of astronauts aside with activities of team building.

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# FACULTY & STAFF



Also Elective Workshops offered a variety of topics to be chosen from, covering all seven areas covered in SSP: Space Management and Business, Applications, Sciences, Humanities, Policy, Economics and Law, Engineering and Human Performance in Space. Among experts that offered those opportunities in SSP we can name Kazuya Yoshida, Juan de Dalmau, Jeremy Myers, and also local names as Rodrigo Ventura and Nuno Mira. Online workshops were more related to their Team Project, counting on lessons learned from NASA and life searching in space among others.

SSP22 Staff was composed not only of people who have been part of ISU for a long time but also staff from previous editions and new volunteers that show passion for space. Logistics, Information Technology, Library, Academic Coordination, External Relations, and Content Reviewers, as always, made their best to deliver the expected professional quality of SSP as it should be as an event promoted by International Space University, not to forget the team that was responsible to deliver to online participants the ISU level course they signed up for.



# TESTIMONIAL

## Leonard de Guzman SSP22 Participant



"I think most people here agree with the notion that SSP is a life-changing experience. We all have our own personal and individual story describing our journey to SSP, but we all have the same story for how SSP has been made possible for us.

It is the absolutely amazing staff who are responsible for planning, curating, and executing a program that has given us such an incredible experience! It is important to recognize and appreciate the great work of all staff, including and especially those in less visible roles. There is an incredible amount of effort required to host an SSP and this year was no exception, with staff working tirelessly across academics, communications, content reviewing, events, finance, health and safety, individual departments, IT, logistics, mentorship, participant liaison, team projects, wellbeing, and many other areas. For every high, staff have been there creating the environment for us and celebrating with us. For every low, staff have been there to support us and care for our hearts. SSP staff are the backbone of the program, without whom this life changing experience would not be possible. They deserve our genuine and heartfelt gratitude, and I hope one day we can return the favor to them."

# BENEFITS OF DOING AN SSP

The 9 weeks spent in SSP bring the participant to a unique environment totally defined by ISU three “P”s: International, Interdisciplinary and Intercultural. Having together dozens of participants with different backgrounds, cultures, ages and nationalities, the environment is especially fruitful for ideas, business and friendships arise:

- **International exposure**: Not only there are participants from dozens of different countries, but also experts from industry and academia coming from all over the world, facing different challenges in different realities brings perspective to the participants to learn and get insights and find common goals and accomplish them;
- **International Interdisciplinary Teams**: Mid/ after Core Lectures the activities related to Team Projects start, making people from different countries, speaking different languages and with different backgrounds work as a team to achieve the same goal. After the Core Lectures, the participants work in two different teams, both in the large TP group and also in a smaller one, for Departmental Activities. Again, they face different people with different backgrounds with other interests in common, learning to work together. These two phases are excellent opportunities to practice cultural and background transversality;



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# BENEFITS OF DOING AN SSP

- **Knowledge in Different Fields of Space Sector:** During the program, the participant is exposed not only to their field of expertise but other related subjects that, after all, are related and/ or impact their subject of interest. The major fields are covered, not only directly by specific lecturers and departmental activities but also during other engagements that bring two or more areas together, combining engineering, sciences, application, policy, economics, law, management, business, arts, human sciences, and performance in space;
- **Cultural Exchange:** SSP is not only about technical content, but also about learning about other cultures and different habits and ways to face aspects of life. Not only during learning activities but also during socials and day-to-day contact people learn how to respect and appreciate other cultures, an essential skill nowadays, when the space sector demands more and more international cooperation;
- **Lifelong networking:** As anybody can see in Alumni events, being a SSP member is a forever bond. Once an ISU member, forever an ISU member. Many years after their experience, SSP participants still have contact with other alumni across the world. Those links make it easier for them to reach better opportunities in the Space sector even many years after SSP;
- **Delivered Content:** No matter the format chosen by the participant, onsite or online, the content covers the same basic subjects and the lecturers are the same, providing all above-mentioned benefits for all participants.

# TESTIMONIAL

"Internet accessibility across the globe helps people to learn without boundaries and ISU's digital education programs aims at reaching out to everyone in the world who desires to begin a career in the field of space journey at an international level.

The Online Space Studies Program, is an intensive 6-weeks professional development course that covers the principal space related fields, both non-technical and technical ranging from engineering, physical sciences and space applications to policy, law, business, management and humanities to life sciences for postgraduate students and professionals of all disciplines.

For all those who are fascinated and curious by space domain and want to contribute to the varied explorations done by mankind in developing the aspects of space sector- the ISU digital programs helps not only to do a comprehensive analysis in international, interdisciplinary and intercultural teams to produce proposals for an international space project but also network with experts of space field to help students and professionals grow their careers in space!"

**SUPPRABHA NAMBIAR**  
**Online Academic Coordinator**



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**SSP22 REPORT**

# CURRICULUM

Onsite SSP is divided into three main phases: Core Lectures, Departmental Activities, and Team Project. Online SSP has the same Core Lectures, streamed from the auditorium, having the same opportunity to interact with the lecturers, and their own Team Project, making it two phases.

Given the international character of the program, all phases are held in English, both lectures and assignments. The curriculum is designed so as to provide international cooperation and show different perspectives in the space sector.

Experienced professionals from industry and academia give speeches and lead activities, both practical and exercises, and also take the participants to technical visits. Since every year SSP happens in a different country, every edition avails different contents, places and expertises, making every program a very unique one.



# TESTIMONIAL

## CLAUDIU MIHAI TAIATU, Academic Coordinator



"ISU is a unique academic institution, focusing on the interdisciplinary, international and intercultural (3Is) aspects of space activities and being recognized at global level for its professionalism and networking opportunities. Participants attend the Space Studies Program not only to learn, but to also experience an intense professional environment, which gives them the opportunity to interact actively with high level representatives from different domains, including but not limited to: Space Agencies, Government, Academia, Space Industry, from spacefaring nations and from emerging space players. SSP participants are exposed to the latest developments in space activities, receiving professional guidance and having the academic freedom in shaping their deliverables.

Overall, the SSP program is designed across three phases: (i) Core Seminars; (ii) Department Activities; and (iii) Team Projects, which include aspects related to Space Applications (APP); Space Engineering (ENG); Human Performance in Space (HPS); Space Humanities (HUM); Space Management and Business (MGB); Space Policy, Economics, and Law (PEL) and Space Sciences (SCI). In addition, the program includes team building and communication skills workshops, mentorship sessions, and offers a series of elective workshops and distinguished lectures. To learn more about this amazing program, check the ISU booth at IAC and/or download the SSP Program Handbook, publicly accessible and/or interact with past participants and staff. I am personally an alumnus of SSP18 in the Netherlands, and I wholeheartedly recommend the Space Studies Program to all space professionals."

# CORE LECTURES

SSP22 presented 46 Core Lectures, designed to be accessible to all participants, no matter their backgrounds. These lectures aim to level the participants so as to have a basic understanding of all main areas of the Space sector, being able to communicate with each other, no matter their expertise. These lectures addressed:

- Space Applications (APP): 9
- Space Engineering (ENG): 7
- Human Performance in Space (HPS): 6
- Humanities (HUM): 6
- Management and Business (MGB): 6
- Policy, Economics and Law (PEL): 6
- Space Sciences (SCI): 6





# TESTIMONIAL

"Reflecting the diversity of participant experience on the course, the CLS lectures were delivered on a broad range of topics and themes. The guest lecturers were all experts in their fields, which gave a certain credibility and authenticity to what they were teaching; and there was a real excitement among participants due to being lectured by people with such esteemed backgrounds. While I've enjoyed all aspects of the course, the CLS period of SSP22 is to me a standout favourite, simply due to the sheer volume and variety of the material; and the raw passion and enthusiasm of the lecturers. One could have a lecture from a retired NASA astronaut about orbital mechanics, followed up by a lecture on International Space Law from a respected lawyer, and this could all be before lunchtime."

**MATTHEW DARK**  
Onsite Participant



# DEPARTMENTS (ONSITE ONLY)

During this phase of the onsite program, the participants are divided in the same areas listed above. They are encouraged to choose an area different from their expertise, so as to broaden their knowledge. During the first week of the program, the Teaching Associates present each Department and the activities that will be carried on. During this phase 112 activities were planned, being 16 for each department.

Departments are:

- Space Applications
- Engineering
- Human Performance in Space
- Space Humanities
- Space Management and Business
- Space Policy, Economics, and Law
- Space Sciences.



# SPACE APPLICATIONS

**Co-chair: Su-Yin Tan, Taiwo Tejumola**

**Teaching Associate: Hoda El-Megharbel**

The objective of this department was to show practical uses for space technology for our lives. Explaining and experimenting from communications to remote sensing, to geographic information systems to geonavigation, space applications have a great role in present life and this department uses its activities to demonstrate so. Learning outcomes from this department include understanding and getting to use hardware and software for image processing, design and complete a research project using space technologies and explore space technology applications.

- Professional Visit to IST Satellites Communications Lab, learning about small satellite design and development. Meet Sat-1, the first Portuguese students' satellite!
- Alfouvar Station for Satellite Operations in Sintra welcomed a joined activity of APP and MGB, learning about applications for everyday uses.
- Afternoon activities comparing different types of satellite remote sensing imagery and investigating how remote sensing can be connected to ground findings.



# SPACE ENGINEERING

Co-chair: Joseph Pellegrino, Todd Mosher

Teaching Associate: Jedrzej Gorski

The objective of this department was to provide hands-on activities regarding space mission life cycle and apply concepts learned in Core Lectures. Aerospace Systems Engineering is the focus of these departmental activities. Applying knowledge to a mission, from conceptual design to mission operations and also minding the end-of-mission is the main goal of Space Engineering and the learning outcomes include knowing how to perform trade studies, what is taken into account when analyzing a mission and dangers and removal strategies for orbital debris.

- Rocket designing was part of Engineering Activities, when the participants went through many phases of building their own devices meeting a list of requirements.
- The participants also had to accomplish a mission with a rover simulating lunar environment. The rover was in Canada and the participants could command it from here.
- Together with HPS the Engineering participants had the opportunity of simulating an Extra Vehicular Activity (EVA) in a tank, scuba diving!



# HUMAN PERFORMANCE IN SPACE

**Co-chairs: Virginia Wotring, Heather Allaway**

**Teaching Associate: Leo Baud**

This department focuses on understanding how space affects people, as individuals and as a team. Since human beings are complex, having physiological, psychological and many other aspects, this department presents to participants to evaluate the influence of space for missions, both short and long term. Covering from Anatomy, to Bioethics to new technologies to attend medical needs, this department aims to offer training in a crew medical office, understand ethical and legal requirements when dealing with health matters in extreme environments and understand the impacts on team dynamics while confined in such an environment.

- Participants could see an interactive real-life practice of medicine in space. They got to know how medicine is practiced in ISS and the historical of medical events in space.
- The group experienced an isolated, confined and extreme environment in Assafora cave in Sintra, having an analogue experience and training, while looking for biomarkers of life forms.
- There was also a discussion on Bioethics and planet protection, and ethical implications of near future possibilities, such as terraforming other planets.



# SPACE HUMANITIES

**Co-chairs: Kerrie Dougherty, Ruth McAvinia**

**Associate Chair: Hugo Simões**

**Teaching Associate: Harshitha Chavan**

Space Humanities Department addresses the very reason that makes human beings wish to reach space and how space relates to society. It aims to insert arts and human sciences to STEM in order to make it look beyond the technical aspect of human conquest of space, bringing another meaning to this effort. Reaching space is another step to the human species, and as so it has a meaning in history and culture as other human activities so far. This department shows participants interactions between space and society, inviting them to develop their creativity and use their skills to solve problems and inspire people, while also analyzing ethical dilemmas that may arise while exploring space.

- **How are mission patches created?** Participants get to understand the process from initial ideas to finishing patches and how to present the artwork. One patch will be selected to be produced for the group.
- **Space Activities** rely a lot on communication and outreach. Attracting funding for projects and gathering interest from the community on space activities can use a variety of communication techniques to tell stories and deliver messages.
- **Visiting MAAT - Museum of Art, Architecture and Technology** helped the participants to see art and sciences interact so as to bring the inspirational value of art to important missions.



# SPACE MANAGEMENT AND BUSINESS

**Chair: Daniel Rockberger**

**Associate Chair: Jim Rymarczuk**

**Teaching Associate: Gaetano Del Bufalo**

For the last few years, Space Exploration has not been reduced to Engineering and Science fields only. Successful companies have been using viable business models and strategies and do not differ a lot from “regular” companies, expecting to meet the customers' needs. This Department focuses on fundamental skills to grow and manage a company in the space sector, covering finances, entrepreneurship, and legal aspects, among many others. Learning outcomes from these departmental activities include turning ideas into viable business plans, financing and fundraising, self-selling skills, and legal and regulatory aspects involved in the process.

- The participants had a Lean Startup workshop and made groups who worked on an idea, to develop it from its early steps to a viable business model.
- The group also could visit one of the largest Accelerators in Europe that has grown Space and non Space sector supercompanies, including some unicorns.
- MGB also had a joint activity with PEL, learning about space business regulations and issues about investments, taxes, international trade and export control.



# SPACE POLICY, ECONOMICS AND LAW

**Co-chair: Nicolas Peter**

**Co-chair: Catherine Doldirina**

**Teaching Associate: Anmol Dhawan**

Activities in space have to be regulated for international use. This department studies the development of space policy, regulation and governance of activities regarding space. Using discussions and debates the participants can have a deeper understanding of how those rules are applied and why they are necessary. Also, the debates lead to a discussion on how they should be developed depending on current and future technological achievements. Impacts on society are considered and also the benefits that may arise.

- The group could discuss the development in the domain of mega-constellations and the relevant policy, legal and economic challenges of such kinds of missions.
- Space security was also addressed by this department, both security from space and security of space. Legal issues were discussed and examples were analyzed.
- The participants finished the activities with a moot court case based on a fictional dispute on a space-related issue!





# SPACE SCIENCES

Co-chair: Hugh Hill

Associate Chair: Scott Ritter

Teaching Associate: Maria Pereira

Space Sciences can present itself in many fields, such as Physics, Biology, Chemistry among many others. This department aims to present to participants many aspects of sciences, with both theoretical and practical activities. Microgravity effects, sky observation, geology and other multidisciplinary effects are discussed so as to relate observed phenomena to learnt background. Analyzing multifactorial effects the department aims to conduct the participants to engage on discussions on potential events and their consequences to modern society

- Science participants could see experiments of a drop tower, considering that new technologies such as cameras and sensors allow measurements of phenomena in slow motion. With a simple experiment, many concepts could be validated by the group.
- Collecting samples of lakes and observing them at Instituto Gulbekian de Ciências allowed the participants to observe magnetotactic bacteria, and then take conclusions on criteria that can be used in search for life!
- Geology formation at the beach in Oeiras led the participants to observe formations of the surface of Earth and different types of soils, leading them to think about the geology of planets than Earth in our Solar System.

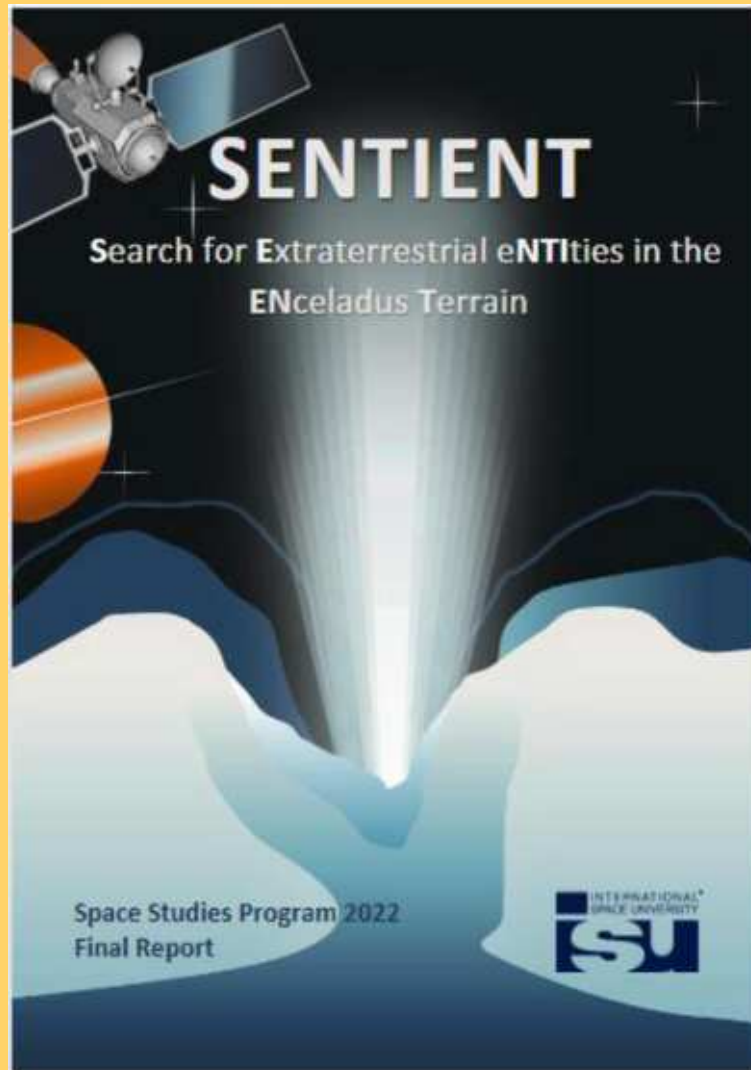


# TEAM PROJECTS

During this phase the participants are grouped into five different groups, one for online participants and four for onsite participants, that could choose their themes before arriving at Oeiras. People with very different backgrounds compose those teams to develop a complete multidisciplinary project. Starting with the program, the participants have activities such as presentations and workshops to help them develop and organize their work that should be finalized during the three last weeks. SSP expects the result to be a high-quality one, sufficient to be submitted to a congress or event in the Space Sector.



# NEW METHODOLOGIES IN THE SEARCH FOR LIFE (ONL)



**Chair: Jacob Cohen**

**Co-chair: Alex Ryan**

**Teaching Associate: Thomas Chrétien**

# NEW METHODOLOGIES IN THE SEARCH FOR LIFE (ONL)

## Abstract:

Since the dawn of time, humans have been fascinated by the stars, wondering, what is out there? Are we alone in the universe? Science fiction has served astronomers, artists, novelists, and scientists alike, in pondering on this question, welcoming the uncertainty of what lies ahead in space exploration. Now, humanity's destiny beyond Earth is on the verge of a new phase of ground-breaking discoveries as we send robotic explorers on deep space exploration missions. Our mission, SENTIENT, aims to further this quest and explore the possibility of life, past or present, on the icy Saturnian moon, Enceladus. The mission concept consists of a spacecraft composed of an orbiter and lander. The orbiter will contain remote sensing instruments to determine an optimal landing zone near the Tiger Stripes around the south pole. The probe will then collect samples and data from the surrounding ice and atmosphere and transmit it to the orbiter, to relay it in turn back to Earth for further analysis for potential bio-signatures.

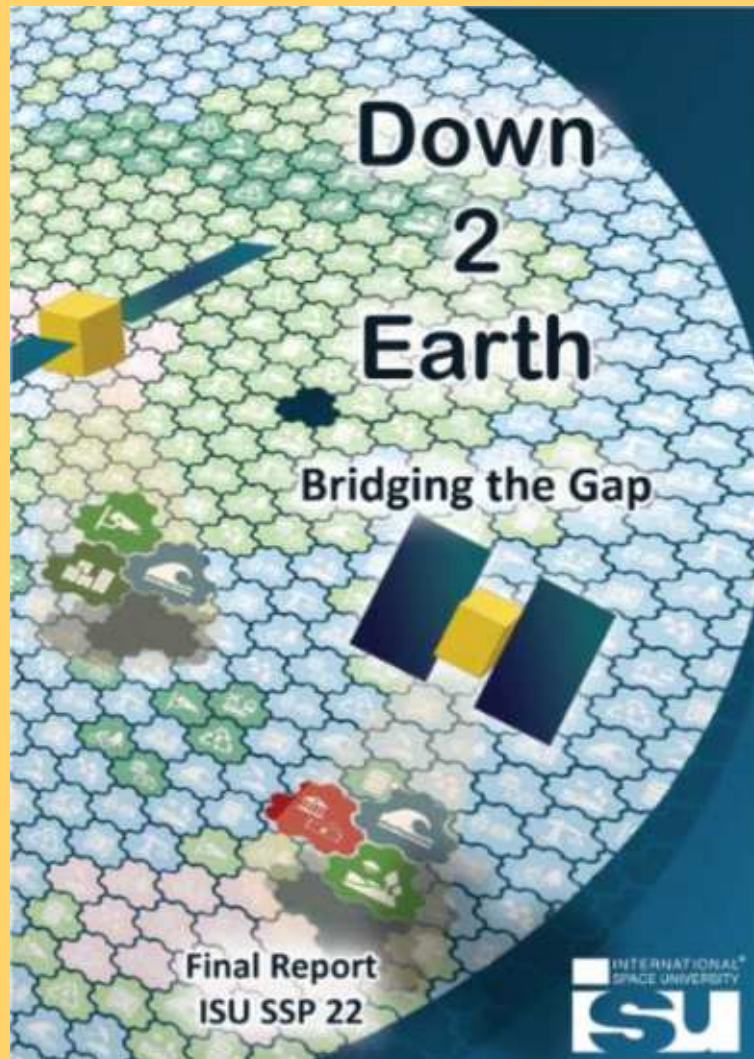
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# NEW METHODOLOGIES IN THE SEARCH FOR LIFE (ONL)

What if we do find life out there? This would in turn raise many other questions from the point of view of science, law, policy, and humanities. Apart from excitement, such an event is anticipated to incite mixed reactions from the public, including ethical concerns around interactions with newly found organisms. Apart from a whole new dimension opened to the scientific community, novel studies would need to be conducted on human behavioral change, new laws and policies would have to be developed, and fresh welfare policies across the globe implemented. The SENTIENT mission aims to create a bridge to this new world of possibilities, where, finally, we are not alone in our universe. Since that first glimpse of the universe that the Hubble Space Telescope presented to the world, the power of ingenuity would have moved us yet another step closer to the stars and beyond.



# SPACE FOR NON-SPACE



**Chair:** Gary Martin

**Associate Chairs:** Carolina Garcia Vieira de Sá

**Associate Chairs:** Raphael Roettgen

**Teaching Associate:** Camilo Reyes

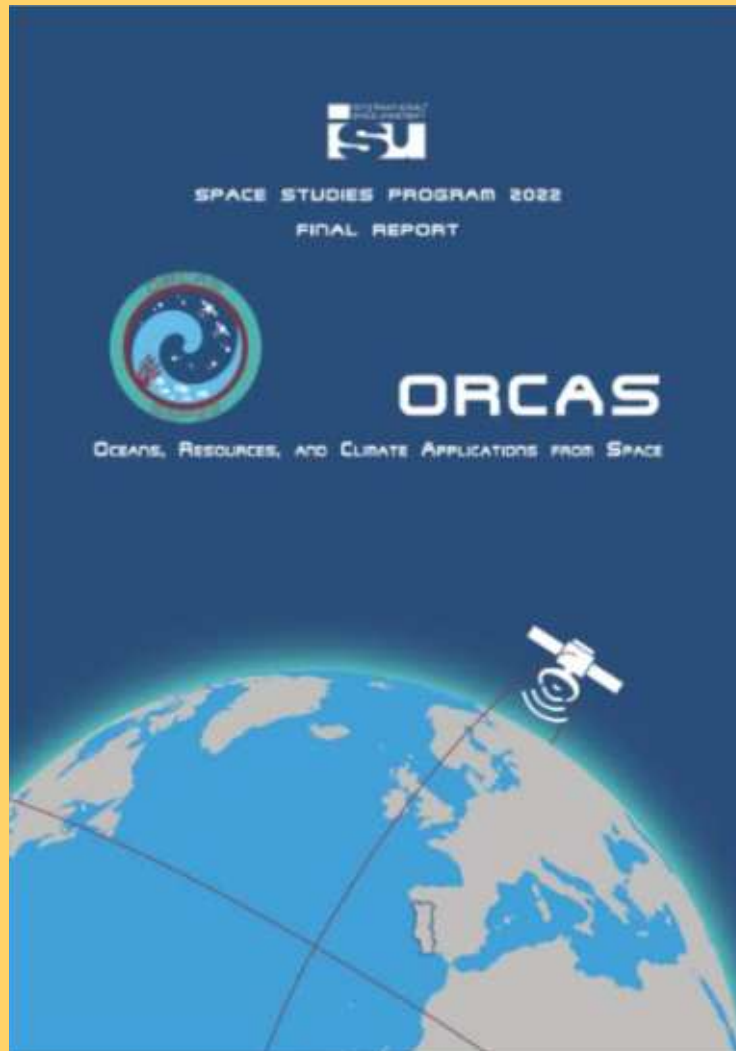
# SPACE FOR NON-SPACE

## Abstract:

Over the last few decades, the space sector has grown exponentially. In particular, the supply of space-based data has become much more prominent. Earth observation (EO), communications, and global navigation satellite systems (GNSS) are commercialized and provide valuable services for the global economy. Active satellites have grown nearly tenfold in the last 25 years, from 541 in 1996 to 4,887 in 2021(Statista, 2021). The team first assessed the space for non-space industry supply chain at a macroscopic scale, reviewing impactful gaps and future trends. Next, the team researched the space for non-space supply chain from a bottom-up perspective, analyzing the space-based services and data available, and the non-space downstream markets they serve. Three markets were analyzed, and the satellite communications and GNSS markets are mature without significant gaps. However, there appear to be gaps in the remote sensing space for non-space supply chain. Satellite remote sensing does not have a space or non-space industry problem. Instead, it has a big data problem.

Remote sensing satellites produce hundreds of terabytes daily, with hundreds of petabytes in storage. Building and maintaining pipelines that convert the data into user-friendly intelligence and value-creating solutions produce large overheads. The team developed two business cases to address this gap, proposing solutions to reduce the overhead costs of turning data into intelligence valuable to non-space industrial clients. The business cases aim to reduce the technical and financial costs for non-space clients using remote sensing space-based solutions. They will enhance non-space industrial adoption of remote sensing space solutions upon success.

# SPACE-OCEAN CLIMATE INTERACTIONS



**Chair: Jan Walter Schroeder**

**Associate Chair: Kyoichi Arakane**

**Associate Chair: João Jesus**

**Teaching Associate: Roberto Adolfo**



# SPACE-OCEAN CLIMATE INTERACTIONS

## **Abstract:**

**In the last century, we, as a species, have become increasingly aware of how deeply interlinked our communities are with our oceans, climate, and planet. At the same time, we have become increasingly aware of the benefits of space-based technology and space applications. Multiple International organizations have recognized that the deep interconnectivity in space-ocean-climate interactions allows for new and innovative solutions to our urgent climate crisis. One such group, the Atlantic International Research Centre (AIR Centre), was formed with the intent to promote an integrative approach to these topics in the Atlantic region. The AIR Centre is currently analyzing the feasibility of an ‘Atlantic Constellation Of satellites in concert with multiple space agencies and other stakeholders in the Atlantic region, co-designed and developed to provide Earth observation data and address some of the critical topics and current needs in global and local coastal communities.**

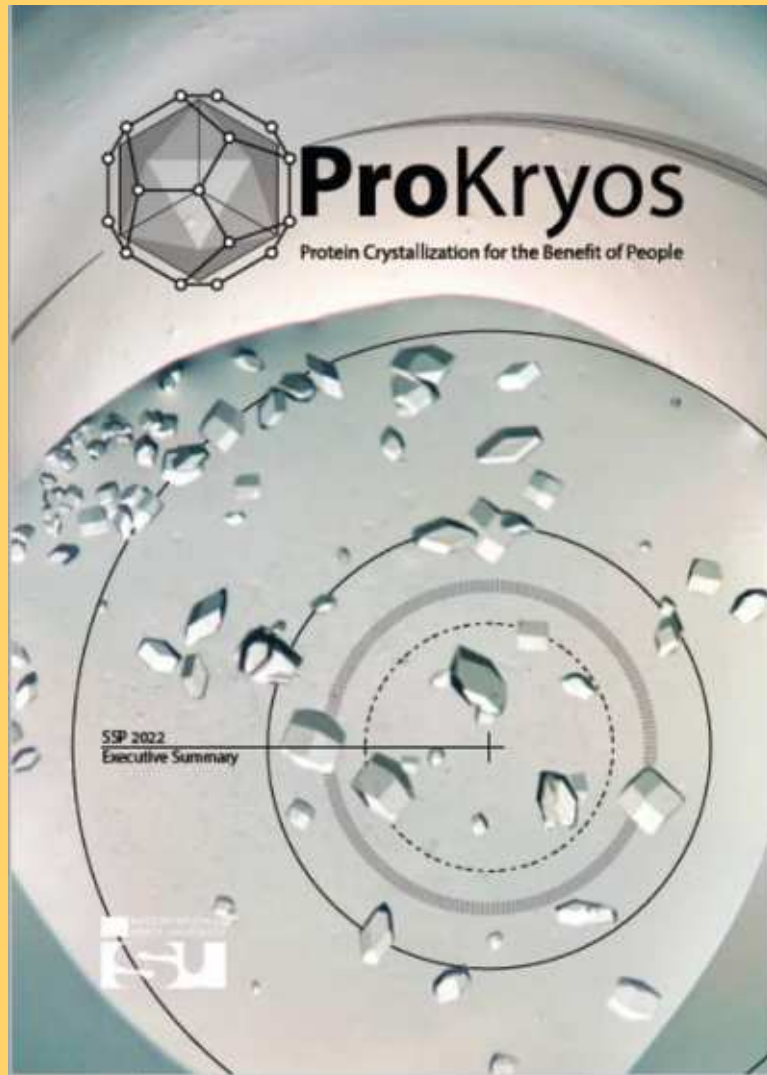
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# SPACE-OCEAN CLIMATE INTERACTIONS

We here on the Oceans, Resources, and Climate Applications from Space (ORCAS) Team are providing additional research and analysis to support this and future platforms. In our report, we analyze the state of the art as well as the critical gaps and needs in five primary areas: maritime monitoring, ocean resource management, coastal hazard mitigation, data handling and sharing, and the governance and commercialization of marine observation systems. We then provide recommendations to stakeholders in the Atlantic Constellation project, both technological and programmatic, as steps that can be taken for this system or for other remote sensing systems in the future. We believe these recommendations would maximize the constellation's value for decision-makers and end-users if implemented. Throughout the report, we also emphasized that the interconnected nature of these topics is both a challenge and an opportunity. At the same time, numerous technical, societal, and economic hurdles exist to such an ambitious international platform. We believe that if those challenges are met correctly, this program and the AIR Centre's future efforts can provide a broad, powerful, positive impact on our communities, our oceans, and the planet they are all a part of.

# MICROGRAVITY BUSINESS SPACE

## R&D FOR BENEFIT OF PEOPLE



**Chair: Veronica La Virginia**

**Associate Chair: Justin Karl**

**Associate Chair: Joan Alabart**

**Teaching Associate: Shrrirup Nambiar**

# MICROGRAVITY BUSINESS SPACE R&D FOR BENEFIT OF PEOPLE

## **Abstract:**

**Our mission is to develop an orbital pharmaceutical factory, ProKryos-Pancea, with an initial focus on the mass production of crystalline protein drugs such as monoclonal antibodies (mAbs). Protein drugs can be used in the treatment of cancer, auto-immune diseases and other health-related issues such as migraines and anemia. The benefits of a microgravity environment for the production of protein crystals have been well documented.**

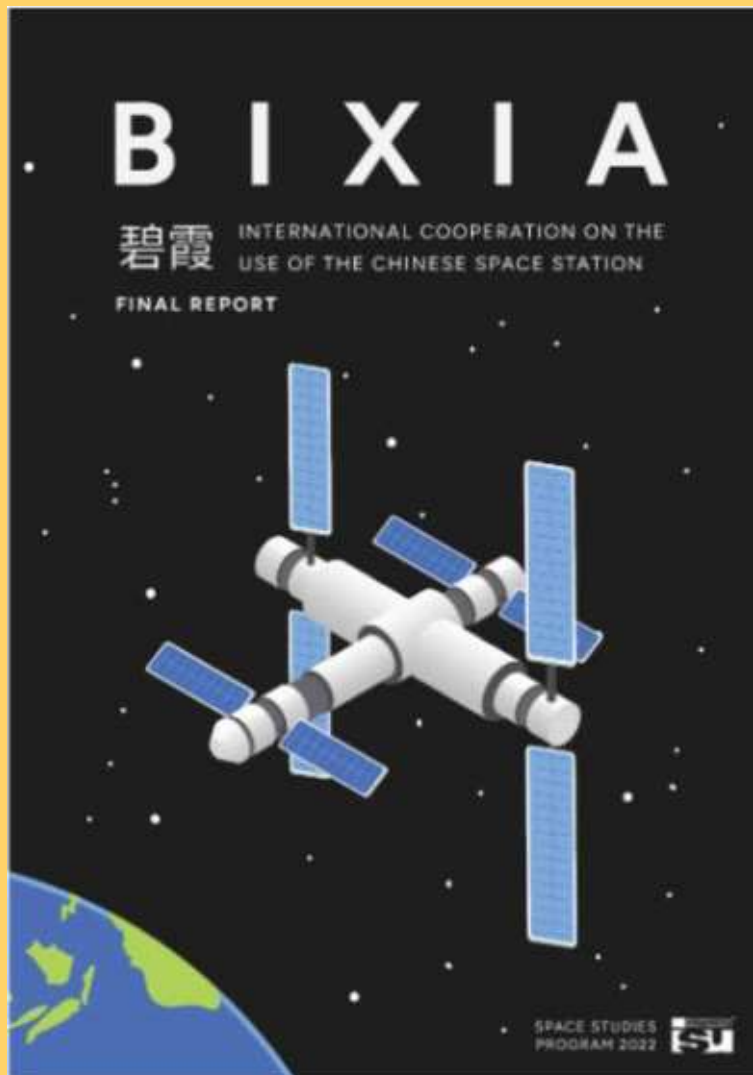
**However, in the last ten years, access to space has become cheaper and more readily available, making now the opportunity for such a business venture. This report investigates the current state of space pharmaceutical manufacturing, setting the scene for our business proposition. We then define a timeline of distinct phases required to make ProKryos-Panacea a reality, covering the scientific, engineering, business, and regulatory verticals to this grand aim. Our report culminates in a detailed description of our demonstrator mission, ProKryos-I, testing our novel hardware for the mass production of protein crystals suitable for pharmaceutical use. This report and the suggestions within it aim to unleash the potential of pharmaceutical manufacturing by paving a viable and life-changing pathway into space.**

**(Go to the next page)**

# MICROGRAVITY BUSINESS SPACE R&D FOR BENEFIT OF PEOPLE

However, in the last ten years access to space has become cheaper and more readily available, making now the opportunity for such a business venture. This report investigates the current state of space pharmaceutical manufacturing, setting the scene for our business proposition. We then define a timeline of distinct phases required to make ProKryos-Panacea a reality, covering the scientific, engineering, business, and regulatory verticals to this grand aim. Our report culminates in a detailed description of our demonstrator mission, ProKryos-I, testing our novel hardware for the mass production of protein crystals suitable for pharmaceutical use. This report and the suggestions within it aim to unleash the potential of pharmaceutical manufacturing by paving a viable and life-changing pathway into space.

# INTERNATIONAL COOPERATION ON THE USE OF CHINESE SPACE STATION



**Co-Chair: Gongling Sun**

**Co-Chair: Yang Yang**

**Teaching Associate: Ales Nohel**

# INTERNATIONAL COOPERATION ON THE USE OF CHINESE SPACE STATION

## Abstract:

This mission aims to develop new technologies and methods which will support humanity in our common journey to the stars. The mission proposes to be the result of international cooperation, with the physical experiment graciously hosted aboard the new Chinese Space Station (CSS). Concurrently, Bixia proposes an extensive outreach program, which seeks to educate and excite the world about this project.

The Bixia mission statement is as follows: To validate the use of supercritical fluids (SCF) aboard the CSS, to prepare for further development into ecological life support systems for use in long-term human space flight; using partners cooperating internationally, and sharing the research via a series of outreach programs. Using SCF technology, this mission aims to produce new methods of sustainable plant growth in outer space. The wider goal is to integrate this technology into Controlled Ecological Life Support Systems (CELSS), to allow human outposts such as Lunar and Martian habitats to become self-sustainable. The initial payload will seek to validate the SCF and plant growth technologies, with a follow-up payload seeking to produce a closed ecosystem aboard the CSS to validate CELSS technologies.

# FUNDAMENTAL WORKSHOPS

Fundamental Workshops are mandatory for the participants, to facilitate and improve their capacity to work as a team, contributing to build a relationship and sort out ways to accommodate everybody's culture and skills. Some of them were also offered to staff to help them to work together. These FW were:

**FWS-01-A - Team Building (LIS)**

**FWS-01-B - Advanced Communication Skills (LIS and ONL)**

**FWS-01-C - Cross-Cultural Awareness and Communications Skills (LIS and ONL)**

**FWS-01-D - Rube Goldberg Machine (Introduction, Preparation, Rehearsals, Final Run and Prize Ceremony) (LIS)**

**FWS - The Well-Being of Astronauts:**

**A Challenge of Space Exploration (ONL)**

Rube Goldberg





# TESTIMONIAL

**EDIR VITAL**  
**Staff Member**



"I really believe the workshops were really good in order to get some sort of link to the other staff members by sharing experiences, thoughts, beliefs, so in order to work better as a team and in the end as a unit".

# ELECTIVE WORKSHOPS

Elective workshops offer the participants opportunities to learn deeper about the subjects that interest them the most among many different options. Depending on the backgrounds and interaction between participants and lecturers, and even among themselves, optional knowledge can be shared and used for Team Project as well.



# ELECTIVE WORKSHOP - ONSITE

**EWS-01-A: International Space Cooperation**

**EWS-01-B: *In-Situ* Construction for the Moon and Mars with a Specialization in 3D printing using Indigenous Resources**

**EWS-01-C: Future Foresight for Space Industry**

**EWS-01-D: Space Robotics**

**EWS-01-E: Space Finance and Investments**

**EWS-02-A: Space Ecosystems in Developing Countries and Emerging Space Nations**

**EWS-02-B: Optimizing planning and operations of Satellites constellations**

**EWS-02-C: SmallSat Constellation - Mission Analysis and Design**

**EWS-02-D: A Strategic Analysis of the Space Industry**

**EWS-02-E: Robotics - Part 1**

**EWS-02-F: Workshop on Multi Temporal Land Cover classification using Sentinel-2 time series and Machine Learning**

**EWS-03-A: Designing your own satellite**

**EWS-03-B: From Challenger to Columbia**

**EWS-03-C: Space archaeology, space food and focus groups**

**EWS-03-D: Civilian Space Development before 2035**

**EWS-03-E: Robotics - Part 2**

**EWS-03-F: Introduction to Microwave Remote Sensing**

# **ELECTIVE WORKSHOP - ONSITE**

**EWS-04-A: Geologic analogues for space exploration**

**EWS-04-B: How International Space Law Affects Commercial Satellite Operators**

**EWS-04-C: Paint your own stars**

**EWS-04-D: Interplanetary spacecraft design – Or, why do exploration spacecraft look the way they look?**

**EWS-04-E: Pilot Wave Theory (and possible space applications)**

**EWS-05-A: Leadership and followership - skills and values for mastering future space**

**EWS-05-B: Imagery Systems for Lunar Exploration Part 1 – Down Selecting an Imagery System The Science an the requirements**

**EWS-05-C: Military Space 101 with hands-on activity on space conflicts**

**EWS-05-D: Crisis communication and media training. A hands-on workshop**

**EWS-05-E: AI for Satellite Imagery**

**EWS-05-F: How to manage your career at the new space?**

**EWS-05-G: Alternative narratives of space exploration**

**EWS-05-H: Strategic Foresighting for the Space Enterprise**

**EWS-06-A: Imagery Systems for Lunar Exploration Part 2 – Qualifying an Imagery System The Science, The Qualification, The Test Plan**

**EWS-06-B: Extraterrestrial Environmental Ethics and Impact Analysis**

**EWS-06-C: Using AI for disaster management and recovery from space**

**EWS-06-D: Ethics for a Sustainable Space**

**EWS-06-E: Catalyzing Space Entrepreneurial Ecosystems**

**EWS-06-F: Moon Habitat Outpost 2028**

**EWS-06-G: Biomimicry applied to space activities: from space systems to ecosystems**

**EWS-06-H: A Leader's Manifesto**

# **ELECTIVE WORKSHOP - ONLINE**

**EWS-ONL-01-A - Follow the Money**

**EWS-ONL-01-B - Aerospace Human Factors**

**EWS-ONL-02-A - Earth Observation Data Applications for Healthcare**

**EWS-ONL-02-B - Imagery Systems for Lunar Exploration**

**EWS-ONL-03-A - Data Mining (Part I)**

**EWS-ONL-03-B - Out of this World Communication: Sending a message to ET**

**EWS-ONL-04-A - Lessons-Learned from Selected NASA Human & Robotic Missions**

**EWS-ONL-04-B - Bioethics and the Search for Extraterrestrial Life**

**EWS-ONL-05-A - Data Mining (Part II)**

**EWS-ONL-05-B - Space-based solutions to accelerate the achievements of the Sustainable Development Goals**

**EWS-ONL-06-A - Alternative narratives of space exploration**

**EWS-ONL-06-B - Mission Planning and Spaceflight Safety**

**EWS-ONL-07-A - Astronaut Field Geology**

**EWS-ONL-07-B - Futures Studies**

# TESTIMONIAL

## JUSTINE LALITA HUE DOUSSET Online Participant



"The interdisciplinary aspect of the Core Lectures is very interesting and gave us an overview of space and our relationship as humans to it. From space science to space management and policy going through humanities was a great and unique experience. The staff online were really dedicated to us, preparing every morning our daily planning and organizing the habitat challenge. We are very grateful that they were present at every lecture and workshop making sure that everything was going smoothly. The fundamental workshops really made us connect to each other. Doing interactive and engaging activities and having to work in small groups broke the ice and were moments to which we were really looking forward to. The elective workshops were even more enlightening as we were learning more about subjects that we liked more. The choice that we were given each time were wide and we could find something that we were driven to each time. The TP was a great experience of working as a team with people from all around the world with different cultures and work experiences. The subject was very inspiring and we are really proud of the work we have put together in this project".

# DISTINGUISHED LECTURES



**DL01 - Disaster Management Using Space Assets -  
Paula Bontempi.**

**DL01**

**DL02 - Humans Working on Mars begins with  
MOXIE - Jeffrey Hoffman**



**DL02**



**DL03 - Making Space Walks Successful: Neutral  
Buoyancy Simulations - James Green**

**DL03**

**DL04 - First Light Observations From the James  
Webb Space Telescope - L.Y. Aaron Yung**



**DL04**



**DL05 - The Martian: Science Fiction & Science Fact -  
James Green**

**DL05**

# DISTINGUISHED LECTURES



DL06

DL06 - Achieving Interstellar Flight: the ultimate moonshot - Harold White

DL07 - The Alpha Centauri System: A beckoning neighbor - Simon Peter Worden



DL07



DL

DL - EU Space Programme Agency, the European Union Agency implementing the EU Space programme - Rodrigo da Costa

DL - VLBI for Geodesy: Fundamentals, Operation, Products, and Applications - João Salmim Ferreira e Víctor Puente



DL



Robotics Competition - Kazuya Yoshida





# DISTINGUISHED LECTURES



The Importance of Outreach (In honor of Major Kenn Rodzinyak, Royal Canadian Academy) - Niahm Shaw, Alice Gorman, James Green



ISU in Metaverse



# PANNELS



## **Astronaut Panel - Living and Working in Space with Jeffrey Hoffman and Paolo Nespoli**

**Have you ever wondered what it's like to live and work in Space? This is what Astronauts Jeffrey Hoffman and Paolo Nespoli approached during this panel open to the public, which took place at Parque do Poetas, in Oeiras.**

Panel 01



# PANNELS



## **2001 SPACE ODYSSEY: How Kubrick & Clarke Made a Masterpiece, with Michael Benson e James Green**

**This panel discussed the mythical 1968 film and the work of Arthur C. Clarke under the analysis of Michael Benson, author of Space Odyssey: Stanley Kubrick, Arthur C. Clarke, and the Making of a Masterpiece, and James Green, NASA Chief Scientist. The panel occurred in Fábrica de Pólvora Barcarena, and was open to the public.**

**Panel 02**



# PANNELS



**The Explorers Club's Global Exploration Summit (GLEX)**

**02/07/2022 17:00 – 20:00**

**Gare Marítima de Alcântara (Lisbon)**



**GLEX**

# PROFESSIONAL VISITS

For professional visits, all participants went to Coimbra to visit some facilities and get to know the lovely city. The participants would visit different spots depending on the interest of their departments:

**Coimbra Observatory:** In Coimbra Observatory the participants could not only see the research instruments but also a piece of history.

Coimbra Observatory has a well preserved inventory of antique instruments and a staff group that can tell its history and details and make the visitor time travel in an amazing place.



←

**IPN:** Instituto Pedro Nunes is an incubator in Portugal that supports startups offering them conditions to work and grow to be full companies. The initiative started as a University initiative but now it is a complete institute.

There the participants could not only learn about its history but also hear about lessons learned when supporting high technology companies.

# PROFESSIONAL VISITS

**Coimbra University - Physics/ Mechanical Eng Department:** One of the most ancient Universities in the world, University of Coimbra is not only a University itself, but also a piece of history and art. Participants could visit and have a lecture on Space Physics and then visit the facilities of the Mechanical Engineering Department. Many projects were shown and we had a tour at the satellite division.



**Active Space:** A visit to a Portuguese Space sector industry was also arranged for this professional trip. Active Space Technology is a company that designs, builds and tests satellite parts and welcomed the participants at their laboratories, showing them all the process from conception to manufacturing and testing the components.

# HIGHLIGHTS

**EVA Training** - In this activity, participants had the opportunity to learn about the similarities and differences between scuba diving and astronaut Extra Vehicular Activity (EVA),

**Robotics Competition** - This activity involved two main tasks: navigation of an unknown world full of rock obstacles; and sample collection of precious pieces (gems). This was a great exercise for a real planetary exploration scenario.



# HIGHLIGHTS

**Rocket Competition - Participants were divided into teams of four to design, construct, and fly a rocket that will meet a set of difficult requirements altitude, payload, data capture, and design style.**

**Caves - Participants experienced training in an isolated, confined, and extreme (ICE) environment in the Assafora Cave in Sintra. They gained an understanding of caving safety, ethics of research, geology and microbiology sample collection, remote sample analysis, and team dynamics in stressful environments.**





# SPOTTED FROM SPACE!



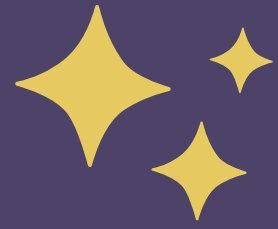
**SSP22 was so special that it was photographed from space! Yes, we had an Israeli satellite flying over IST and we could have a formation to write “SSP22” to be captured by its camera! Now all of us can say we have a picture taken from space. Nothing bad!**

# SOCIAL ACTIVITIES - CULTURAL NIGHTS

Most Fridays we have cultural nights! All participants present to the others their countries, curiosities, trivias, dances and foods! It is an immersion in world culture, dances, parties and getting to know more about other different places. All the singing, dancing and enjoyment also make friendships stronger!



# SOCIAL ACTIVITIES



## - ALUMNI WEEKEND & SPACE MASQUERADE BALL

Say hello to your old friends! SSP is not just a great place to learn but also to make friends and to network. One of the opportunities to meet your old friends and meet people from the space sector is alumni weekend. We have presentations, speeches, get togethers and in the end, a dinner followed by a masquerade ball! This year the participants not only had those traditional events but also could sing Happy Birthday to ISU, who is completing 35 years! It was nice to toast together!



# SOCIAL ACTIVITIES

## - TALENT NIGHT



Our participants are not only space geeks but also have other talents, like singing, playing instruments, standing up and many others! We had to prepare a whole night to appreciate them all and have fun together. Of course the staff could not miss it and also prepared a show. They who did not want to show their talents could at least stay and have fun with their friends. We never miss a chance to spend time together and create lovely memories for the future!

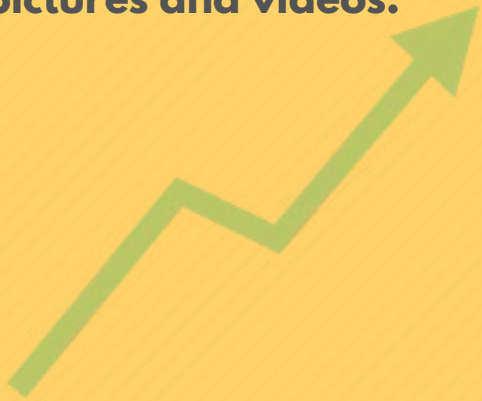
# OTHER ACTIVITIES

Our liaison Melody would not let the participants be bored! She arranged many activities, not only going out in Lisbon but also stargazing, skydiving, game nights and birthday surprises. She was always present with a surprise and bringing fun to the participants to keep their spirits high and energy to keep going. Also the participants were encouraged to have their own socials and outings and pursue their own activities and travels in free time.



# SOCIAL MEDIA & OUTREACH

Similar to previous SSPs, ISU ran a large scale social media campaign during the program. This year we majorly focused on Instagram, Facebook, Twitter, and LinkedIn. The SSP22 blog provided weekly texts, pictures and videos.



Page overview	
<b>Discovery</b>	
Post reach	5,899
Post engagement	3,477
New Page Followers	54
<b>Interactions</b>	
Reactions	989
Comments	49
Shares	46
Photo views	1,047
Link clicks	97

Insights	
Custom ▾	Jul 17 - Aug 30
<b>Insights Overview</b>	
You reached +220% more accounts compared to Jun 2 - Jul 16	
Accounts reached	36.9K +220%
Accounts engaged	1,258 +29.8%
Total followers	10.5K +1.7%



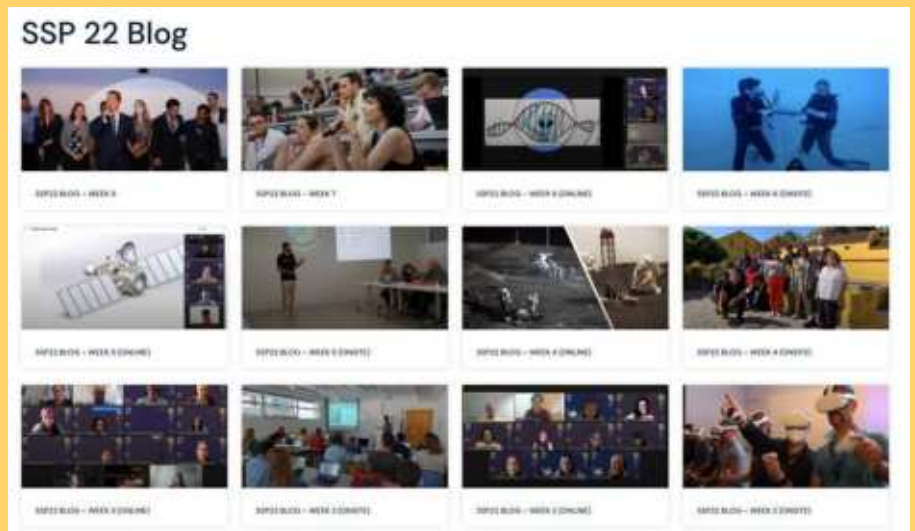
Source: Instagram



Source: Facebook

# SOCIAL MEDIA & OUTREACH

The SSP22 blog provided weekly texts, pictures and videos. Distinguished Lectures and special events were live streamed on ISU's YouTube Channel and Instagram. Many of those had more than 1,500 views.



# SSP ON THE MEDIA



SpaceWatch.Global gave special attention to our program. Some of the subjects were discussed in their homepage, like [Astronaut Performance and Training](#), an HPS subject written by Prof. Virginia Wotring, or [It's Rocket Science, But Not As We Know It!](#), a very interesting SCI essay by Prof. Hugh Hill. Another highlight on SSP subjects was an opinion article written by Dr. Catherine Doldirina & Prof. Nicolas Peter, where they discuss [Studying Policy, Economics and Law for Space \(PEL\)](#). Applications was greatly presented by Dr. Su-Yin Tan with the description of [A Summer of Space Applications \(APP\)](#). We are glad to see our word spread and to get attention from Space community for those very important subjects that were covered in SSP22.



SCI

## #SPACEWATCHGL OPINION: ISU SSP22 SPECIAL – IT'S ROCKET SCIENCE, BUT NOT AS WE KNOW IT !

By Prof. Hugh Hill

“There is life on Mars: Yes, we put it there”

The above, mischievous words, “There is life on Mars: we put it there”, are on the part of the renowned NASA Astrobiologist and member of ISU's faculty, Dr. Chris McKay. The reality is that we humans, via our early – and unsterile – Martian landers have already contaminated the Red Planet. Yes, we have; yes, we have!

In a way, such contemporary polemics are the essence of the Space Science Department at the 2022 International Space University's Space Studies Program (SSP). It's a miscellaneous mix of top-notch academia, debate, friendliness, frankness, disapproval, clarification, condemnation, dogma, humility, networking, and blatant passion for Space!

The SSP is a long-established, nine-week, itinerant (international) program for Graduate Students started in the late 1980s by three idealistic students. They proposed a noble institution devoted to the study of Space (thereafter, ISU) for humanity and, most notably, for peaceful intentions. And, for the most part, the institution has progressed impeccably this way.





# SSP ON THE MEDIA



## #SPACEWATCHGL OPINION: ISU SSP22 SPECIAL — A SUMMER OF SPACE APPLICATIONS

*By Dr. Su-Yin Tan*

It has been long recognized that space technologies not only benefit space exploration but offer direct and tangible benefits to people on Earth. Satellites have the capability of observing Earth's surface from space with constant revisit times. We have grown reliant on satellites for weather forecasting, military reconnaissance, transportation, agriculture, and many more services that can be considered as either public goods or else sold for profit. Although the space sector has historically focused on the upstream sector, including engineering aspects of space transportation, ground stations, and exploration, the focus has shifted towards the downstream sector that relies on data and services primarily from satellite applications.



APP



HPS

## #SPACEWATCHGL OPINION: ISU SSP22 SPECIAL — ASTRONAUT PERFORMANCE AND TRAINING

*By Dr Virginia Wotring*

This year, the Human Performance in Space Department of International Space University's Space Studies Program explored further than ever before. Led by Dr. Virginia Wotring, ISU Professor, and Dr. Heather Allaway, Assistant Professor, Louisiana State University and ISU Global Faculty member, a team of 15 diverse participants examined human performance, in classroom activities at the Institute Taguspark in Oeiras, Portugal, in nearby laboratories, and even under the Earth's surface and underwater.

The group of participants was diverse in age, country of origin, and educational and professional backgrounds – but they shared a lack of significant experience in the life sciences. They were all learning and exploring a new topic together. They spent almost one month learning about life sciences, astronauts and their training, and also about themselves.

## #SPACEWATCHGL OPINION: ISU SSP22 SPECIAL — STUDYING POLICY, ECONOMICS AND LAW FOR SPACE

*By Dr. Catherine Doldirina & Prof. Nicolas Peter*

The Space Studies Program (SSP) of ISU is since 1988 a unique intensive nine-week course hosted each year where participants learn about all facets of space. The SSP provides courses in all space disciplines, as well as hands-on education through workshops and professional visits. As part of the SSP academic program participants must choose and attend the so-called departments that offer three weeks of lectures and activities dedicated to a specific sector, e.g. engineering, space applications and other. This year was no exception during the 34<sup>th</sup> SSP in Oeiras (Portugal).

This year Dr. Catherine Doldirina, General Counsel at [D-Orbit](#) and myself Prof. Nicolas Peter ISU Faculty and Head of the [Space Policy and Entrepreneurship Lab](#) (SPEL) co-chaired the Policy, Economics and Law (PEL) Department. We worked since the end 2021 to prepare the PEL Department programme. We had countless meetings and interactions with various experts to provide the best insights in our fields for this year's SSP.



PEL

# SSP ON THE MEDIA



Local press also reverberated the program in Portugal, releasing news and making public not only SSP but the fact that local participants were enjoying this great experience, as one can see in “sapo.pt” [Há nove portugueses no curso intensivo ‘Space Studies Program’ da International Space University](#) (in English - There are nine Portuguese citizens in the intensive course 'Space Studies Program' of the International Space University). “Expresso.pt” also would write about SSP in [Portugal acolhe o programa de estudos de 2022 da Universidade Internacional do Espaço](#) (in English - Portugal hosts 2022 studies program of the International Space University).

Formação

## Há nove portugueses no curso intensivo ‘Space Studies Program’ da International Space University

Joana Nabais Ferreira  
15 julho 2022

Este ano, o curso da International Space University, que arrancou no final de junho, conta com 107 participantes de 37 nacionalidades. Portugal está representado por nove elementos.

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SAPO



Expresso

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SEBASTIÃO

## Portugal acolhe o programa de estudos de 2022 da Universidade Internacional do Espaço

Universidade Internacional do Espaço

Proposta da Agência Espacial Portuguesa e do Instituto Superior Técnico foi selecionada e vai atrair centenas de estudantes, professores e especialistas internacionais



# SSP ON THE MEDIA



## EXAME INFORMÁTICA

### **Há astronautas à solta por Oeiras**

Curso promovido pela International Space University junta mais de cem participantes, de trinta países. Em nove semanas de formação intensiva, visitarão empresas, institutos de investigação e universidades portuguesas e assistirão a aulas dadas por elite do mundo espacial. Algumas das sessões serão abertas ao público

**Source: Exame Informática**

# SSP ON THE MEDIA



Foto: A. B.

Foto: A. B.

## CURIOSIDADES SOBRE O CURSO DA ISU

**102**

PARTICIPANTES

**36**

NACIONALIDADES

**BRASIL**

PRÓXIMO CURSO  
SERÁ EM SÃO JOSÉ DOS CAMPOS

**11**

ELEMENTOS  
VINDO DE ISRAEL,  
O MAIOR CONTINGENTE

**MALDIVAS**

PARTICIPARAM  
PELA PRIMEIRA VEZ

**110**

NAÇÕES JÁ  
REPRESENTADAS NO SSP



Na noite cultural, obrigatória no programa, cada país apresenta uma parte da sua história, sem fugir aos estereótipos

Da comitiva brasileira fazem parte o participante Sérgio Roberto e também os organizadores do curso do próximo ano

entre 36 000 concorrentes. Tudo isto enquanto terminava o doutoramento.

"Nos primeiros dias sentia como se me tivessem enfiado a cabeça num forno micro-ondas", ilustra o brasileiro Sérgio Roberto, engenheiro da divisão de eletrónica do Instituto Nacional de Pesquisas Espaciais. Mais do que a densidade do currículo, Sérgio diz que foi o facto de a língua oficial ser o inglês que contribuiu para esta sensação. Enquanto servia calpirinhas na noite cultural, o engenheiro conta como graças ao curso regressará ao Brasil - o próximo destino da SSP - com uma visão bem mais abrangente do setor. "No Brasil trabalho com uma visão que parte do espaço para a Terra. Daqui levo uma perspectiva que vai do espaço para o resto do espaço", conta.

Aos 23 anos Danish Ai é dos mais novos do grupo. É também o participante que mais quilómetros completou para frequentar o curso. Veio diretamente do Japão, com o objetivo muito claro de enriquecer o currículo, já bem preenchido, e chegar mais perto do sonho que o acompanha desde que se lembra de ser gente, o de ser astronauta. No último processo de seleção da Agência Espacial Japonesa, JAXA, passou pelas primeiras duas fases. Daqui a cinco anos, na

próxima fase de recrutamento, o lugar não lhe escapará, acredita. Na simulação no CPAS ficou na equipa de apoio - "uma aprendizagem essencial", diz Todd Mosher. "Neste contexto, o coletivo é muito mais importante do que o individual", sublinha.

Era precisamente o coletivo que estava na cabeça de Madin Maseeh quando o maldivo se candidatou. E o que começou por ser apenas um plano, começou a tomar forma em Oeiras. Apesar de ser umas das regiões do globo de maior risco associado às alterações climáticas, não há nenhum satélite de observação da Terra que forneça dados úteis específicos do arquipélago. "Vim para cá com o objetivo de avaliar de que forma é que o espaço nos pode ajudar". Em pouco mais de um mês, o consultor, nómada digital, mas com o coração na terra natal, montou um projeto de lançamento de um satélite, que virá a ser o primeiro do arquipélago. Tem ainda a ideia de instalar numa das ilhas uma base de lançamento de satélites equatoriais. "A proximidade da Índia e o facto de estarmos no Equador torna-nos num excelente parceiro para as pequenas nações em desenvolvimento", acredita. É que o espaço quando nasce (ainda) não é para todos. ■



# SPONSORS & SUPPORTERS

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Royal Military College of Canada  
University of Waterloo

Portugal Space Agency  
Técnico Lisboa  
Oeiras Valley Município Oeiras

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Carol Carnett  
Michael Potter

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**French Space Agency (CNES)**

**Canadian Space Agency (CSA)**

**Dr. Kalpana Chawla Scholarship  
Project**

**EUMETSAT**

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**Federal Aviation**

**Administration (FAA)**

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**Italian Space Agency (ASI)**

**Portugal Space Agency**

**Republic of Korea Army**

**SSPF Netherlands**

**Tohoku University**

**UK Space Agency (UKSA)**

