INTERNATIONAL® SPACE UNIVERSITY

ANNUAL REPORT

Academic Year
2023 - 2024

International Space University

In 2023, the International Space University continued to strengthen its role as a global leader in space education, innovation, and international collaboration. Today, ISU boasts a distinguished legacy, with over 5,800 alumni shaping the global space ecosystem across 112 countries. Through its dynamic postgraduate and professional programs, ISU remains committed to preparing the next generation of space leaders.

ISU's flagship programs include the **Master of Space Studies (MSS), the Space Studies Program (SSP), the Southern Hemisphere Space Studies Program (SHSSP),** and a variety of **Executive Space Courses**. These programs equip students and professionals with the knowledge and interdisciplinary skills needed to thrive in the evolving space sector. In addition, ISU fosters **entrepreneurship** through its in-house **Start-up Incubator**, supporting innovative ventures and accelerating the intersection of space and business.

The 2023–2024 academic year marked the successful **implementation of ISU's newly revised Master's curriculum**, developed in response to the rapidly changing landscape of space exploration, industry, and scientific research. With accreditation from ASIIN, ISU continues to enhance the global recognition of its Master's degree, ensuring that graduates are well-equipped for the challenges and opportunities of the space economy.

The space sector is increasingly interconnected with global industries, playing a crucial role in **climate science, economic development, security, and technological innovation**. The expansion of commercial space activities, the rise of new spacefaring nations, and the growing investment in space ventures create an unprecedented landscape of opportunities for ISU students and professionals.

The following report highlights the key programs, activities, and achievements of the **International Space University during the 2023–2024 academic year**.

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Introduction

We are pleased to present the International Space University's (ISU) Annual Report for the Academic Year 2023–2024.

This past year has been marked by significant achievements that reinforce ISU's dedication to interdisciplinary, international, and intercultural space education. In a rapidly evolving space sector, ISU continues to lead the way, equipping future space leaders with the skills and expertise they need to thrive.

The successful implementation of ISU's revised Master of Space Studies (MSS) curriculum reflects our commitment to adapting to the dynamic needs of space exploration, industry, and research. ISU has also expanded its entrepreneurial ecosystem, strengthened its research impact, and engaged with global stakeholders at key international events. These accomplishments have been further enriched by the support of partners such as the European Space Agency (ESA), whose dedication to advancing space education continues to empower the next generation of space professionals.

A Year in Review

September marked the launch of the **MSS24 class**, welcoming a diverse cohort of students eager to embark on their space education journey.

October ISU faculty, staff, and alumni actively participated in the **International Astronautical Congress (IAC23)**, engaging in panel discussions and networking events that connected ISU with industry leaders and space professionals worldwide.

November ISU launched a new webinar format, the "Digital Open House", to attract new students from around the world by highlighting ISU's Central Campus and its various academic offerings. This month brought other exciting developments as ISU hosted two **Executive Space Courses** and welcomed **new start-ups** into its **in-house Incubator**, reinforcing its commitment to bridging the gap between space education and industry.

December was a month of celebration and academic achievement at ISU, highlighted by the graduation of the MSS23 cohort. This milestone marked the culmination of an intense year of learning, research, and collaboration, as graduates prepared to embark on their careers in the space sector. Additionally, ISU hosted the inaugural "Health in Space" Conference, bringing together experts to explore medical advancements driven by space research, further reinforcing ISU's role as a hub for interdisciplinary space studies.

January set the tone for an impactful year at ISU, with President Nicolas Peter representing ISU at the 44th ICESCO Executive Council in Jeddah. His address highlighted the importance of space-based solutions and international collaboration, reinforcing ISU's global engagement as it prepared for the year ahead.

February was a month of strategic discussions, including the **Board of Trustees Meeting** and the **ISU Academic Council Assembly**, where key decisions were made to guide ISU's future direction. The **ISU Incubator** also expanded its partnerships, collaborating with local and international organizations to support space entrepreneurship.

March saw the **MSS24 students** embark on specialized professional visits, including trips to **the European Space Operations Centre (ESOC)** and **the Ries Crater Museum**, providing them with hands-on exposure to key space and planetary science facilities. ISU also hosted a **Diversity and Inclusion Panel**, reinforcing its commitment to fostering an inclusive space community.

April marked ISU's **37th anniversary**, celebrated with an event showcasing ISU's impact on global space education. ISU also participated in the **Space Symposium in Colorado Springs**, where faculty and leadership contributed to discussions on international collaboration and space policy.

May was a milestone month for ISU's research community. Faculty members, including **Dr. Bertrand Goldman** and **Dr. Virginia Wotring**, published significant findings on **planetary-mass objects and medication stability in microgravity**, reinforcing ISU's position as a hub for cutting-edge space research.

June launched the **Space Studies Program (SSP24)**, hosted in collaboration with international partners. The ISU Incubator was also recognized as a **member of the French Tech Est network**, strengthening its support for space entrepreneurs.

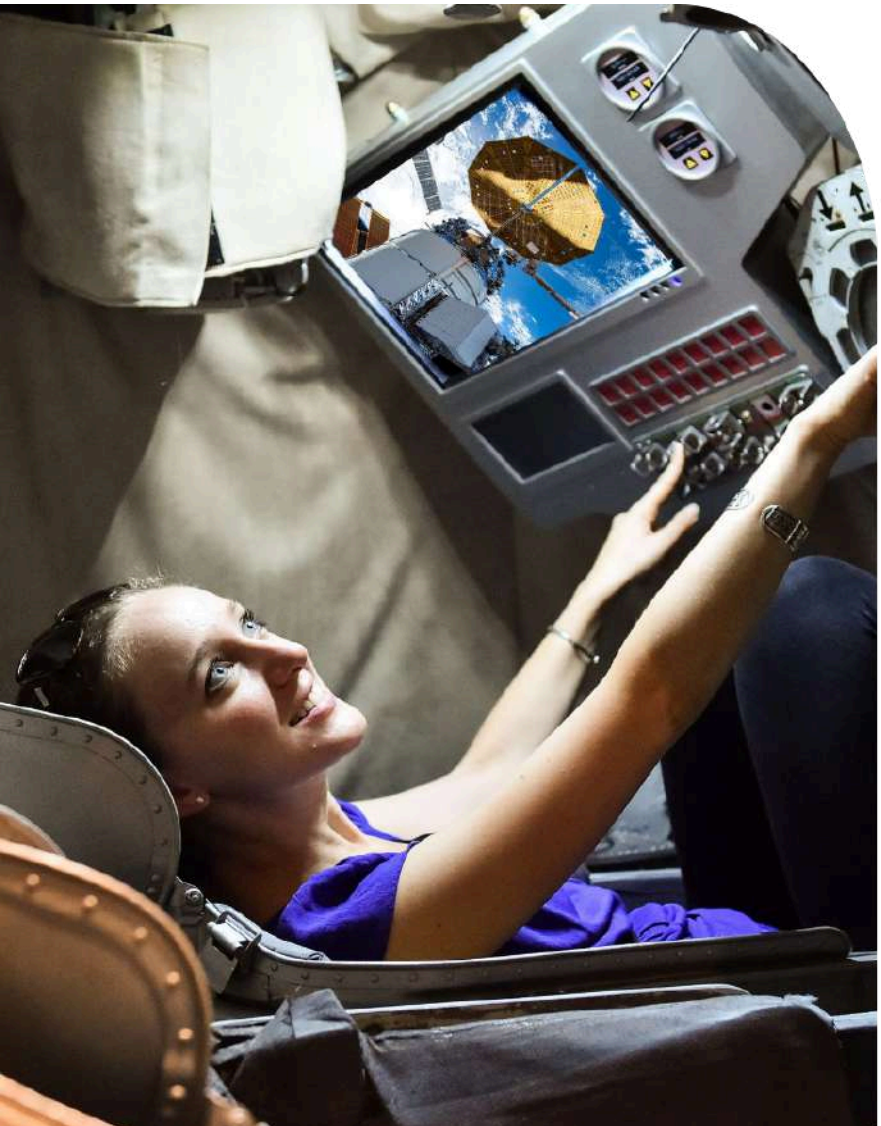
July brought the **Annual ISU Alumni Conference**, where graduates from around the world gathered to reconnect and discuss advancements in the space industry. The ISU community also celebrated the success of **start-ups incubated at ISU**, including **LeanSpace and Prometheus Life Technologies**, which have expanded their operations in the space-tech sector.

August ISU wrapped up SSP24 with participants presenting innovative projects on space exploration and sustainability. ISU also prepared to launch **new digital education initiatives** and became the f**irst educational institution** to join the **Space for Climate Observatory**, reinforcing its commitment to using space for climate action.

Looking Forward

The **2023–2024 academic year** has been one of growth, innovation, and impact. ISU continues to **adapt to the evolving space sector**, preparing students and professionals for careers that will shape the future of space exploration and commercialization.

As we move forward, ISU remains committed to **fostering international collaboration, expanding research frontiers, and empowering the next generation of space leaders**.



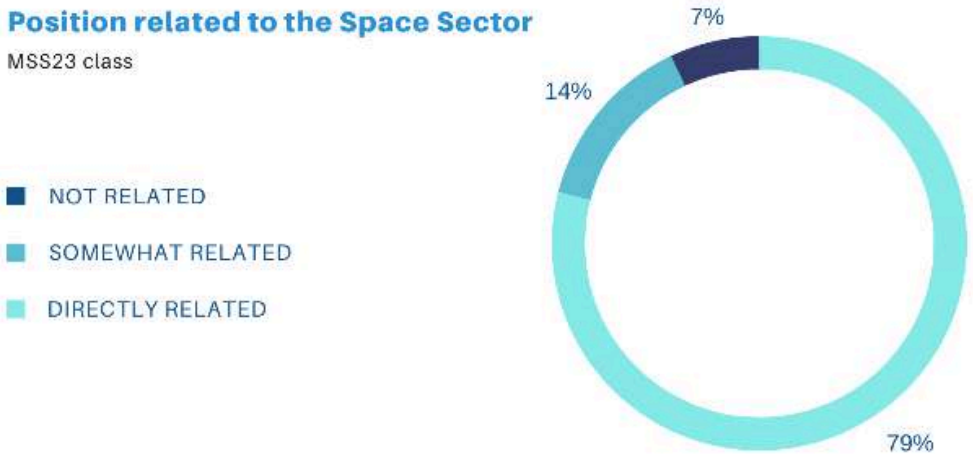
1. Summary and Key Figures

1.1. Summary and Key Figures

Program	Location	# Participants
Executive Space Course – Glasgow	Glasgow, UK	7
Executive Space Course – Oxford	Oxford, UK	5
Executive Space Course – Oslo	Oslo, Norway	32
Executive Space Course – China	Beijing, China	20
Executive Space Course – Strasbourg	ISU Central Campus, France	15
Master of Space Studies (MSS24)	ISU Central Campus, France	20
Space Studies Program (SSP24)	Houston, Texas, USA	155

1.2. MSS23 Alumni Employment Statistics

By June 2024, 33 out of the 37 MSS23 alumni responded to the employment survey. Among them, 28 reported being employed (85%), closely aligning with the 83% employment rate of the previous cohort. Notably, 26 of these graduates indicated that their roles were directly or somewhat related to the space sector, highlighting the strong impact of ISU's MSS/MSc program in shaping the careers of its students within the industry.



KNOWN EMPLOYER BEFORE THE MSS PROGRAM

UNKNOWN EMPLOYER BEFORE THE MSS PROGRAM

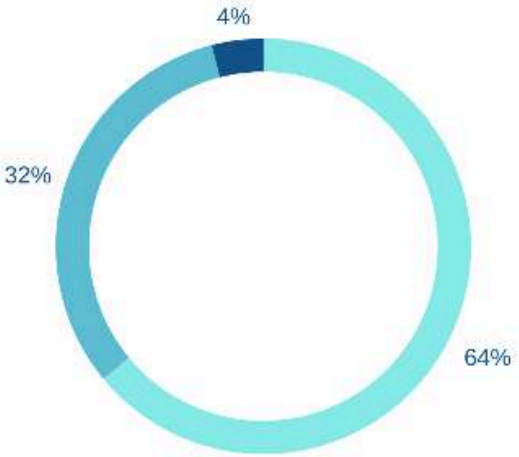
Timeframe to get employed

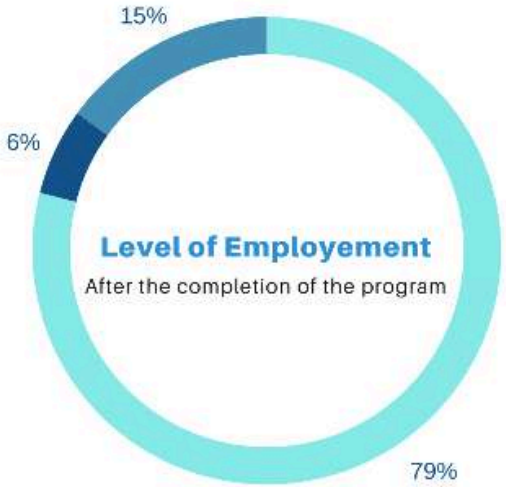
MSS23 class

BEFORE GRADUATION (DURING THE INTERNSHIP)

WITHIN 1-3 MONTHS OF GRADUATION

WITHIN 4-6 MONTHS OF GRADUATION

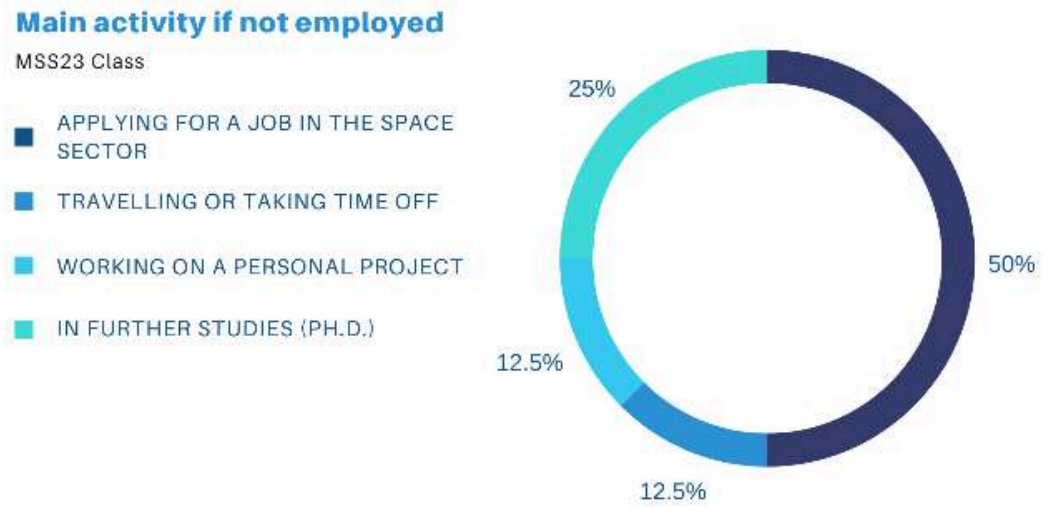


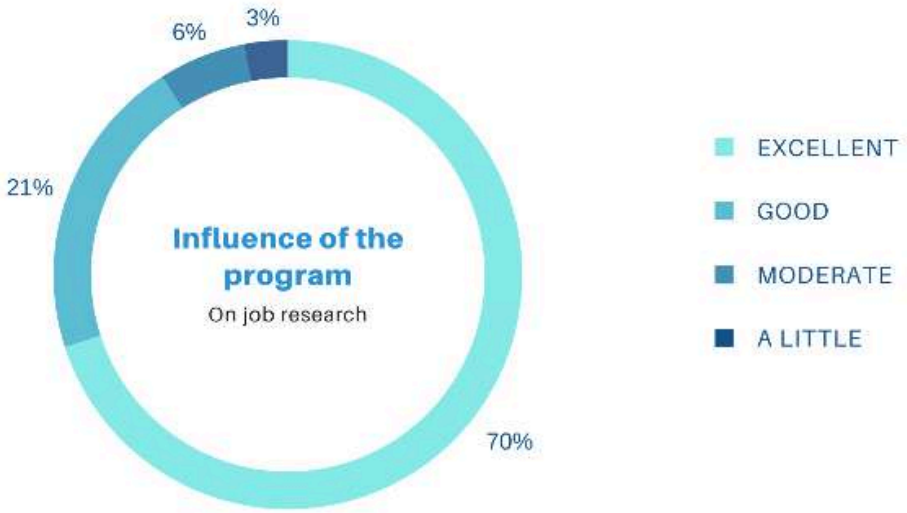


EMPLOYED FULL TIME

EMPLOYED PART TIME

UNEMPLOYED





The survey also provided MSS23 alumni with an opportunity to share their reflections on their experience in the program.

One MSS23 alumna shared:
"The MSS program has been invaluable in helping me secure an internship in the space sector, allowing me to contribute to the field through various space-related projects. I hope to soon transition into a full-time role within a space company."

1.3. ISU Global Faculty

The **International Space University (ISU)** boasts a distinguished faculty community for the 2023-2024 academic year, comprising **180 members** across various categories:

- **Faculty**: 74 members
- **Associate Faculty**: 13 members
- **Adjunct Faculty**: 55 members
- **Faculty Emeriti**: 34 members
- **Deans Emeriti**: 4 members

This diverse and accomplished group reflects ISU's commitment to fostering interdisciplinary, international, and intercultural excellence in space education. See Annex 5.

1.4. Alumni

The International Space University (ISU) continues to expand its global network, with **5,800 alumni representing 112 countries** as of the 2023-2024 academic year. This diverse community of space professionals spans government agencies, private industry, research institutions, and entrepreneurial ventures, driving innovation and collaboration in the space sector worldwide. See section 10 for more information about ISU's growing alumni network.

2. Master of Space Science Studies – Accredited

The 2023–2024 academic year marked a significant milestone for the International Space University (ISU) with the first iteration of its newly accredited Master of Science in Space Studies (MSc). This development reflects ISU's commitment to enhancing its academic offerings and providing a more structured and recognized framework for advanced space education. Accredited by ASIIN, this MSc program aligns with international standards, reinforcing ISU's position as a leader in interdisciplinary space studies.

Building on the legacy of the Master of Space Studies (MSS), the MSc program introduces a more rigorous academic structure tailored to meet the evolving demands of the space industry and research communities. The program emphasizes research-driven learning, practical application, and interdisciplinary collaboration. Students benefit from a curriculum that integrates space engineering, policy, business, law, and life sciences, ensuring a well-rounded approach to space education.

One of the key differentiators of the MSc program is the Master's Thesis, which replaces the previous Individual Project module. This shift allows students to engage in extended research projects that contribute directly to industry needs or academic advancements. As of Summer 2024, five students from the first MSc cohort have already begun their research at external host organizations, demonstrating the program's strong ties to real-world applications.

The MSc program is designed to provide students with direct exposure to space-related challenges through professional visits, workshops, and interdisciplinary team projects. In its inaugural year, students participated in visits to SES Luxembourg, the European Space Operations Centre (ESOC), and Telespazio Germany, among others. These experiences provided invaluable insights into the operational aspects of major space organizations.

The program also introduced new Interdisciplinary Workshops, including:

- Space-Exploration Robots – a hands-on robotics competition.
- Speculative Science Fiction in Space – a workshop exploring creative narratives in space exploration.
- Human Planetary Exploration Design – focused on vehicle and habitat engineering.

Additionally, replacing traditional electives, the MSc program implemented Advanced Studies Modules, with topics such as New Space Business Planning and Astrobiology.

The first iteration of the MSc in Space Studies has set a strong precedent for future cohorts, balancing academic depth with practical industry engagement. With its accreditation, emphasis on research, and growing industry partnerships, the MSc program is positioned to equip the next generation of space leaders with the expertise needed to tackle the challenges of space exploration, technology, and policy.

3. Master of Space Studies – MSS24

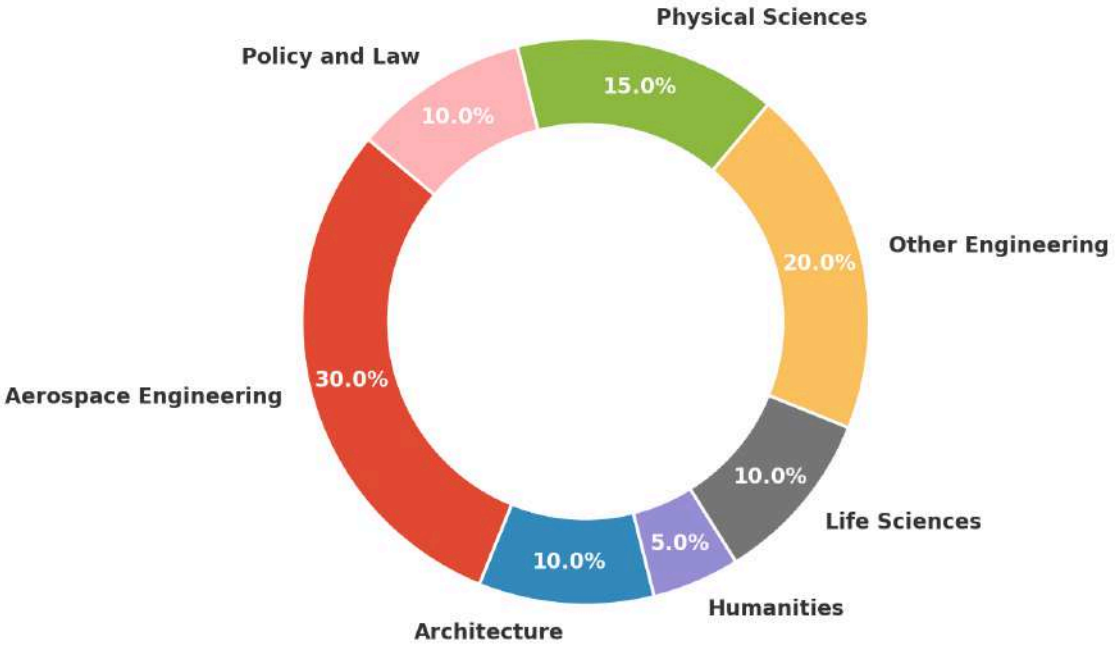
3.1. Summary and Key Figures

The Master of Space Studies (MSS24) cohort is a diverse and dynamic group. At the start of the academic year, the cohort included 20 students from 11 different countries, reflecting ISU's international spirit. With backgrounds spanning engineering, science, business, and policy, these students bring unique perspectives to space exploration and innovation. Their global origins foster a rich learning environment, encouraging cross-cultural collaboration and knowledge exchange. As they progressed through the program, they engaged in academic content, research activities, and hands-on projects, preparing them for leadership roles in the space sector.

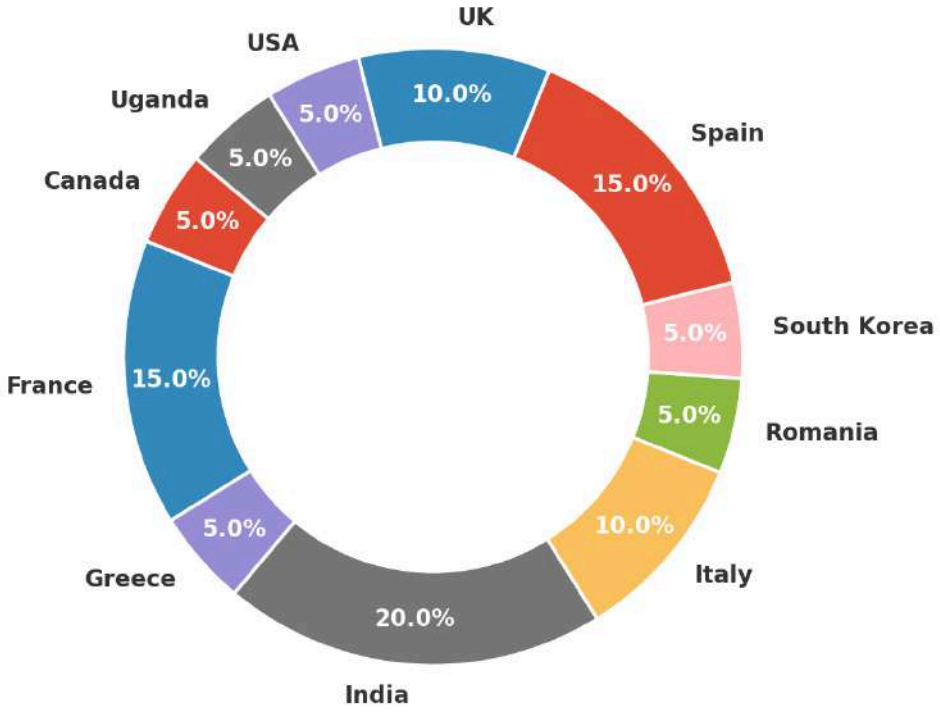
3.2. MSS24 Cohort

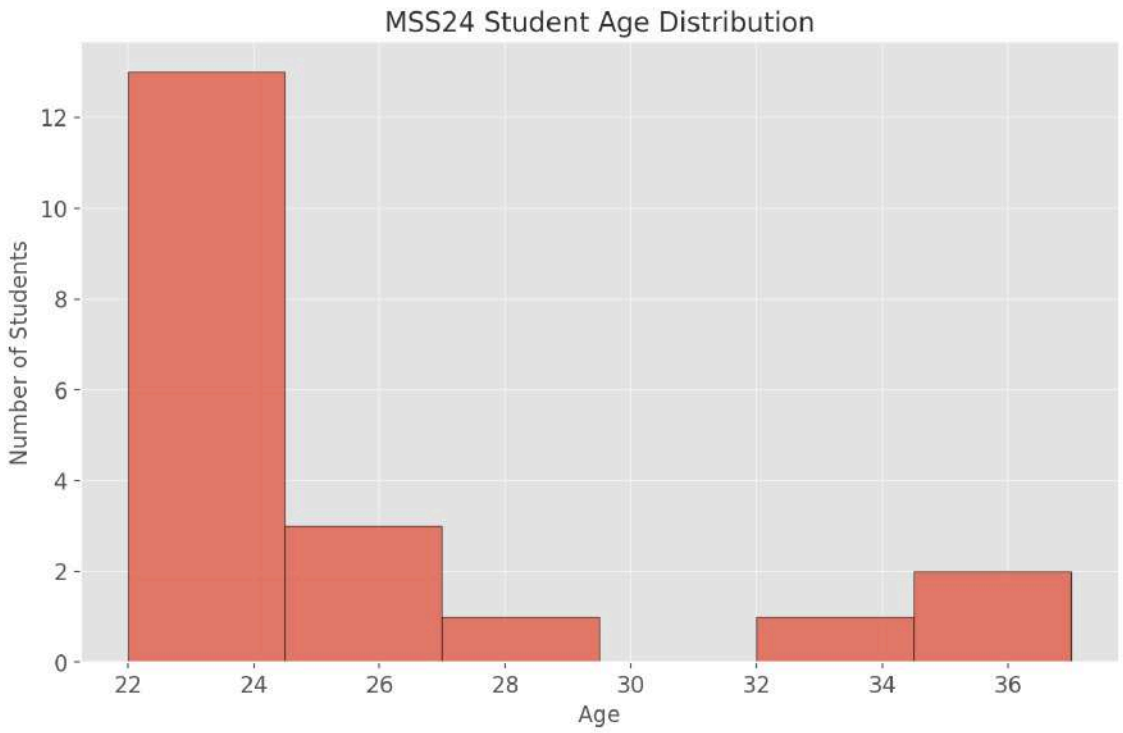
The Master of Space Studies (MSS) program 2024, counted 18 full-time students and one modular student by the end of the academic year.

MSS24 Student Distribution by Background



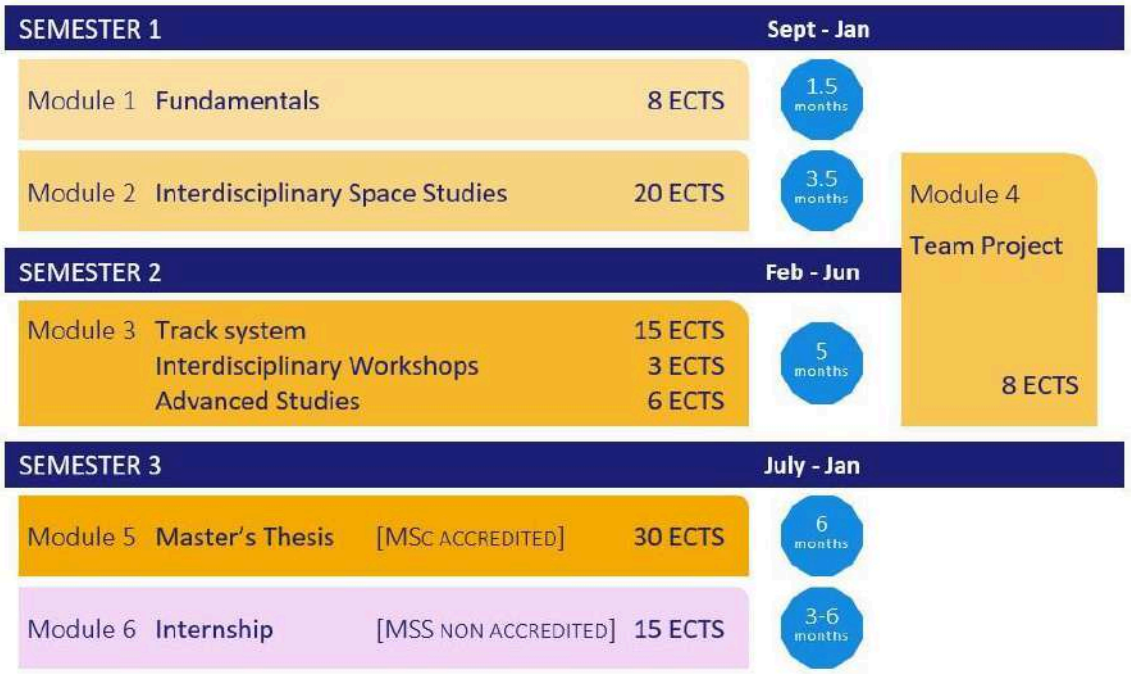
MSS24 Student Distribution by Country




MSS24 Student Age Distribution
Number of Students
0
2
4
6
8
10
12
22
24
26
28
30
32
34
36
Age

3.3. MSS24 Structure

The following scheme depicts the MSc & MSS generic structure:



Newly instituted in the Master's program, 3 **Interdisciplinary workshops** were organized. Topics in 2023/2024 were:

- Design and construction of Space-exploration robots (SER) - Robotics competition, with esteemed guest instructor Dr. Yoshida from Tohoku University.
- Imagining the Future: Space, Science, and Speculative Fiction (3SF), with Dr. Jana Fey of ISU.
- Vehicle and habitat design for human planetary exploration (VHD), with esteemed guest instructor Dr. Barbara Imhof from LIQUIFER Systems.

Replacing the previous *Electives*, the two 2-week **Advanced Studies** were:

- In May 2024: New Space Business Plan
- In June 2024: Astrobiology

3.4. MSS24 Activities

In the academic year 2023/2024, the following professional visits were organized:

13 Sep 2023	*Planetarium of Strasbourg*	
27 Oct 2023	*Astronomical Observatory of Strasbourg & Museum of Seismology and Earth Magnetism, in Strasbourg*	

9 Jan 2024	*IRCAD, Strasbourg - MIS training center, offers an exceptional training facility, welcoming over 7,200 surgeons from all surgical specialties every year.*	
30 Jan 2024	*SES Luxembourg, Betzdorf*	
4 Mar 2024	*Remote Visit of ESO's Paranal Observatory*	

12 Mar 2024	*European Space Operations Centre in Darmstadt, Germany & Telespazio Germany in Darmstadt, Germany*	 
05 Jun 2024	*Ries Crater field trip in Nördlingen, Germany - Prof. Stefan Hölzl, Director of the Ries Krater Museum organized a tour of the interesting outdoor sites and guided participants through the museum.*	

19 Jun 2024	*Aerial, a structure that combines on a single site a multidisciplinary team of around 25 individuals and efficient laboratories, in Illkirch-Graffenstaden, France*	

Other MSS24 activities included:

- French-speaking Students helped to conduct activities during the national **Fete de la science** in October 2023.
- Students had **the Poster competition** during their second module, with a different format for the first time: they were required to work on a digital poster!
- ISU hosted a Panel on **Diversity and Inclusion in the Space Sector**, with the kind participation of several esteemed guest speakers, both on site and online: Cecile Deprez from DLR, Vera G. PINTO from the European Commission, Anastasia Nazare from SES, Isabelle Kraus from UNISTRA, Misael Perez from Airbus.
- Students had the opportunity to participate in a **3-min presentation competition**, organized with the support of Jardin des Sciences (University of Strasbourg)
- The **MSS Lego Robotics Competition** occurred as an Interdisciplinary Workshop this year.

- French **Astronaut**, Michel Tognini, visited to talk about life as an astronaut.
- Track 1 Students went out of campus to Mont Saint Odile for a Ground-truthing Field Trip.
- Track 2 Students enjoyed a Space Food Lunch at ISU Campus.
- The **Self-Deployable Habitat for Extreme Environments** (SHEE) was explored during the Space Architecture and Design Interdisciplinary Workshop.

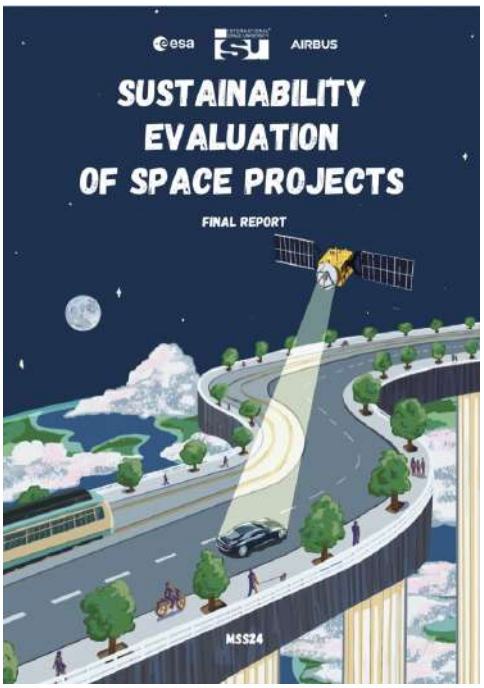
3.5. MSS24 Individual Projects

With the new format of the Master's programs, the previous *Individual Project* module has been replaced by the 6-month Master's Thesis: Students who have selected the MSc format will work on their Masters' Thesis during their 3rd semester (Sep. 2024 to Feb. 2025).

As of summer 2024, **5 students** of the 23/24 cohort have expressed an interest in going ahead with a thesis, most of them at an external host organization.

3.6. MSS24 Team Project

The **MSS24 Team Project** focused on **developing a methodology for assessing the sustainability of space projects**, bridging environmental, societal, and economic aspects. Unlike previous years, this was the **only team project** for MSS24, aligning with the research strategies of **ESA and Airbus**.



Students explored ways to **quantify the environmental footprint and handprint** of space missions, an emerging challenge in sustainable development. They engaged with **experts from ESA and Airbus**, refining their approach through industry insights and feedback. The team implemented an **innovative interdisciplinary structure**, enabling effective collaboration across technical and policy domains.

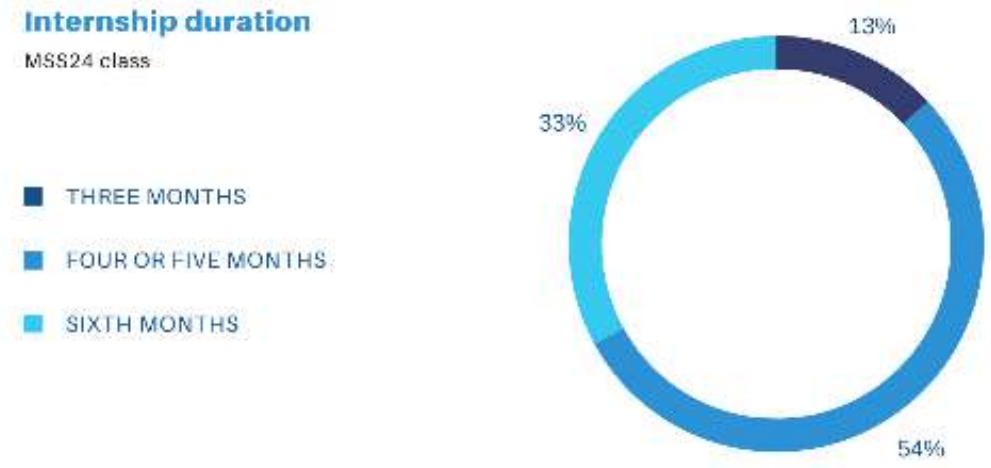
The project culminated in a final report and presentation, **highlighting key impact indicators** and practical applications. The work gained **attention from sustainability experts** in finance, education, and space applications, reinforcing the project's real-world significance.

3.7. MSS24 Internships

With the launch of the new accredited MSc program, the MSS24 cohort became the first to include a six-month Master Thesis option at the end of their studies. While this alternative gained interest, 100% of the students secured internships, with most choosing placements in France or abroad, while others opted for ISU's "research" internship pathway, culminating in a thesis. Despite the availability of remote or hybrid formats, all students pursued on-site opportunities.

A notable trend this year was the increasing preference for longer internships, with 13 out of 15 students securing placements lasting four months or more. Many students also applied for internships at the European Space Agency (ESA), a long-standing partner of ISU. However, despite a high number of applications, only one student was selected for an ESA opportunity. Holding both Italian and Dutch citizenship, she secured a prestigious Young Graduate Trainee position at ESTEC, within the Directorate of Human and Robotic Exploration Programmes in Noordwijk, Netherlands. We hope that the MSS25 cohort will have greater success in securing ESA internship positions in the coming year.

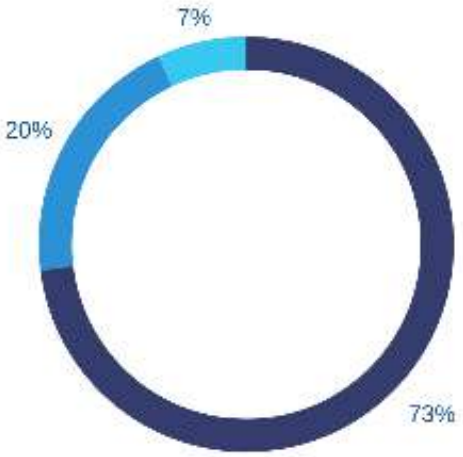
The following graphics illustrate the duration, location, and types of internships undertaken by the MSS24 cohort.



Internship location

Per continents

- Europe (Germany, France, Finland, Luxembourg, The Netherlands, Spain)
- ASIA (Japan)
- AMERICA (California)
- AFRICA
- OCEANIA



- HYBRID
- REMOTE
- ON-SITE

4. Space Studies Program – SSP24

4.1. Introduction

The **36th edition of the International Space University's (ISU) Space Studies Program (SSP24)** took place from **June 8 to August 3, 2024**, in **Houston, Texas, USA**. This prestigious **nine-week intensive program** was hosted at **Rice University**, in collaboration with **NASA's Johnson Space Center (JSC)**, reinforcing Houston's reputation as a leading center for space exploration.

A Record-Breaking Cohort

The SSP24 program welcomed **155 participants** from **over 30 countries**, representing a diverse array of backgrounds, industries, and academic disciplines. This year's cohort included **graduate students, young professionals, and experienced industry leaders**, all united by their passion for space. The interdisciplinary nature of the program enabled participants to engage in **a broad curriculum covering engineering, science, policy, business, and space applications**, ensuring a holistic understanding of the sector.

An Inspiring and Historic Setting

Rice University, the site of President **John F. Kennedy's iconic 1962 "We choose to go to the Moon" speech**, provided a fitting venue for SSP24. Its deep-rooted connection to space history, combined with its cutting-edge research facilities, created an **inspirational learning environment** for participants. Additionally, proximity to **NASA's Johnson Space Center** enabled first-hand engagement with leading space professionals, astronauts, and key stakeholders in the space industry.

Cutting-Edge Curriculum and Hands-On Learning

As in previous years, SSP24 maintained ISU's commitment to **interdisciplinary, international, and intercultural education**. The program featured **core lectures, department activities, team projects, workshops, and professional site visits**. Participants had the opportunity to work on **real-world space challenges**, collaborate with industry experts, and develop innovative solutions for the future of space exploration.

Key highlights of the curriculum included:

- **Expert-led lectures** by senior figures from NASA, ESA, private industry, and academia
- **Hands-on workshops** in mission design, robotics, space medicine, and space law
- **Team projects** addressing critical space-related issues, fostering teamwork and problem-solving skills
- **Professional visits** to key space institutions, including NASA JSC, aerospace companies, and research centers

Fostering a Global Network

Beyond academics, SSP24 facilitated invaluable **networking opportunities**, allowing participants to connect with space leaders, entrepreneurs, and policymakers. Graduates of the program joined ISU's extensive **alumni network of over 5,800 space professionals across 112 countries**, further strengthening their connections in the global space community.

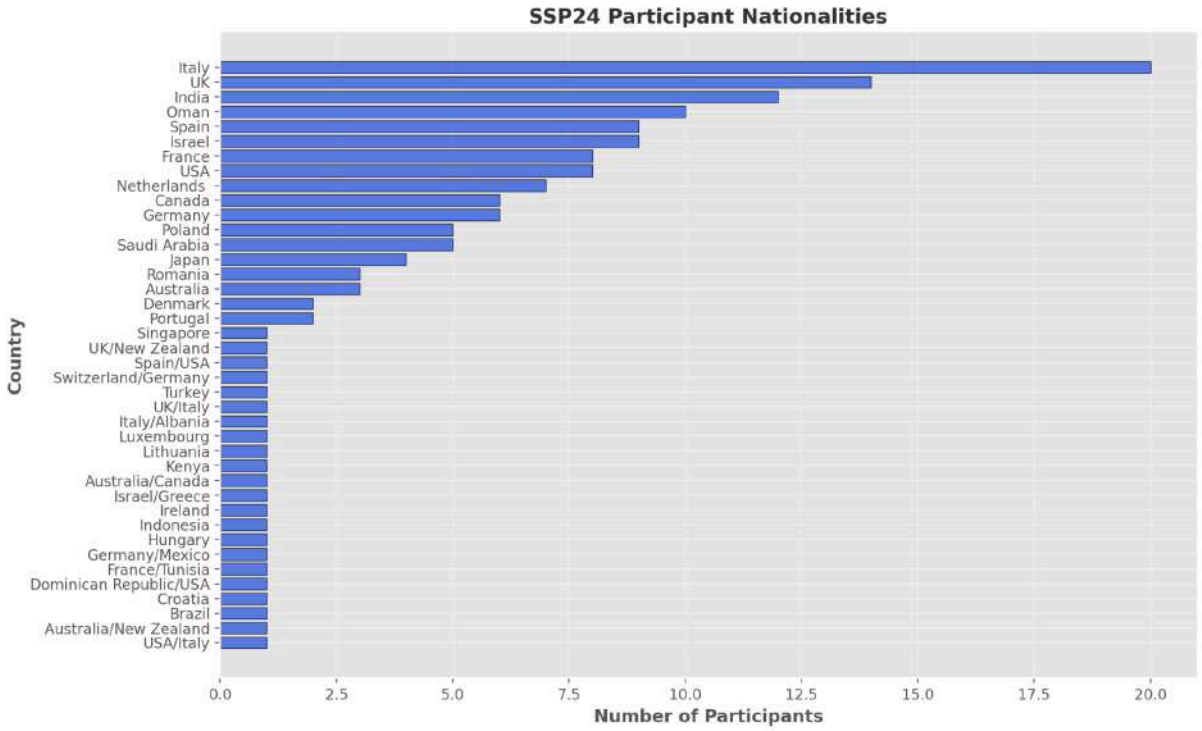
A Lasting Impact

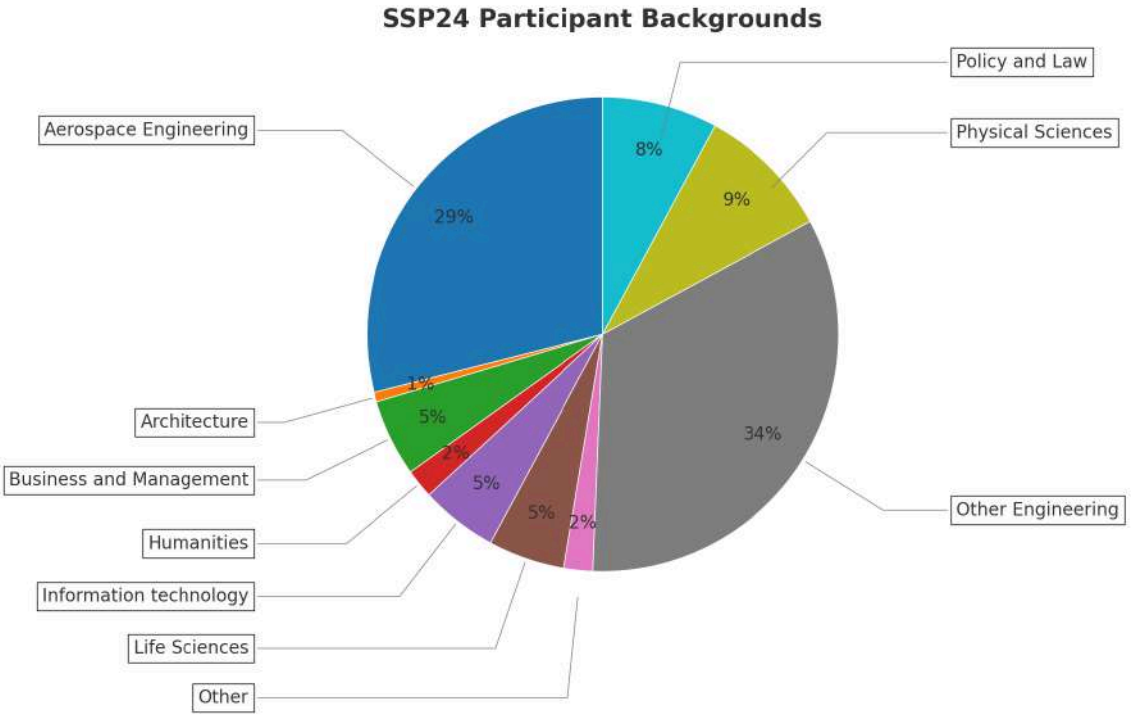
The **SSP24 program in Houston** successfully upheld ISU's mission of advancing space education and professional development. Through a **rigorous curriculum, real-world industry exposure, and unparalleled networking opportunities**, the program equipped participants with the knowledge, skills, and global connections necessary to contribute meaningfully to the future of space exploration.

As ISU looks forward to **SSP25**, the legacy of SSP24 remains—a transformative experience that empowered its participants to become future leaders in the space sector.

4.2. Participants

SSP24 brought together **155 participants** from over **30 countries**, showcasing the program's commitment to international and interdisciplinary collaboration. Participants came from a wide range of academic and professional backgrounds, creating a dynamic and inclusive environment. This diversity of perspectives enriched the program's discussions and activities, fostering innovation and cross-cultural exchange in the field of space studies.




SSP24 Participant Backgrounds
Policy and Law
Physical Sciences
Other Engineering
Aerospace Engineering
Architecture
Business and Management
Humanities
Information technology
Life Sciences
Other
8%
9%
34%
29%
1%
5%
2%
5%
5%
2%


SSP24 Participant Experience Levels
No experience
Less than 3 years' experience
3 years' or more experience
8.4%
31.0%
60.6%

4.3. SSP24 Content

SSP24 offered an immersive and interdisciplinary curriculum that blended academic theory with hands-on learning. The program was structured into several key components: **core lectures, department activities, workshops, team projects**, and **professional visits**. This structure created a dynamic learning environment, enabling participants to engage with experts, collaborate on real-world challenges, and specialize in areas of interest.

Core Lectures

The program began with **core lectures**, a series of foundational presentations covering a wide array of space-related topics. These included space science, engineering, policy, law, business, and applications. Delivered by experts from academia, industry, and government, these lectures ensured all participants, regardless of their background, gained a comprehensive understanding of the space sector's core principles. The interdisciplinary nature of these sessions encouraged participants to explore the interconnectivity of disciplines and their application to complex space challenges.

Department Activities

After the core lecture phase, participants specialized in **department activities**, which provided deeper insights into specific fields of interest. Departments included disciplines such as **robotics, life sciences, satellite applications, systems engineering, policy and law**, and more. These sessions allowed participants to engage in discussions, experiments, and case studies relevant to their chosen field, fostering an environment of active learning and innovation.

Workshops

SSP24 emphasized practical learning through **workshops** that covered specialized topics and provided hands-on experience. These workshops often simulated real-world scenarios, such as mission planning, space habitat design, or policy development, allowing participants to apply theoretical knowledge to tangible challenges. Workshops were facilitated by industry professionals and academic mentors, ensuring relevance to current and future space initiatives.

Team Projects

A highlight of SSP24 was the **team projects**, where participants collaborated on large-scale interdisciplinary projects addressing critical issues in the space sector. These projects mirrored real-world challenges, requiring participants to integrate knowledge from multiple disciplines, work in diverse teams, and propose innovative solutions. Examples included sustainability in space exploration, applications of space technology, and the design of new space missions.

Professional Visits and Networking

SSP24 included **professional visits** to space agencies, research institutions, and private companies, providing participants with insights into cutting-edge advancements and operations in the space industry. These visits, combined with networking opportunities, allowed participants to connect with industry leaders, researchers, and fellow space enthusiasts, forming invaluable professional relationships.

SSP24's academic content and structure equipped participants with the knowledge and skills to contribute to the rapidly evolving space industry. By integrating foundational knowledge, practical experience, and collaborative problem-solving, the program provided a unique platform for developing the next generation of space leaders.

4.4. SSP24 Team Projects

SSP24 featured four dynamic and interdisciplinary Team Projects, embodying the program's commitment to tackling contemporary challenges in the space sector. These projects brought together participants from diverse backgrounds to collaborate on innovative solutions and groundbreaking concepts, supported by leading industry experts and academic mentors. The following Team Projects were successfully carried out by SSP24 participants and are summarized below:

1. **Lunar Gateway – Defining Mars-Forward Capabilities**
2. **Smart Transportation – Space Technology for Mobility**
3. **Environmental Sustainability Assessment of Space Projects**
4. **International Lunar University (ILU)**

The **Lunar Gateway – Defining Mars-Forward Capabilities** project examined how NASA's **Lunar Gateway** could serve as a platform for testing technologies and strategies essential for future human missions to **Mars**. The study assessed the Gateway's role in **sustainable lunar exploration**, identifying capability gaps, and proposing improvements to enhance its function as a **deep-space outpost**.

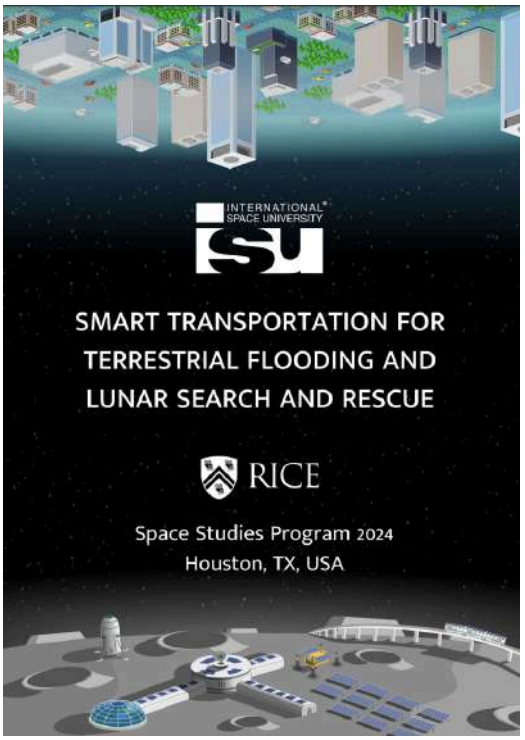
A primary focus was on enabling **long-duration human missions** by analyzing **life support systems, radiation protection, in-situ resource utilization (ISRU), and crew health management**. These elements are essential for future Mars-bound astronauts, particularly as deep-space missions require increased **self-sufficiency** due to communication delays and limited resupply options.

The study also explored how the **Gateway** could serve as a **testbed for deep-space operations**, such as **autonomous mission control, spacecraft maintenance, refueling, and habitat sustainability**. By leveraging its existing capabilities and proposing **new technological advancements**, the project aimed to create a **roadmap for transitioning from lunar exploration to Mars exploration**.

Another crucial aspect involved identifying **collaborative opportunities** with **international partners, private industry, and space agencies**. The study proposed policies that would facilitate cooperative mission planning, **resource-sharing**, and the **integration of commercial services** into the Gateway's operations, ensuring a **global approach to deep-space exploration**.

The findings underscored the **critical role of the Lunar Gateway as a stepping stone to Mars**. By addressing the technological and operational challenges of deep-space missions, the project demonstrated how the Gateway could **enhance human spaceflight sustainability and autonomy**, paving the way for long-term exploration beyond Earth's orbit.

The **Smart Transportation – Space Technology for Mobility** project focused on leveraging space technologies to address challenges in urban and planetary transportation systems. It explored the integration of satellite navigation, remote sensing, and IoT to enhance mobility efficiency and sustainability. The project identified opportunities for optimizing terrestrial and extraterrestrial transportation systems, proposing innovative strategies for smart infrastructure and traffic management on Earth and planetary surfaces.



Participants conducted an in-depth assessment of current transportation challenges, including congestion, environmental impact, and the need for adaptive systems in extreme conditions. They highlighted the potential of space-derived solutions, such as real-time data from satellites, to revolutionize transportation networks, improve disaster response, and develop frameworks for planetary traffic regulation.

This interdisciplinary initiative emphasized the role of global collaboration in implementing space technologies for smart transportation systems. It showcased the ability to address immediate terrestrial mobility needs while contributing to the long-term planning of human activity and resource movement in extraterrestrial environments. The project serves as a blueprint for integrating advanced space technologies into sustainable and adaptive transportation solutions for the future.

The **Environmental Sustainability Assessment of Space Projects** focused on developing innovative tools and frameworks to evaluate and minimize the environmental impact of space activities. The team introduced the **Lunar Sustainability Assessment Tool (LUSSAT)**, which uses **Life Cycle Assessment (LCA)** to measure the ecological effects of lunar exploration activities. This tool provides a quantitative approach to evaluating sustainability throughout a project's lifecycle.

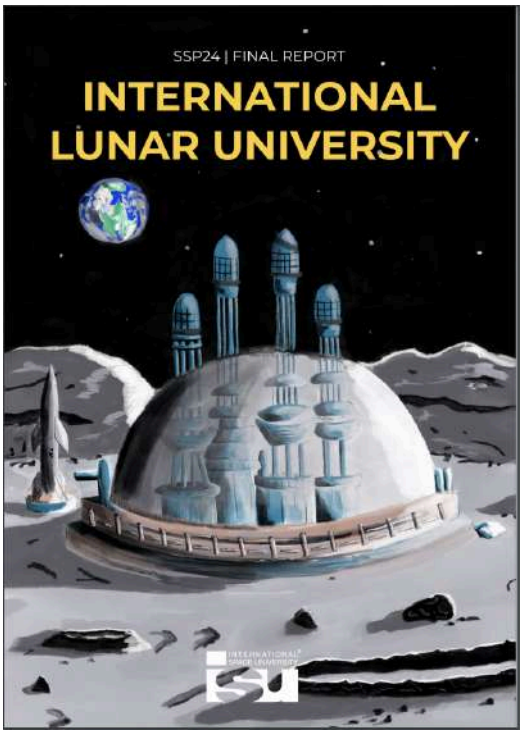
In addition, the project proposed the **Sustainable Technologies for Advanced Research in Space (STARS)** initiative to fund research and development aimed at advancing eco-friendly space technologies. This initiative would prioritize global collaboration and align space exploration with the **United Nations Sustainable Development Goals (SDGs)**.

The project emphasized the need for international cooperation to establish standardized sustainability guidelines and frameworks. By involving experts and stakeholders from various disciplines, the team explored how innovative policies and practices can lead to ethical and sustainable space exploration. The outcomes aim to ensure that future space missions are not only technically feasible but also environmentally responsible.

The report highlights practical applications of sustainability frameworks for both terrestrial and extraterrestrial projects, proposing scalable solutions that could influence the space sector globally. This interdisciplinary approach provides a foundation for ethical decision-making and policy creation, ensuring space exploration continues in harmony with environmental stewardship.

The project's recommendations underscore the critical importance of addressing environmental concerns in the rapidly expanding space sector. Through tools like LUSSAT and programs like STARS, the team paved the way for a new era of sustainability-focused space exploration. This work reflects a growing commitment within the space community to prioritize planetary health alongside scientific discovery and technological advancement.

The **International Lunar University (ILU)** project proposes the establishment of a groundbreaking institution dedicated to lunar-focused education and research, supporting global exploration efforts such as NASA's Artemis program. This visionary concept aims to provide interdisciplinary programs encompassing science, engineering, policy, business, and sustainability, fostering the next generation of lunar experts.



The ILU would serve as a global hub, facilitating collaboration among international space agencies, private industries, and academic institutions. Its curriculum focuses on practical applications for lunar exploration, including in-situ resource utilization, habitat development, and long-term sustainability. Designed to address the challenges of a rapidly growing space economy, the ILU envisions training experts equipped to manage complex projects on the Moon and beyond.

The governance model proposed for ILU ensures inclusivity, balancing representation from government entities, private stakeholders, and academic organizations. This model promotes global cooperation while maintaining flexibility to adapt to emerging needs in space exploration. The project also emphasizes building physical and virtual campuses to enable worldwide participation and collaboration.

The ILU aims to set a precedent for combining education, innovation, and international collaboration, reflecting humanity's commitment to responsible and sustainable exploration of the Moon. By providing a framework for interdisciplinary research and policy development, it seeks to bridge gaps in knowledge and prepare future leaders for the unique challenges of lunar exploration.

This ambitious initiative underscores the role of education in advancing space exploration, envisioning the ILU as a cornerstone of humanity's efforts to expand its presence beyond Earth.

4.5. Call for SSP 26,27,28 Hosts

Traditionally, an annual call for institutions, universities, or space agencies worldwide to express their interest in hosting the Space Studies Program (SSP) has been issued. However, the last such call was made in the spring of 2019, before the COVID-19 pandemic, leading to the selection of host institutions for SSP21 (Spain), SSP22 (Portugal), and SSP23 (Brazil). Over the past five years, no calls for future hosts were published. Consequently, the SSP24 host location in Houston, TX, was confirmed through bilateral contacts with ISU at NASA Johnson Space Center and Rice University. Similarly, the SSP25 host selection in South Korea was conducted via bilateral communications.

While these bilateral communications allowed for managing physical hosts for SSP24 and SSP25, this approach proved suboptimal. The short time frame hindered hosts' ability to prepare adequately, secure sponsors, and conduct fundraising activities. Additionally, the absence of a transparent bidding process led to criticism for ISU and diminished international interest in hosting future SSP programs.

Return to International Bidding Process

To address these issues, ISU has recognized the importance of reverting to an international bidding process for selecting SSP host locations. Typically, this process occurs three years before the hosting year of the program. In March 2024, ISU announced the call for hosting "ISU SSP in 2026, 2027, and 2028." A dedicated webpage on the ISU website has been prepared to provide necessary information to interested bidders, and a brochure summarizing the process was widely distributed to the ISU community, including former bidders, alumni, and global faculty. The Request for Proposal (RFP) document was revised, shortened, and updated to be more appealing and accessible, incorporating photos and figures to attract more attention from bidders.

Application and Selection Process

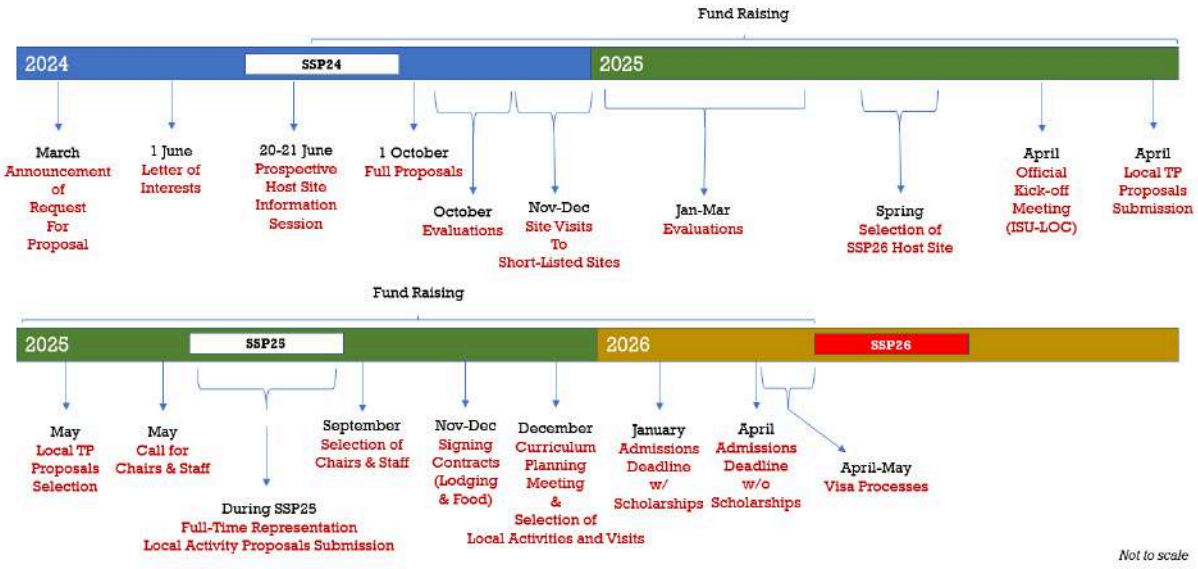
By the deadline for submitting Letters of Interest, ISU received eight applications from seven different countries. On June 20-21, 2024, ISU hosted a hybrid information session for prospective SSP host sites, including on-site immersion sessions in Houston, TX, and an online briefing to provide necessary information and address questions. Representatives from all applicant institutions attended the online briefing, including two participating in the on-site immersion sessions.

As of this report's date, prospective SSP host sites are still preparing their proposals. During this period, ISU continues to respond to any questions and queries from prospective bidders. After the deadline, an evaluation committee, comprising current and former SSP directors, will review the proposals and shortlist sites for physical visits in the last quarter of 2024. The evaluation committee will use a blinded process to ensure impartiality and fairness.

Site visits, the most critical evaluation step, will occur in November-December 2024 timeframe, including Q&A sessions with applicants. Historically, some proposals that looked promising on paper did not meet expectations during site visits, while others that seemed average were better than anticipated. This discrepancy often arises because Local Organizing

Committees (LOCs) may not view their sites from ISU's perspective. ISU, with its experience, evaluates not only the physical facilities but also the overall atmosphere and engagement during the visit—critical but unwritten criteria.

The BOT will decide on the locations of SSP26 (and possibly SSP27) based on academic, logistical, financial, and strategic criteria. The expected host site selection and planning timeline for SSP26 is visualized in the figure below:



Conclusion

Returning to an international bidding process for selecting SSP host locations is crucial for ISU to ensure proper preparation, adequate sponsorship, and community interest. This structured and transparent approach aims to enhance the quality and success of the Space Studies Program in the coming years, reinforcing ISU's tradition of excellence in space education and international collaboration.

5. Short Courses

5.1. Executive Space Courses

ESC in Oxford, UK: Medicines in Space

The **Executive Space Course (ESC)** in Oxford, held at **Hertford College**, explored the challenges of medicine in space, focusing on the physiological impacts of extreme environments on the human body. Conducted from **November 12 to 16, 2023**, it was the first worldwide course delivered both **in-person and in the Metaverse**. Participants examined critical areas such as cardiovascular health, musculoskeletal atrophy, and psychological well-being during space missions. The course also delved into **pharmacology for space**, exploring in-situ medication production for extended missions. It brought together biomedical experts, engineers, and space enthusiasts to discuss innovation in space medicine. A key highlight was the **interdisciplinary approach**, with workshops and case studies enabling participants to apply theoretical knowledge in practical scenarios.

ESC in Oslo, Norway: Interdisciplinary Space Studies

Hosted by the **Norwegian Space Agency** in Oslo from **May 27 to 31, 2024**, this ESC introduced participants to the global space sector through an **interdisciplinary lens**. Topics ranged from **space propulsion and satellite navigation** to **space policy, law, and sustainability**. The course featured **lectures, workshops**, and a **site visit** to Norway's leading space facilities. Professionals from diverse industries engaged with global experts to understand the evolving space ecosystem. The program emphasized practical applications, including workshops on **space mission design** and **orbital mechanics**, while also offering opportunities for networking.

ESC in Glasgow, Scotland: Space Cybersecurity

The **ESC on Space Cybersecurity**, held at **Strathclyde Business School** from **May 13 to 15, 2024**, tackled the rising concerns around cybersecurity in the space sector. The course covered topics such as **satellite vulnerabilities, data protection, and emerging threats**. Participants, including cybersecurity experts and space professionals, explored **policy frameworks, case studies**, and real-world simulations. A visit to the **National Manufacturing Institute Scotland (NMIS)** provided hands-on insights into cybersecurity applications in space technologies. The program fostered collaboration, equipping attendees to address the unique challenges of securing space assets and infrastructure.

ESC in Beijing, China: Interdisciplinary Space Studies

The **ESC in Beijing**, hosted at **Beihang University** from **July 29 to August 4, 2024**, offered a **seven-day deep dive** into the global space sector. Covering topics like **space engineering, applications, business, and humanities**, it provided a balanced curriculum to professionals seeking interdisciplinary insights. The course emphasized **collaboration and networking**, with participants engaging in lectures, hands-on activities, and site visits to space-related labs in China. By incorporating ISU's **3Is approach (Interdisciplinary, International, Intercultural)**, the program prepared attendees to tackle the challenges of an expanding space economy.

ESC in Strasbourg, France: General Executive Space Course

The **ESC in Strasbourg**, held at the **International Space University (ISU)** from **August 26 to 30, 2024**, provided a comprehensive overview of space activities. The program combined **core lectures** on topics such as **space engineering, applications, and policy** with **practical workshops** like space mission design. Highlights included sessions on **environmental sustainability** and a panel discussion on the **future of space applications**, featuring global experts. The course also included networking dinners and tours of ISU's facilities. Attendees gained a well-rounded understanding of the space sector, with emphasis on **international collaboration and interdisciplinary learning**.

5.2. Space Sector Crash Course

The Space Sector Crash Course (SSCC), inaugurated by the International Space University (ISU) in Houston, Texas, from November 12–17, 2023, offered an immersive and interdisciplinary exploration of the global space sector. This intensive program delivered lectures across ISU's seven academic departments: Space Physical Sciences, Space Life Sciences, Space Engineering, Space Policy and Law, Space Business and Management, Satellite Applications, and Space Humanities.

Each department provided 3.5 hours of lectures, covering historical, current, and forward-looking perspectives in their respective fields. Participants gained insights into diverse topics such as space mission design, satellite technology, space law, human physiology in space, and the societal implications of space exploration. Lectures were complemented by interdisciplinary discussions on key space themes, fostering collaboration and dynamic debates.

Houston was strategically chosen for its proximity to the NASA Johnson Space Center and the city's robust space industry infrastructure. The program also included a memorable site visit to the Space Center Houston, where participants toured iconic facilities and deepened their understanding of NASA’s contributions to space exploration.

Despite logistical challenges, including a limited number of paid participants, the SSCC successfully delivered an engaging and highly interactive experience. Participants appreciated the close interaction with renowned faculty members such as Dr. Gilles Clément, Dr. Lucy Stojak, and Mr. Remco Timmermans, who provided expert insights. Informal activities, such as group dinners and a reception attended by ISU alumni and space experts, added to the program's value.

Key lessons learned included refining registration processes, enhancing marketing strategies, and optimizing event structure to increase future participation. The feedback underscored the importance of interactive sessions and leveraging ISU’s global network for marketing and recruitment. As a pilot initiative, the SSCC set a promising foundation for future crash courses, aligning with ISU’s mission to advance space education and professional development globally.

6. Digital Education

The Tracks to Space course, developed and offered by ISU with support from the School of Disruption, is an intensive, interdisciplinary program designed for individuals aiming to begin or redirect their careers in the space industry. The program consists of 11 chapters and 65 lessons, providing a comprehensive overview of essential space-related disciplines.

6.1. Course Structure and Content

The curriculum is meticulously crafted by ISU to cover a broad spectrum of topics integral to understanding the multifaceted nature of space activities. Key areas of focus include:

1. Introduction to Space: Exploring the fundamental question, "Why Space?" to understand the motivations and significance behind space exploration.
2. Space Science: Delving into the study of celestial bodies and cosmic phenomena.
3. Space Engineering: Examining spacecraft design, space travel mechanics, and challenges of operating in space environments.
4. Astronomy: Investigating the composition of the universe and its mysteries.
5. Remote Sensing: Understanding technology and applications for observing Earth and celestial bodies.
6. Satellite Navigation: Learning about global navigation satellite systems and their applications.
7. Space Policy and Law: Analyzing international treaties and regulatory frameworks governing space activities.
8. Space Business and Management: Exploring economic aspects of the space industry, including funding, entrepreneurship, and market trends.
9. Space Humanities: Reflecting on cultural, philosophical, and ethical implications of space exploration.
10. Human Performance in Space: Studying the physiological and psychological challenges humans face in space environments.
11. Future Learning Opportunities: Providing guidance on further educational pathways within ISU and the broader space sector.

6.2. Learning Outcomes and Benefits

Participants receive an official certificate from ISU, enhancing their credentials in the space industry. Graduates also gain access to mentorship opportunities with ISU experts, preferential enrollment conditions for ISU's advanced programs, and a network of professionals within the global space sector.

6.3. Target Audience and Flexibility

Designed for university students, professionals, entrepreneurs, researchers, and space enthusiasts, the Tracks to Space course is entirely on-demand, allowing participants to learn at their own pace and balance studies with professional commitments.

7. Research

7.1. Research and Publications

Professor Hugh Hill

Prof. Hill's research projects include peer-reviewed publications in the interdisciplinary fields of Astrophysics, Astrochemistry and Astrobiology. The publications are the result of ongoing international collaboration, e.g., with MSS 2004 alumnus, Prof. Bhalamurugan Sivaraman, Atomic Molecular and Optical Physics Division, Physical Research Laboratory (PRL), Ahmedabad, India. The main thrust of the research was Astrochemistry, mostly in the context of the icy bodies of the outer Solar System (moons, asteroids and comets), and astrophysical dusts in the interstellar medium. The ices are actually cocktails of several molecules including ubiquitous water, carbon dioxide, ammonia, methane and sulphur dioxide. For sure, all of these to some degree are noteworthy biomarkers and can be converted into other interesting chemical species using different radiation environments (photochemistry). Another biomarker we have studied is ozone (O_3), which is a trace gas but still relatively concentrated in the Earth's stratosphere where it both absorbs incident solar UV photons and acts as a greenhouse gas. Elsewhere in the Solar System, ozone is also observed, e.g. in the atmospheres of Mars and the dim, outer Solar System satellites Ganymede, Rhea and Dione. Recently, we also discovered the presence of ozone on Jupiter's substantial moon Callisto (Ramachandran et al., 2024). We unambiguously identified ozone using the reliable Hartley band (240 – 300 nm). While Callisto's ozone is generated by abiotic processes (photons and energetic ions), this is not dissimilar to its terrestrial equivalent, which forms from the combination of molecular and atomic oxygen in the lower stratosphere. We continue this investigation with emphasis on classical Astrochemistry and, potentially, Astrobiology.

Fig. 1. Callisto is the third-largest moon in the Solar System and is pock-marked with numerous meteorite impacts. Ozone (O_3) was recently detected via the dependable Hartley band in the UV (240 – 300 nm). Photocredit: NASA.

Dr. Bertrand Goldman

Dr. Goldman dedicated most of his research time in 2023/2024 to the ESA astronomy mission Euclid. The telescope was launched on 1 July 2023 and quickly reached its final location at L2. The project is designed to explore the composition and evolution of the dark Universe, but to do so will survey about a third of the sky, at high Galactic latitudes, to unprecedented depth and spatial resolution for such a large area. Dr. Goldman, as a member of the Euclid Consortium since 2019, will use these data to search and study extremely cool dwarfs of the Solar neighborhood.

The first months of Euclid operations were dedicated to the commissioning and characterization of the instruments. ESA dedicated some telescope time to perform an Early Release Observations program that offered several telescope pointings for scientific projects with high outreach value. Dr. Goldman contributed to two of the accepted programs, one dedicated to the search and study of young, low-mass planetary-mass objects around the Orion nebula; the other to the study of globular clusters.

The first articles resulting from these observations were included in the Euclid-wide submission to the European journal Astronomy & Astrophysics in May 2024. The first, led by Dr. Martín, revealed new candidates to be planetary-mass objects of just a few Jupiter masses (see Fig.Gol1). A major outreach event was organized by ESA on November 7, in which the beautiful image of the Horsehead Nebula obtained in this program played a special role (see Fig.Gol2).

The second article, led by Dr. Massari, studied the globular clusters NGC 6254 (M10) and NGC 6397 to surface-brightness limit about 6 times fainter than in the literature. It revealed an elongated morphology of the former cluster, which could be the first evidence of a tidally induced morphological distortion by the Milky Way gravitational field of a globular cluster.

The main survey of the mission is now underway with dozens of square degrees internally released to the consortium.

In May, Dr. Goldman became co-lead of his Science Working Group, the Milky Way and Resolved Stellar Population group, after being deputy lead.

In addition, Dr. Goldman is contributing to the publication to the international-renown Strasbourg Data Centre (CDS), the most used curator of astronomy data world-wide, of legacy photometric data obtained by the EROS microlensing survey (e.g. Blaineau et al., 2002, A&A 664, 106). Dr. Goldman supervised one student of the University of Strasbourg who studied the possibility of using the ESA Gaia DR3 astrometric data to predict microlensing events that may have been observed, but missed, in the EROS dataset.

Dr. Goldman has continued the collaboration with former Year B student E.Gonzáles (MSS20) studying the polarization of ultra-cool dwarfs, with an article based on the Year B thesis being prepared for submission.

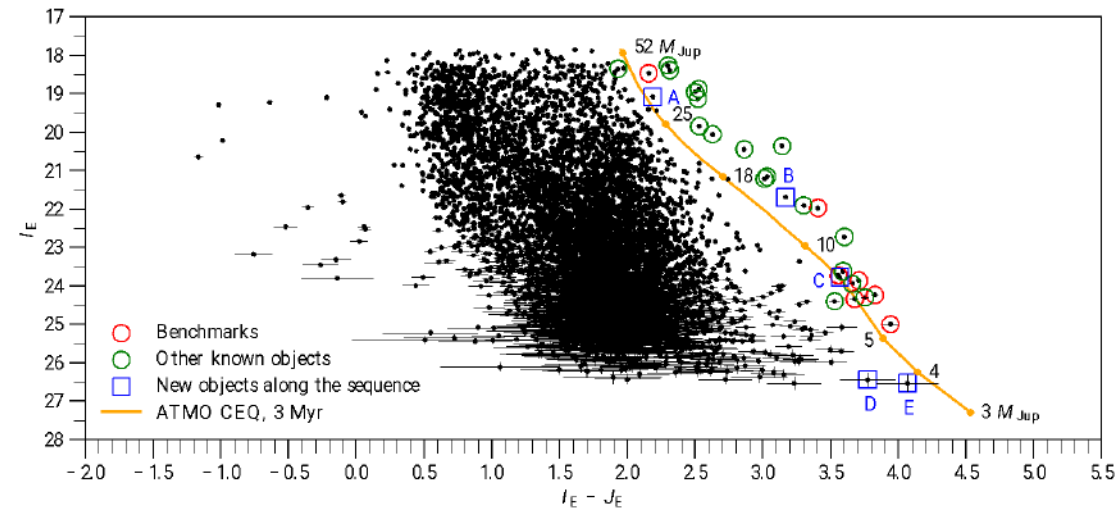


Fig. Gol1: color-magnitude diagram of sources in the σ Orionis cluster, representing the magnitude in the visual Euclid band as a function of the visual vs. near-infrared (1.25µm) color. New candidates revealed by our study are indicated by the blue squares. A synthetic track for objects of the expected age of 3 Myr is represented in yellow.

Fig.Gol2: Image of the Horsehead Nebula obtained by the Euclid telescope as part of the Early Released Observations, and presented by ESA on November 7, 2023.

Dr. Virginia Wotring

Dr. Wotring's submission to the CNES call for proposals in April 2023 was accepted, albeit with some reduction in time frame and scope. The work, a study of medication stability in an accelerated aging model, will employ a mission-feasible handheld Raman spectrometer to determine medication safety and efficacy in a non-destructive manner. The funds awarded will allow purchase of equipment that will increase the capabilities of the Life Sciences Laboratory. Dr. Wotring is seeking a PhD student or post-doctoral fellow to work on this project, and will apply for additional funds that the project will require over time.

MSS Thesis student Victoria Rendon successfully defended her Thesis in May 2024 "Planarian Ocelli Regeneration when exposed to Microgravity, Radiation and Low Magnetic Fields" and will graduate in September 2024. She is working with Dr. Wotring to prepare a manuscript for publication in npj Microgravity.

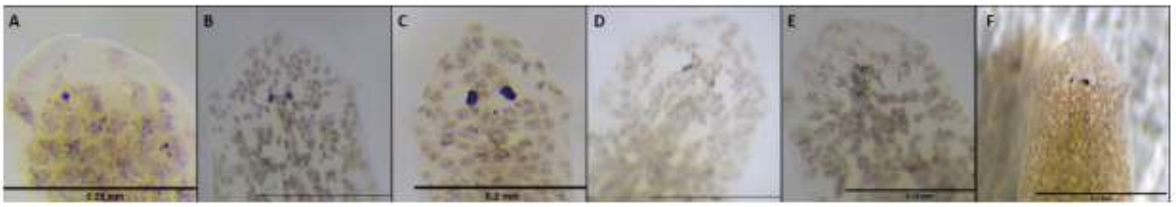


Fig. 21-Visualization of Abnormal Ocelli Types. A. Image of a planaria with one ocellus (cyclops) scale=0.25mm. **B.** Planaria with fused eyes; characterized by a bridge connecting the two ocelli in the middle scale=0.5mm. **C.** A planaria with abnormally large eyes scale=0.2mm. **D.** An additional ocellus can be seen on the left side of the planarian scale= 0.25mm. **E.** A planarian that did not develop ocelli after 15 days of trunk regeneration scale=0.25mm. **F.** The planarian has a right ocellus that is irregularly shaped scale = 0.5mm.

Since the re-opening of the laboratory (after closure for almost 2 years for renovations), research has resumed with many interns and Dr. Wotring hard at work.

Ms. Jette Ritz came from the Pharmacology Department at Karolinska University to conduct a research project in omics (co-supervised with Willian da Silveira, Stokes University, UK). Working part-time over 6 months, she completed an exhaustive analysis of gene expression changes seen in mice in space with respect to genes involved in metabolism of medications used during space missions. She presented her work at the NASA GeneLab Analysis Working Group Virtual Symposium in May; the talk is available on the NASA GeneLab Analysis Working Group YouTube channel. She successfully defended her Thesis in May and graduated with high honors. She will be presenting this work at the upcoming IAC meeting in Milan and is preparing a paper for submission to an omics journal for dissemination beyond the space community.

Two pharmacy students from University of Nottingham came in spring to perform research rotations on the effects of melatonin on planarians in space analogs, and in summer another from the Department of Biology at University of Strasbourg worked on another portion of this project. Another UniStra undergraduate conducted a short project on nociception in planarians exposed to low magnetic field conditions. Dr. Wotring is completing both of these projects this summer.

Dr. Wotring continues her work with the ESA Topical Team in Pharmacological Countermeasures. The group is now preparing a submission for European Cooperation in Science and Technology funding to support meetings and short-term research collaborations and also a submission to the Marie Curie Doctoral Network, which would provide support for PhD students wishing to perform research with group members.

Dr. Wotring, with ISU-NA VP Ken Davidian, Blue Abyss, and The Cleveland Clinic, submitted a new grant proposal in answer to the ISSNL CALL FOR PROPOSALS IN STEM EDUCATION AND WORKFORCE DEVELOPMENT entitled “Space Medicine for STEM Inspiration “. The project proposed is a new 1 week course to be offered in the US during the summer 2026-2027. Funding would support the course such that it can be offered at no charge to underrepresented graduate and medical students to introduce the possibilities of careers in the space sector. The ISU portion of the project is ~100K USD over 3 years.

Dr. Ignjatovic

In a period 2023-2024 research done by Danijela Ignjatovic was spread between Earth observation studies, lunar geotechnologies, and space education.

EO focus: Illegal mining in the Venezuelan Amazon has proliferated in the last decade, due to multiple socioeconomic factors. In 2016 a 111,843 km2 region named the Arco Minerodel Orinoco (Orinoco Mining Arch) was unlocked by the government. The study is focused on the Cerro Yapacana mine site, located in the state of Amazonas, Venezuela, where illegal gold mining has taken place since the 1980’s. Level-2 data from ESA’s Sentinel-2 satellite is used to compute three vegetation indices: Normalized Difference Vegetation Index (NDVI), Red Edge Position (REP) and Normalized Pigment Chlorophyll Index (NPCI). The spatial changes of these indices are examined visually through the application of index masks, as well as graphically through longitudinal and latitudinal slices of the raster data. Changes over time of the indices are examined in the period 2020 – 2023. Preliminary results show an overall decrease in the value of NDVI between 2020 and 2023 when compared over equivalent latitudes, suggesting a drop in the chlorophyll production capability of the vegetation surrounding the mine site. Additionally, the data demonstrates how elevation variations can be used to identify regions of higher vegetation contamination risk, due to drainage gradients. The next phase of the investigation will seek to compare vegetation health between sections in the vicinity of the selected mine site, and a control location not in proximity of a mine.

Lunar Geotechnologies: A dependable infrastructure accommodating large transportation spacecraft is crucial for human and robotic missions. One key aspect of this infrastructure is the site's engineering preparation. Efficiently manipulating and levelling the regolith requires conducting landscape and geotechnical surveys and thoroughly understanding the geotechnical parameters.

A ground-based surface surveying system coupled with a space segment is needed to measure the Moon's surface parameters in real-time. These parameters are critical for civil engineers to design lunar landing and launch pads that can withstand the unique static and

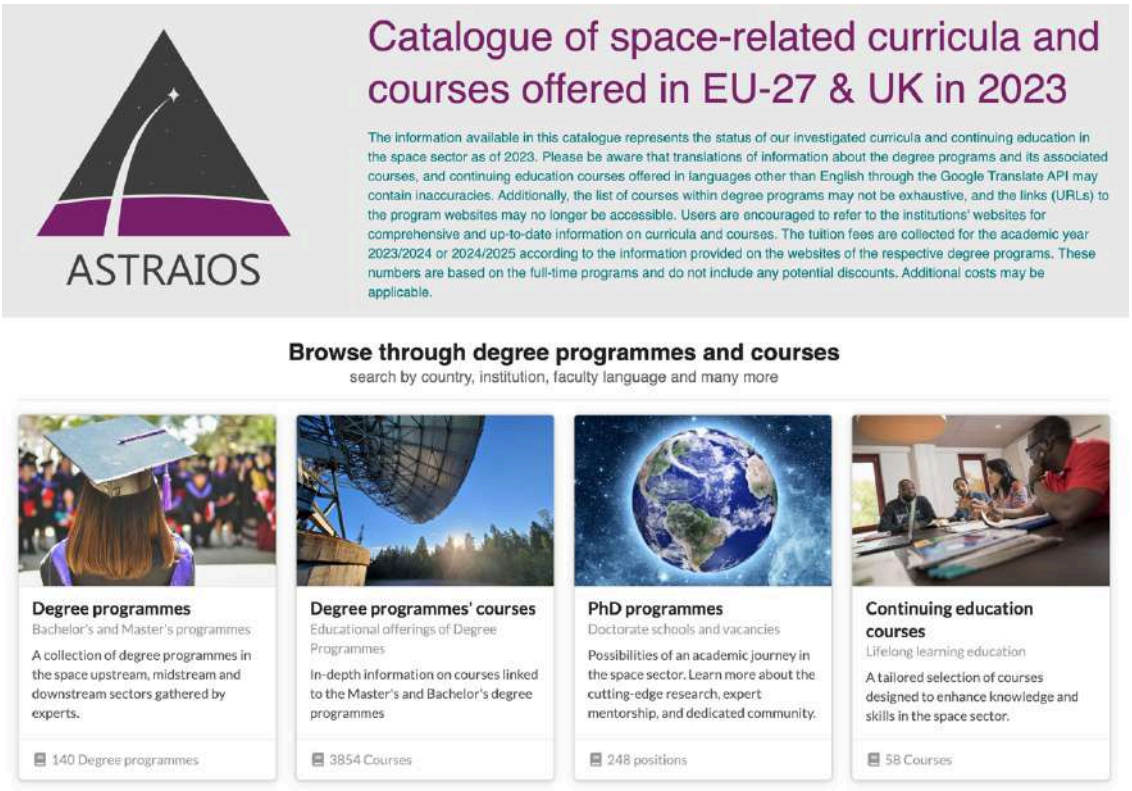
dynamic load scenarios, are built on uncharted lunar soil, and respond in a controlled manner during extreme soil-structure interactions. A comprehensive understanding of the landscape and geotechnical features of the lunar regolith is necessary for the entire resource exploitation value chain, including logistics, transportation or mining. By understanding this, we can improve spacecraft operations and minimize the risk of human and robotic missions.

This research presents a concept for a surveying system that utilizes ground segments to facilitate site preparation and construction activities. This system aims to assess the potential civil engineering risks associated with the interface between the soil and infrastructure during the development of lunar landing and launch pad infrastructure.

Space Education: The ASTRAIOS team raised awareness about the ASTRAIOS web catalogue through a dedicated presentation of the portal during the upcoming International Geoscience and Remote Sensing Symposium (IGARSS) 2024, which will take place in Athens, Greece from 7-12 July, 2024. Our team selected and analyzed the courses and educational standards of 140 Degree Programs (DPs) at Bachelor (26 DPs) and MSc (114 DPs) levels, 19 PhD programs, and 58 continuing education (CE) courses. Gathered DPs have been mapped across 28 knowledge domains (KDs) and 106 knowledge areas (KAs) identified in ASTRAIOS and across the different segments of the value chain of space activities relevant to the three space sectors: upstream, midstream, and downstream.

The analyzed DPs and courses are shared in a structured and curated web catalogue that allows users to search, and retrieve collected DPs and courses based on country, institution,

language, space sector, KAs, KDs, or European Qualifications Framework (EQF) levels. The data collected by the project and stored in a Postgres relational was structured using LinkedData technology such as Resource Description Framework (RDF). It allowed instances (e.g., Courses, Degree Programs) and concepts (e.g., Knowledge Domain and Knowledge Areas), represented by nodes, to be related to one another by relationships, represented by arcs between the nodes.



8. Library Services

8.1. New Library Spaces

August 2023 marked the end of the renovation work at the Library and we opened the brand new spaces to the students at the beginning of September.

That exciting transformation, brings an array of new features that significantly enhance convenience for our students: modern closed group working rooms, perfect for collaborative research and utilizing our extensive information resources, brand new furnitures to accommodate study, leisure reading and privacy spaces and a brand-new reference and checkout desk warmly welcomes and guides users with ease.

As a result, the library spaces have become the preferred working facility for students, who have utilized them extensively throughout this academic year.

8.2. Digital Resources

Despite a very small MSS class, we managed to maintain access to electronic resources to provide our users with large access to scholarly e-books and full-text journals, much needed for their studies and research.
We integrated new features to our EBSCO Discovery search tool like a new search interface, an APP on mobile devices, and Unpaywall, which enables access to open access scholarly articles.

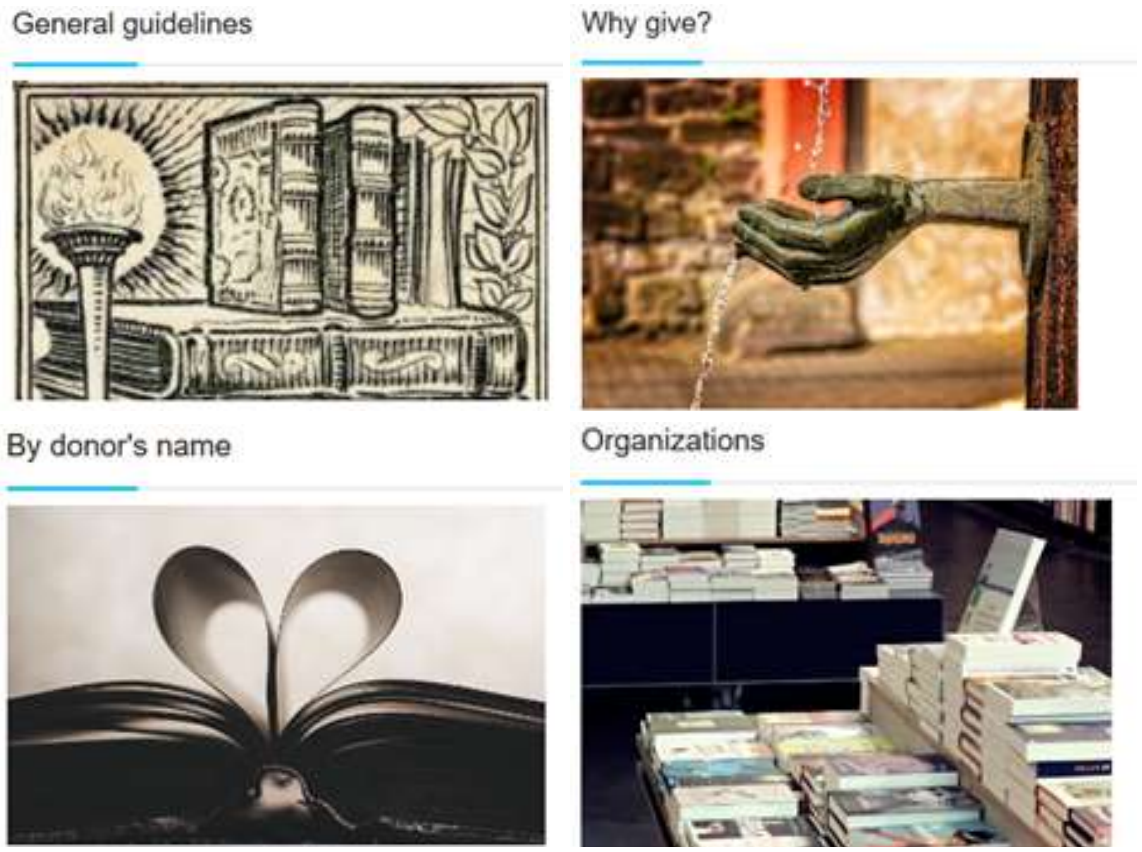
We have set up a link back from Google Scholar to ISU Library which provides our users a seamless access to full-text articles even when searching on Google Scholar. Now, in Google Scholar, once search results are displayed, on the right of each record, ISU Library users will see a link "Full text at ISU Library" when the pdf is available!

8.3. Library Donation and Bookplate Program

In these challenging times, we rely on the support of our library friends to develop and maintain collections and services that meet the evolving needs of ISU Library. To better facilitate this support, we have introduced new web pages on the Library website detailing the donation process and recognizing our generous donors.

⇒ Giving and Digital Bookplates web pages

While bookplates have traditionally been placed in print materials, we have created a digital bookplate program to add a permanent bookplate in the online catalog for items acquired in print or electronic format through gifts. In this way, visitors can see the breadth of materials acquired with the generosity of our supporters.



9. Start-up Incubator

Building on the success of its initial startups and its role in fostering a regional space ecosystem, the ISU Incubator has secured continued and expanded support from local partners. This ongoing commitment will enable the organization of additional events to further enhance engagement and opportunities for startups.

Key infrastructure developments include:

- Upgraded Facilities: A new audio-visual system has been installed in a shared, dedicated meeting room for incubatees.
- Strategic Partnerships:
    - A new agreement with Euroconsult to provide valuable market insights to startups.
    - A collaboration with CNES to integrate the Incubator into the CNES accelerator program.
    - Renewal of the partnership with SEMIA, a local Incubator, for mutual support and resource sharing.
- Improved Workspace: The Incubator has undergone refurbishment, creating new offices and breakout rooms while optimizing the corridor space to enhance functionality.

The Incubator continues to welcome startups with fascinating subjects. This year, we saw the entry into the incubation of the subsidiary of Swiss company Prometheus Life Technologies. This team is developing a disruptive space-proven technology to produce high-quality human tissue organoids in Low Earth Orbit with the vision of improving and saving lives. The company's move to the ISU brings it closer to the healthcare sector, which is very active in Alsace, notably via Biovalley.

Fig. Breakout rooms in the Incubator area

9.1. Evolution of the ISU Start-Ups

Graduated Start-Ups

Several start-ups have successfully grown within the ISU Incubator, with some securing funding and expanding their operations:

1. LeanSpace, founded by ISU MSS alumni, secured Series A funding and relocated to a business park near Strasbourg to accommodate its rapid expansion, now employing around 40 staff. LeanSpace remains closely connected to ISU, delivering lectures on entrepreneurship and actively engaging with alumni for recruitment.
2. Watershed Monitoring, having achieved a strong financial position, relocated its European headquarters to downtown Strasbourg. The company continues to develop its Earth Observation-based water quality monitoring solutions, securing local contracts.

One start-up was unable to secure post-seed financing, leading to its integration into an established drone technology company, ensuring that the expertise and innovations developed during incubation remain active in the industry.

Current Start-Ups in the Incubator

GrapeHawk and **EwoSmart** continue to develop their technologies within the Incubator.

New Additions:

1. **Spacepharma Europe**, originally from Israel, specializes in **producing large pharmaceutical-grade crystals in microgravity** using small satellites.

2. **Prometheus**, founded by an **SSP alumnus**, focuses on **human tissue production in space**. A **recently graduated MSS alumna with a biology background** is currently supporting its research and development at ISU.

Additionally, two **new companies** have **finalized their legal and administrative processes** with assistance from a specialized law firm in Strasbourg and are expected to join the Incubator soon.

Fig. Round-table joining ISU Start-ups with decision makers on local water management.

At a press conference held ahead of the first "Health in Space" conference organized in Strasbourg by ISU on December 13, Raphaël Roettgen, Co-founder and CEO of Prometheus Life Technologies announced his decision to set up his first European office in the ISU Incubator, located in the “Parc d'Innovation” de l'Eurométropole de Strasbourg in Illkirch-Graffenstaden.

"Strasbourg was a natural choice for Prometheus: as a biotech company, we appreciate its location at the heart of the Rhine "BioValley" (a unique tri-national healthcare ecosystem in Europe) and its proximity to our headquarters in Switzerland. The region's world-renowned educational and research establishments, as well as the sites of renowned life sciences companies, are potential partners and customers for Prometheus. Last but not least, Strasbourg is also home to the International Space University, a logical domicile for Prometheus as a space biotech company, of which I am an alumnus, lecturer and board member." Raphaël Roettgen, co-founder and CEO of Prometheus Life Technologies.

Fig 1: inauguration of Prometheus Life Technologies to the press in the ISU meeting room on 13/12/2023

9.2. Development of the Incubator Visibility

The Incubator has been increasing its presence in the local ecosystem and has participated in various local and international events.

In November, the Incubator team was invited to participate in the Hydreos "Aquathon." Over several months, we collaborated with Eurométropole de Strasbourg, Watershed Monitoring, and ISU to represent the Rhinespace Booster by proposing a challenge for the hackathon. The challenge was to find ways to make recreational boating responsible and sustainable, while respecting nature and users. This project provided the opportunity to participate in a large-scale hackathon, where participants had access to the premises of the Région Grand Est and were able to present interesting projects. During the hackathon, 16 projects were presented, 10 teams were formed, and 136 participants attended throughout the weekend. To assist these teams, 40 coaches were involved.

The Incubator also participated in the SpaceTech Expo Europe in Bremen. This international event provided an opportunity to meet entrepreneurs interested in starting a business in France, as well as prospective ISU students. The Incubator and the EuroSpaceHub project also supported the Hackathon organized by Leanspace at this event..

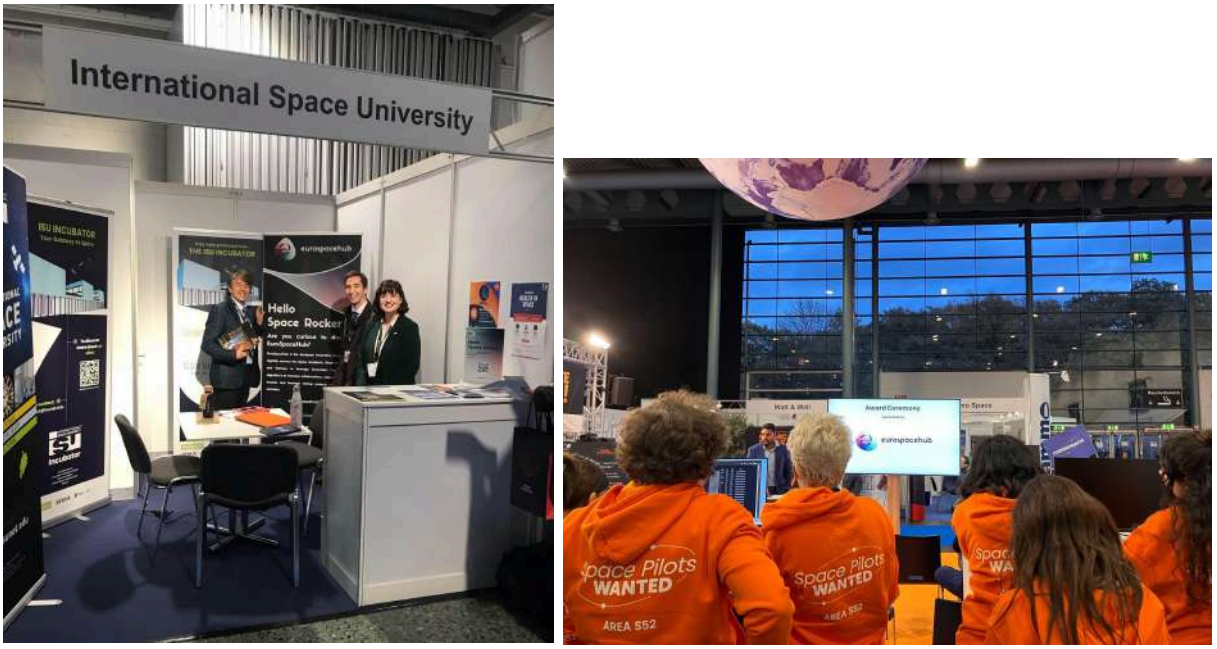


Fig 2&3: SpaceTech Expo Europe, Bremen, ISU booth and Leanspace hackathon

In February, the Incubator was invited to its first Space Club as a member of the Aériades network. This meeting of ecosystem players was held at the Institut Lafayette in the presence of CNES and representatives of several COMETs. It was an opportunity for ISU to open up to companies and institutions in the Grand Est region that include space in their work. The next Space Club will take place at the ISU, where we'll be welcoming all collaborators during the day on September 19.

Fig 4: Aériades cluster "Space Club" 22/02/2024

In May, the Incubator was invited by "Entreprendre pour Apprendre," an organization that supports and promotes entrepreneurship among young people by connecting companies and schools, to serve as a jury for the best Post-Bac project prize. Alongside ecosystem partners such as French Tech Est and SEMIA, ISU had the opportunity to attend presentations by young entrepreneurs and was impressed by the high quality of the projects.

9.3. Conferences

Health in Space

On December 13, 2023, the ISU Incubator organized a healthcare event bringing together both local companies and institutions.

On Earth, the field of health is making progress every day, driven by scientists from all over the world, for the benefit of everyone. Ever since man first set out on his space adventure, medicine has also been exported to space. Both to care for astronauts and ensure they remain in good health, and to facilitate scientific research experiments for the benefit of terrestrial medical advances. Health has thus become an important part of the space sector, which will continue to grow in response to the major issues affecting human beings, whether on earth or in space.

Today, institutions, companies and even start-ups are working on this subject. In France, the CNES (Centre national d'études spatiales) has set up MEDES, the Institute for Space Medicine and Physiology. Private companies such as Spacepharma and Prometheus Life Technologies, both recently established in the Incubator of the International Space University (ISU) in Illkirch-Graffenstaden, are working respectively on experimental space laboratories and the creation of high-quality human tissue organoids in low-Earth orbit.

With continued space exploration and new challenges on Earth, this research is more necessary than ever. In the Grand Est region, and more particularly in Alsace and Strasbourg, health is at the heart of our concerns and innovations. That's why the “Health in Space” conference was held on December 13 at the International Space University. The public was able to attend round-table discussions between experts from the space and health sectors, as well as players in the Alsace innovation scene. Still available on the ISU YouTube channel, you can find unedited discussions between human performance in space researchers and Biovalley experts, on the same stage.

During the conference, the ISU welcomed some 50 participants, and a number of collaborations were formed, notably between the institutions represented and startups from the Incubator.

Fig 5: Round Table during the conference Health in Space

Fig 6: Health in Space Networking Event

Space for Water Management

At a time when climate change is having a visible impact on our environment, water resources are a major concern. At this conference, immerse yourself in a world where water management meets cutting-edge technologies to create innovative and sustainable solutions.

During this event, we will explore how spatial data is revolutionizing the way we perceive, measure and manage water resources. Experts will share their knowledge and experience of using satellite data, remote sensing and geographic information systems to monitor, predict and optimize water resource management.

We have covered a wide range of topics, with experts from space companies such as Watershed Monitoring and EwoSmart, as well as local institutions such as La Région Grand Est with its Water and Climate Change department, and Aquanova (formerly Hydreos).

Whether you're a water specialist, a natural resource management professional, a policy-maker or simply passionate about new technologies, you can find the live stream on our Youtube channel, and this event will offer you unique perspectives on current and future water management challenges.

This conference facilitated discussions between local companies and regional institutions on collaborative projects. Partnerships were then discussed at the conclusion of the event, particularly after the round table discussion, which highlighted regional water resource needs.

Fig 7: Space for Water Management Conference

9.4. Partnerships

Over the past year, the Incubator has developed several partnerships and consolidated existing collaborations.

Firstly, ISU joined the CNES initiative to incubate lunar exploration projects: Tech The Moon. On April 30, the Incubator joined a jury of other local incubators to judge the 10 candidate projects. One project present at ISU applied. In all, 5 projects were selected for this first promotion of this national program. The projects were welcomed at CNES on June 18 for a launch event.

Another noteworthy collaboration is ISU's entry into the Aériades cluster. Bringing together all the players in the aeronautics and space sectors in the Grand Est region, this partnership is further evidence of ISU's openness to its ecosystem. This network enables the Incubator to present its projects to players closer to home than those already heavily involved internationally.

9.5. Renovations

At the instigation of the Strasbourg Eurometropolis, the ISU building has been renovated, in particular to meet new ecological standards. During this work, the Incubator benefited from a new space for startups. Previously located on the 3rd floor of the building (picture 1), the Incubator is now located on the 2nd floor with new workspaces (picture 2).

Encouraged by the success of the initial start-ups in ISU such as LeanSpace (https://leanspace.io/) and Watershed Monitoring (https://watershedmonitoring.com/en/) who left the ISU Incubator after hiring more staff and therefore needing more accomodation, the local authorities agreed to refurbish the ISU Incubator and provide better functionalities.

Since the beginning of 2024 the new and modernized area of the ISU Incubator facility is operational, offering a number of advantages:

- A dedicated separate area with a shared meeting room
- More offices available of different sizes
- Better conditions w.r.t. environmental conditions
- Separate breakout corners to receive visitors.

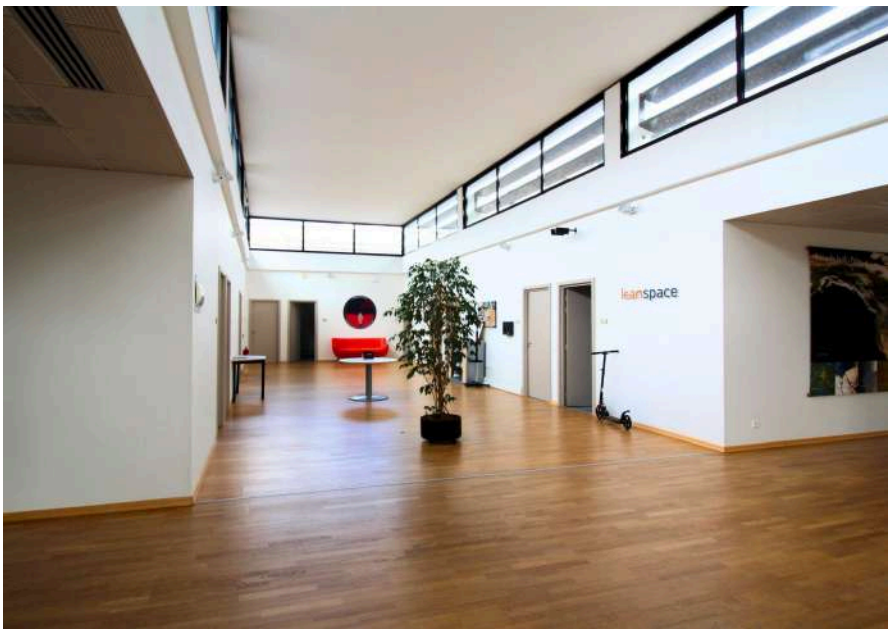


Fig 8: Previous Incubator Space

Fig 9: New Incubator Space on the 2nd Floor

9.6. EuroSpaceHub Project

This year also saw the continuation of the EuroSpaceHub consortium. The project is intended to strengthen the knowledge triangle between business, education, and innovation.

Several actions have been taken in this direction, some of which have directly involved the Incubator.

Firstly, the Incubator coordinator was able to give two masterclasses to a very varied audience. The first was on the specifics of a space Incubator, and the second on themed events to showcase space applications. These masterclasses gave rise to some interesting conversations, both with entrepreneurs wishing to open their business in France, and with potential partners.

Fig 10: Masterclass for EuroSpaceHub

Recently, EuroSpaceHub and the Incubator were able to work together to support ISU master's students in a 2-week workshop on how to set up a business and develop a project in the space industry. With several experts from VCs, incubators, business planners and CEOs of well-known companies, the students were able to work on their ideas and make this event the perfect convergence between university, industry and entrepreneurship.

Fig 11: Winning team for the Business Plan Competition

10. Alumni Affairs

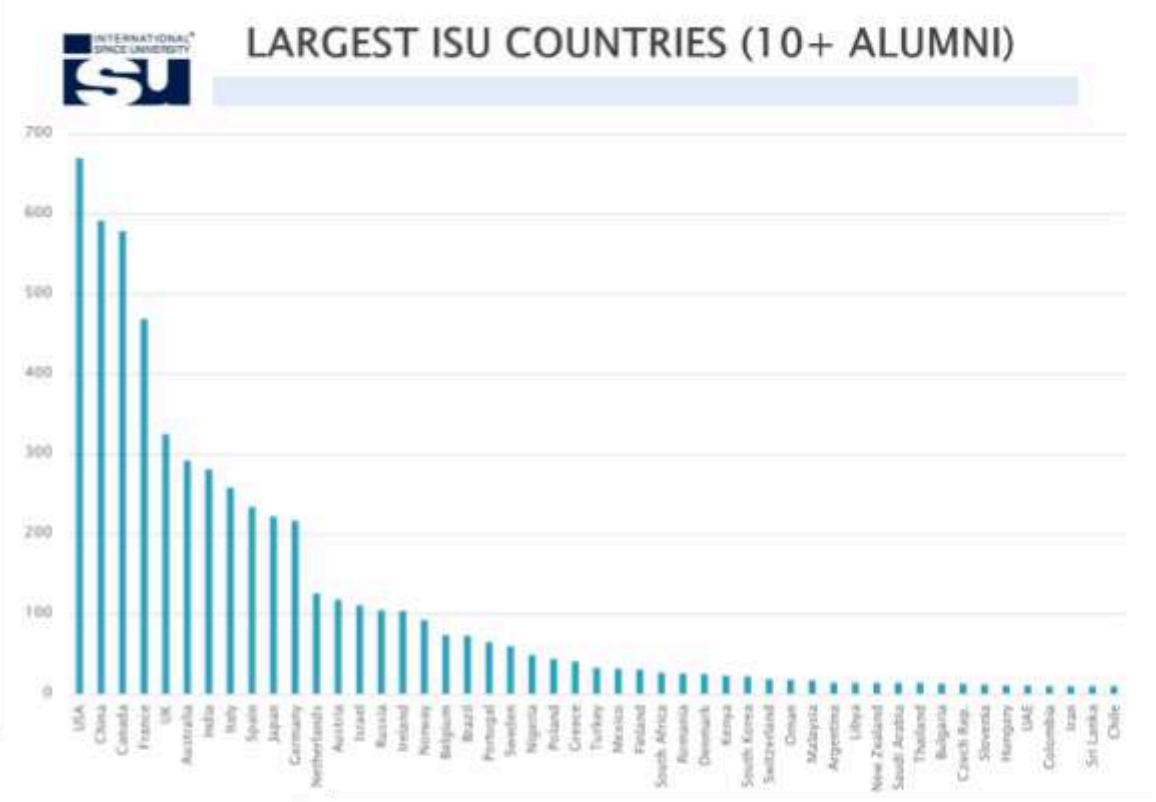
10.1. The ISU Alumni Statistics

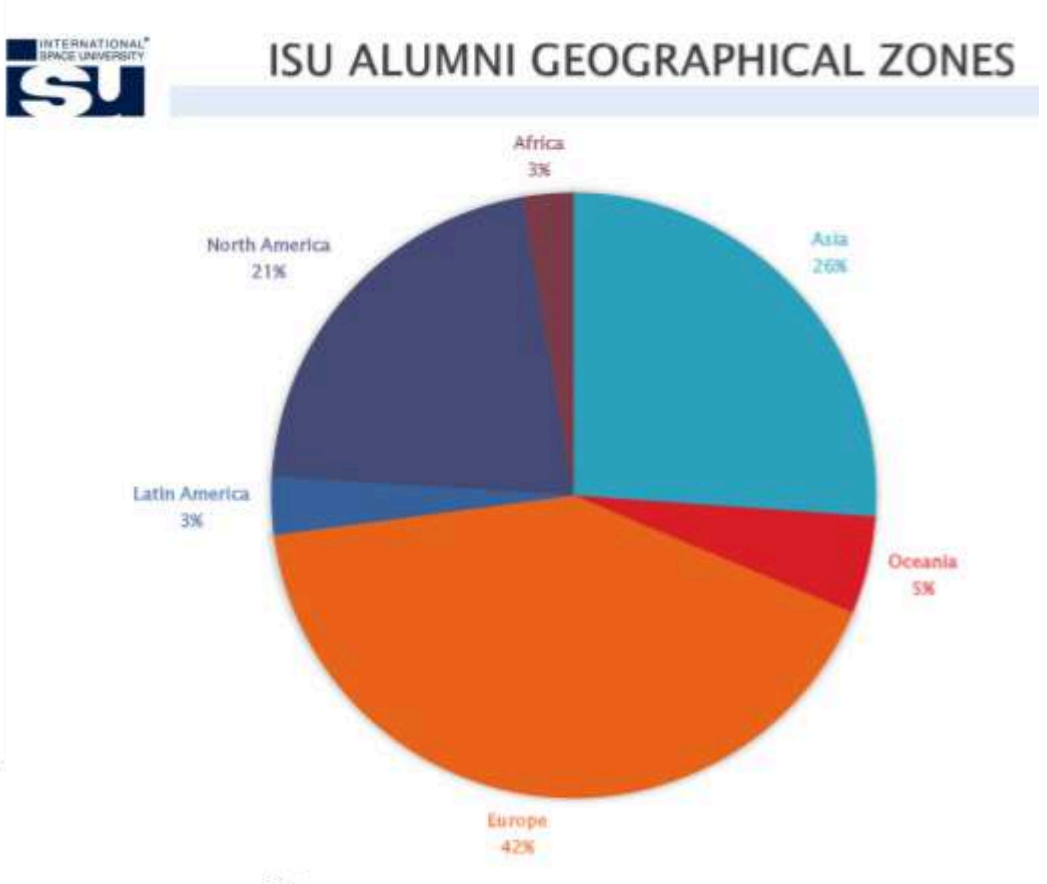
ISU has fostered one of the most **diverse and influential alumni communities in the space sector**, with **over 5,800 graduates** representing **112 countries**. Since its founding, ISU has served as a launchpad for professionals who now lead space agencies, drive commercial innovation, conduct cutting-edge research, and shape space policy worldwide.

ISU alumni can be found in **key leadership positions across major space organizations**, including **NASA, ESA, CNES, JAXA, and private industry giants**, as well as in **emerging space nations**. Their expertise spans disciplines such as **engineering, science, law, business, and human spaceflight**, demonstrating the **interdisciplinary** foundation that ISU provides.

Beyond professional success, ISU alumni remain **deeply connected to the university**, actively engaging in **mentorship programs, guest lectures, and collaborative projects**. They play a crucial role in **supporting current students and fostering innovation within the ISU ecosystem**.

Through participation in major industry events such as the **International Astronautical Congress (IAC) and the Space Symposium**, ISU alumni continue to expand their professional networks, drive industry advancements, and contribute to **global space development**.


LARGEST ISU COUNTRIES (10+ ALUMNI)
700
600
500
400
300
200
100
0
USA
China
Canada
France
UK
Australia
India
Italy
Spain
Japan
Germany
Netherlands
Austria
Israel
Russia
Ireland
Norway
Belgium
Brazil
Portugal
Sweden
Nigeria
Poland
Greece
Turkey
Mexico
Finland
South Africa
Romania
Denmark
Kenya
South Korea
Switzerland
Oman
Malaysia
Argentina
Libya
New Zealand
Saudi Arabia
Thailand
Bulgaria
Czech Rep.
Slovenia
Hungary
UAE
Colombia
Iran
Sri Lanka
Chile


ISU ALUMNI GEOGRAPHICAL ZONES
Africa
3%
North America
21%
Asia
26%
Latin America
3%
Oceania
5%
Europe
42%

10.2. Success Stories

The International Space University (ISU) boasts a diverse network of alumni spread across the globe, deeply involved in various sectors of the space industry, including space agencies like NASA and ESA, private spaceflight companies, academia, and governmental bodies.

These alumni are known for their multidisciplinary and international approach to tackling

complex challenges in space and related fields. ISU alumni often hold influential positions and play key roles in advancing space exploration, satellite technology, policy-making, and education. Their contributions continue to shape the future of space, driven by the unique, collaborative, and innovative education received at ISU.

Spotlight on SSP24 Alum: Nadine Duursma

Meet Nadine Duursma, an Space Studies Program SSP24 alum who's inspiring the next generation! Nadine has accomplished incredible feats in technology, all by the age of 25.

She's designed an artificial eye for the blind, built satellites, and even developed a prototype for an energy-generating aircraft wing. Her latest achievement? Authoring a children's book!

10.3. Alumni Conference

The ISU Alumni Conference 2024 was held during ISU's 36th SSP in the USA.

The ISU Alumni Conference 2024, held in Houston, Texas, from 11 to 14 July 2024 brought together ISU alumni, Space Studies Program (SSP24) participants, and industry leaders for an event filled with networking, knowledge-sharing, and engaging activities. Hosted at Rice University, the conference served as a platform to connect generations of International Space University (ISU) graduates and strengthen professional relationships within the global space community.

A key highlight of the event was TEDxISU at Rice University on 13 July 2024, where space professionals delivered inspiring talks on topics such as commercial astronaut training, mental performance in extreme environments, Earth-based applications of space technology, the democratization of space, and the uniqueness of cislunar space. Speakers included – all ISU alumni - Matt Daniels, Emeline Paat-Dahlstrom, Barret Schlegelmilch, Maynard Holliday, Kris Lehnhard, Jaisha Wray, Anousheh Ansari, Erika Wagner, and Emma Lehnhardt. The event concluded with a reception and remarks from ISU representatives, providing an excellent opportunity for alumni and guests to engage in deeper discussions.

The organizers had planned exclusive site visits to major space facilities, including SpaceX's Starbase in Boca Chica on 10 July. However, a hurricane struck Texas, necessitating the cancellation of this visit for safety reasons. On 12 July, attendees toured Ellington Spaceport, followed by a visit to Space Center Houston, reinforcing ISU's strong ties with the space industry.

Cultural and social events also played a central role in the conference, celebrating the diverse backgrounds of the ISU community. The SSP24 Cultural Night on 12 July showcased the traditions of participants, fostering an atmosphere of inclusivity. The Grand Dinner and Space Masquerade on 13 July provided a formal setting for networking, allowing alumni to reconnect while welcoming new graduates into the ISU family. The weekend concluded with the ISU staff and Alumni vs. SSP24 participants football match on 14 July, a friendly yet competitive game on Rice University's soccer field.

The ISU Alumni Conference 2024 effectively connected past and present ISU participants, providing access to leaders in the space industry and valuable opportunities for mentorship and career advancement. This conference underscored the significance of the ISU alumni network, which boasts a vibrant community of 5,600 members spanning 110 countries.

11. Faculty and Executive appointment

In December 2023, the International Space University (ISU) appointed Professor Nicolas Peter as Interim President, succeeding Professor Pascale Ehrenfreund, who had held the position since September 2021.

With over two decades of experience in the international space sector across eight countries and four continents, Professor Peter has been instrumental at ISU as a Professor of Practice in Space Policy and International Affairs. He has led Policy, Economics, and Law activities, launched the Space Policy and Entrepreneurship Lab (SPEL), and enhanced the ISU Incubator's impact. His prior roles include positions at the European Space Agency (ESA), the European Commission, and the German Aerospace Center (DLR).

11.1. New Faculty Appointments

The professionals listed below have accumulated sufficient teaching time at ISU to join the Global Faculty, and they have agreed to contribute with their expertise to the ISU academic, research, and professional development programs.

The updated list of over 170 faculty members is accessible on the ISU website with links to the profile of each individual.

The procedures for faculty eligibility, appointments, and currency are established in the ISU Academic Handbook.

Promoted to Full members of the ISU Global Faculty: Mr. David Bruce, Dr. Ryan Clement, and Dr. Catherine Doldirina

Appointed Adjunct Faculty: Dr. Willian Abraham da Silveira, Ms. Emeline Paat-Dahlstrom, Mr. Raphael Roettgen, Dr. Rodrigo Ventura, Ms. Neta Vizel, and Mr. Liad Yosef

Appointed Faculty Emeritus: Dr. Gerhard Haerendel and Dr. Bernd Madauss

Elections to the **Academic Council** took place in September 2024. For reference, the current Academic Council Members are:

Lucy Stojak - Chair of the Academic Council, HEC Montréal
Tanja Masson-Zwaan - Vice-Chair of the Academic Council, IIASL Leiden University
Jacob Cohen, NASA Ames Research Center
Daniel Garcia Yarnoz, European Union Agency for the Space Programme (EUSPA)
Natalia Larrea Brito, Euroconsult
Scott Ritter, German Aerospace Center (DLR)
François Spiero, French Prime Minister's Office
Olga Zhdanovich, AKKODIS

11.2. Incoming ISU President, Dr. John Wensveen

ISU announced the appointment of **Dr. John Wensveen** as its **new President**, effective **September 3, 2024**. With a distinguished career spanning **higher education, aerospace, and entrepreneurship**, Dr. Wensveen brings a strategic vision that aligns with ISU's mission to **advance space education, research, and global collaboration**.

Dr. Wensveen succeeds **Interim President Nicolas Peter**, who has led ISU through a transitional period and will return to his role at the **European Space Agency (ESA)**. Under Dr. Wensveen's leadership, ISU aims to strengthen its position as a leading institution for **interdisciplinary space studies**, fostering the next generation of space professionals.

Bringing extensive experience in **innovation and strategic development**, Dr. Wensveen previously served as **Chief Innovation Officer** at **Nova Southeastern University (NSU)** and as **Executive Director** of the **Alan B. Levan | NSU Broward Center of Innovation**. His expertise in **public-private partnerships, higher education management, and aerospace strategy** will play a key role in ISU's future growth.

As President, Dr. Wensveen has outlined several priorities, including:

- **Expanding ISU's global partnerships** with academia, industry, and government.
- **Adapting ISU's programs** to align with the evolving space economy.
- **Launching a fundraising campaign** to support ISU's programs, research, and infrastructure.

The coming years will bring both challenges and opportunities, and ISU is well-positioned to embrace them, continuing its leadership in global space education and professional development. Central to this vision is the MOON SHOT 2030 strategic plan, which will position ISU to support the rapidly evolving New Space Economy. This ambitious plan focuses on expanding ISU's global footprint through new satellite campuses, enhancing virtual learning opportunities, and strengthening partnerships across industry, government, and academia. By adapting its programs to meet the needs of this dynamic sector, ISU aims to foster the next generation of space professionals and ensure its continued leadership in space education and innovation.

12. International Relations

ISU continues to strengthen its global presence and foster international collaboration through a series of strategic meetings, high-profile visits, and participation in key space-related events. Below is an overview of ISU's international engagements over the past year.

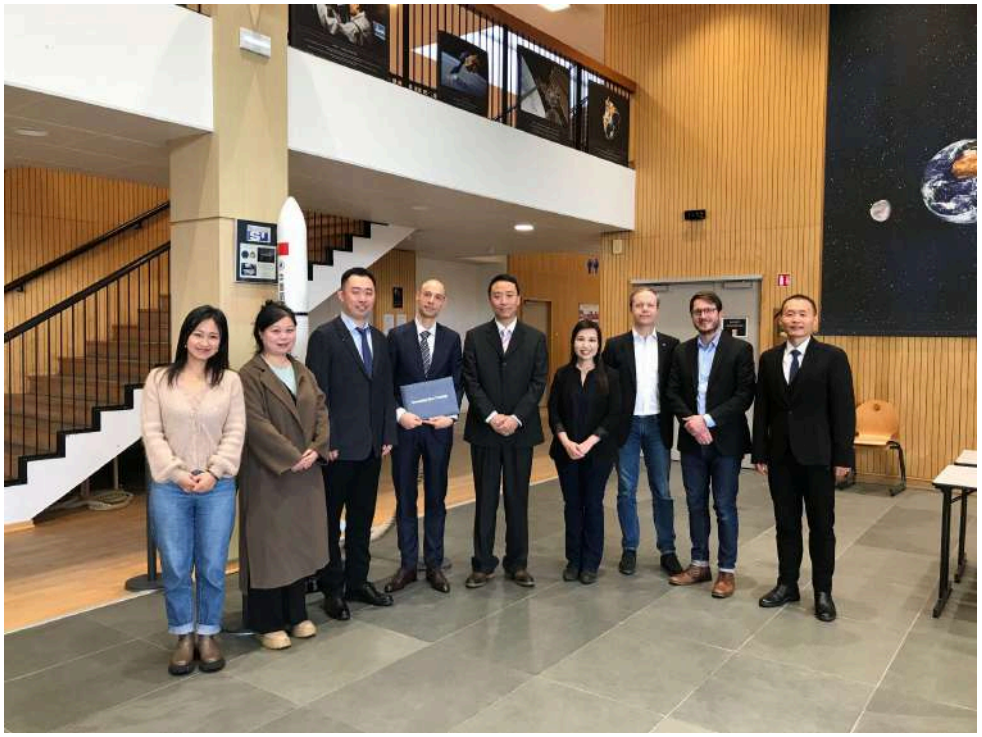
12.1. Key International Engagements

1. Strengthening Ties with Japan

- **September 7, 2023:** ISU hosted a **Japanese delegation** including Mr. Nakamura, Mr. Uchida (Consul General), and Mr. Uchikawa (Consul), who arrived at ISU for a high-level meeting and a lecture. Discussions focused on enhancing cooperation and academic exchange.
- **March 18, 2024:** The **Japanese Consulate in Strasbourg** hosted a formal dinner in honor of Prof. Fujimoto's visit to ISU. The dinner, attended by JAXA representatives and ISU leadership, aimed to reinforce ISU's collaboration with Japan in space education and research.

2. International Collaboration in Space Education and Research

- **October 3, 2023 – Baku, Azerbaijan (IAC 2023):** ISU met with **UNOOSA (United Nations Office for Outer Space Affairs)** to discuss collaborations on training centers and education for developing space nations.
- **October 3, 2023 – Baku, Azerbaijan (IAC 2023):** ISU held a **bilateral meeting with the China National Space Administration (CNSA)**, discussing potential areas of cooperation. ISU representatives were also invited to CNSA's reception at the Hilton Hotel in Baku.
- **November 3, 2023:** ISU welcomed a **high-level delegation from CLTC**, consisting of six senior members. The discussions centered on deepening institutional cooperation and future joint initiatives.



3. Regional Partnerships and Government Relations

- **December 7, 2023:** ISU hosted **Franck Leroy (President of the Grand Est Region) and Michèle Boisvert (Déléguée Générale du Québec)** for a series of discussions, including presentations on the **Parc d'Innovation de Strasbourg**, ISU's Incubator, and potential collaborative projects with the Grand Est Region and Québec.
- **December 15, 2023:** ISU signed an **MOU with ICESCO (Islamic World Educational, Scientific, and Cultural Organization)**, launching the **ICESCO Chair in Space Engineering and Space Sciences at ISU**. This initiative aims to advance research and capacity building in space sciences for emerging space nations.
- **January 17, 2024 – Jeddah, Saudi Arabia:** ISU President **Prof. Nicolas Peter** was the **guest of honor at ICESCO's 44th Session**, where he delivered a keynote address on international cooperation, space solutions, and STEM education.

4. Participation in Major International Space Events

- **April 24-26, 2024:** ISU participated in **Space Day China**, where ISU engaged with key space industry leaders to strengthen ISU's ties with Chinese space institutions.
- **July 9-11, 2024 – South Korea:** ISU played an active role in the **2nd World Congress of Korean Scientists & Engineers**. Key activities included:
    - **Interview and Q&A** on ISU hosting the **Space Studies Program (SSP) 2025**.
    - **Keynote speech by Prof. Nicolas Peter**, reinforcing ISU's leadership in space education.
    - Engagement with the Korean space and scientific community to explore future partnerships.

ISU remains committed to fostering international cooperation in space education, research, and policy development, ensuring that its programs continue to inspire and shape the next generation of space leaders.

13. ISU North America

Over the past year, International Space University - North America (ISU NA) managed a variety of tasks and projects to keep the university's operations smooth and progressive, balancing between strategizing for the future and handling day-to-day challenges. ISU NA conducted activities in the following categories (presented in order of diminishing time commitment over the course of the year): Office Administration (including travel and activities of the ISU NA intern, Rush Deeter), the Space Sector Crash Course (both in-person and digital offerings), Travel Administration, support for the Space Studies Program, strategic planning, and other activities that comprise the remainder of the available time (including external funding relations, marketing, and alumni outreach).

OFFICE ADMINISTRATION

Last year, ISU NAO focused on administration tasks to keep the university's North American (NA) office running smoothly. Special projects supplemented the routine administrative tasks, including transactions supporting government procurement and grant awards, creating and executing the Space Sector Crash Course (both in-person and digital versions), and supporting sponsorship solicitation and payment collections for the 2024 SSP.

ISU NA was also responsible for ensuring the organization's good standing with the state of Massachusetts and applying for tax exemption certificates from multiple U.S. states. ISU NA also ensured organizational registration, full compliance, and good standing within the U.S. government procurement and grant websites. ISU NA also ensured the successful completion of sponsorship receipts, invoice payments, and audit reporting through the appropriate ISU NA banking establishments.

Travel

In the past year, ISU VP NAO participated in several trips associated with different projects and events for ISU, including:

- Nova Southeastern University Space Day: Participation on multiple panels of this space-themed event designed to encourage participation of Florida's Miami and Fort Lauderdale companies in the space industry.
- SSP24 Site Visit: Conducted a site visit for the 2024 Space Studies Program in Houston, Texas.
- ISU Board of Trustees Meeting #71: Participating in the International Astronautical Congress spring planning meetings (in Paris) and a Board of Trustees meeting (in Strasbourg).
- SSCC-01: Execution of the first in-person Space Sector Crash Course (SSCC) in Houston, Texas, on 12-17 November 2023.
- SpaceCom: Participated on a spaceport panel at this industry conference focused on space commercialization.
- NJIT Site Visit: A site visit related to a partnership or collaborative project with the New Jersey Institute of Technology.
- ISU Board of Trustees Meeting #72: Attending another Board of Trustees meeting for the International Space University (Strasbourg).

- Space Symposium: Staffed the ISU exhibition booth at this significant industry conference in Colorado Springs, Colorado.
- KSA CST Class: Presented two 20-hour courses entitled “Introduction to the Space Economy) given in the Riyadh, Saudi Arabia.
- SSP24 Opening & Closing: Participating in the opening and closing ceremonies of the Space Studies Program.

Rush Deeter, ISU NA Intern

During the past year (25 June 2023 – 3 June 2024), Mr. Rush Deeter was employed as an ISU NA intern. He supported various projects and administrative tasks under the guidance of the ISU VP NAO. Deeter was actively involved in numerous meetings with the ISU VP NAO, discussing and planning several key projects, including the SSCC (both in-person and digital versions). For the SSCC, he provided support for the smooth execution of the SSCC, helped with logistical arrangements, participant registrations, preparation of course materials, and collection and analysis of feedback. Rush also refined the details of events and courses, showing a keen ability to handle responsibilities that were pivotal to the operational success of the university's initiatives. His involvement gave him valuable hands-on experience in space sector education but also significantly benefited ISU by ensuring that projects progressed efficiently and effectively.

SPACE STUDIES PROGRAM SUPPORT

Last year, ISU NA was involved in the Space Studies Program (SSP) starting with preliminary site visits to Rice University, and concluding with participation in the SSP Closing Ceremonies. ISU NA participated in early budget constraint meetings, executive committee meetings. ISU NA developed and submitted proposals for grant support for the International Lunar University and Gateway Team Projects (TPs) from the U.S. space agency, NASA.

STRATEGIC PLANNING

The North American office of ISU was heavily involved with a special project entitled the “5-Year Plan.” This plan identified ISU’s current challenges (in administrative operations, programmatic development and execution, and organizational structure) and their financial implications. The plan outlined three possible future scenarios — best case, worst case, and status quo — to clearly demonstrate ISU's potential performance and long-term viability. ISU NAO worked on several important tasks throughout the year. Key tasks included developing and revising the "5-Year Plan," a strategic and financial document delivered to the Board of Trustees at its October 2023 meeting in Strasbourg, required frequent sessions with the ISU executive office and faculty to outline and update the university's long-term goals. This project required regular review and adjustments, reflecting its importance and complexity. This document required regular updates and revisions to outline the strategic direction and goals of the university over a five-year period, ensuring that the institution remains on track to achieve its long-term objectives.

OTHER ACTIVITIES

- ***Alumni Outreach***

In the past year, ISU NA worked on several key activities to maintain and strengthen connections with past students of the university. Activities creating marketing materials and producing video shorts to engage alumni. As the year progressed, ISU NA represented ISU, through exhibit booth representation, panel presentations, and featured speeches to alumni organizations (e.g., SEDS-USA, SEDS-Canada) showcasing the university's achievements and plans. Additionally, Each activity was aimed at ensuring that the alumni felt valued and remained an active part of the university community.

During the Satellite Conference (18-21 March 2024), the ISU VP NAO helped orchestrate an Alumni Gathering, an event aimed at reconnecting graduates of the International Space University in attendance at the conference. This gathering provided an excellent opportunity for alumni to network, exchange ideas, and share their professional experiences. Such events are essential for fostering a sense of community and continuity among alumni, encouraging them to stay involved with the university's current projects and initiatives. The gathering also served as a platform for alumni to discuss potential collaborations and support new ventures, further enhancing the university's reputation and extending its influence in the broader space and satellite industry.

- ***Funding Relations***

Last year, ISU VP NAO worked extensively on developing relationships with external funding sources, an essential task to ensure the university had the financial support needed for its various programs. He started the year by preparing for major events like the International Astronautical Congress (IAC), where he spent several days meeting with potential funders and discussing collaboration opportunities. Throughout the year, ISU VP NAO also drafted presentations and developed proposals tailored to attract funding from organizations interested in space education and research. These activities were crucial for the growth and sustainability of the university’s ambitious projects.

- ***Marketing***

In the past year, ISU NA was very active in promoting and marketing the university's programs and initiatives. The year started with preparing marketing materials and setting strategies for the SSCC. Throughout the year, ISU NA also focused on digital marketing efforts, creating video shorts for alumni outreach and managing updates to the university's website to make it more informative and user-friendly. Additionally, ISU NA participated in meetings aimed at planning and executing webcasts, which were essential in reaching a broader audience online. Each of these activities was geared towards raising the university's profile and attracting more students, partners, and funders by showcasing the unique opportunities and cutting-edge research at ISU.

- ***Lecturing***

Last year, the ISU VP NAO made numerous appearances in-person panel appearances and in webinar interviews, gave guest lectures, and taught classes in support of multiple ISU programs. Throughout the year, the ISU VP NAO prepared and shared his knowledge and insights with the students.

- ***Conference Presentations***

    - 21 Sept 2023: South Florida Space Day – Commercial Space Station Panel
    - 21 Sept 2023: South Florida Space Day - Interstellar Alliances: Exploring Global Collaboration in Space Economy
    - 25 Oct 2023: AIAA ASCEND Conference - Role of Military and Commercial Space Panel
    - 10 Nov 2023: SEDS Conference – Space Education Panel
    - 18 April 2024: eMerge Americas – Innovations in Space Panel (https://youtu.be/rpDZGWf4Tys?si=I-TOW1upYMKcjk0J)

- ***Webinar Appearances***

    - 9 Nov 2023: Vector Episode 13
    - 19 Jan 2024: The Space Show – with Angie Bukley

- ***Class Lectures***

    - 16 Oct 2023: MSc - Space Transportation Economy (1 hr)
    - 13-17 Nov 2023: Space Sector Crash Course – Business & Management Lectures (5 hrs)
    - 12-16 May 2024: SSA CST Space Academy - Space Economy Lectures (2x 20 hrs)

14. John Templeton Foundation Grant

ISU, together with GWU (Washington) were awarded a grant from the John Templeton Foundation in order to study different aspects of future space exploration and the interaction with society. The basis of the output are:

- Peer-reviewed articles on a number of research questions
- Organization of workshops both at GWU and in ISU.

The three topics can be summarized as follows:

1. What is the effect of space policy on international relations?
2. Which type of governance will be applied to future exploration?
3. How can we make sure that society understands and supports space exploration?

In order to facilitate this research, under the funding of the grant, three postdoc researchers were hired in the reporting period (i.e. two in ISU for the topics 1 and 3, and one in GWU for topic 2).

In line with the ethical oriented aims of the Foundation, as a first step an ethical advisory committee was formed, called EAC (Ethical Advisory Committee). The composition of the committee has targeted to join a different spread of geographical and ideological opinions. The ethical committee is at present:

- Jacques Arnould, CNES, France (Theologist, Ethics Advisor)
- Daniel Capper, Denver Metropolitan University (Professor of Philosophy and Religion)
- Kathryn Denning, York University (Professor of Anthropology)
- Alice Gorman, Flinders University, Australia (Archeologist)
- Niklas Hedman, Sweden, COSPAR (former Acting Director UNOOSA)
- Margaret McLean, Santa Clara University (Applied Ethics)
- Kelly Smith, Clemson University (Professor of Philosophy and Biological Sciences)
- Antonio Yukio, former INPE, Brazil (Futurist)

In parallel with the aforementioned research papers, a first plenary event is planned in Washington at GWU from 3-5 December 2024, bringing together a range of experts to discuss the Future of International Cooperation in Deep Space. This 3-Day event features keynotes, plenaries, as well as a workshop element in order to facilitate productive interdisciplinary conversations regarding cooperation and bringing insight, especially, to the first research question of the grant, regarding space policy. Panel and discussion topics will include: geopolitical issues in space, emerging space countries, legal frameworks, and ethical considerations regarding exploration.

15. EuroSpaceHub Project

15.1. Background

In June 2024 ended the two-year EuroSpaceHub project. The project was an initiative of EIT (European Institute of Innovation and Technology) co-funded by the European Union. Recognizing that traditional (space) science and technology institutes of Higher Education did not sufficiently prepare their students to be able to start as entrepreneurs, the main objective was to look at solutions to improve this situation.

A consortium of four universities (Vilnius in Lithuania, Kiev Polytechnical Institute of Ukraine, UCM of Spain and ISU) augmented by outreach-oriented organizations (Lunex in the Netherlands and Collabwith in the Netherlands) was awarded the two years contract in order to analyze the situation and come up with a proposal for entrepreneurship oriented curricula.

As one of the aims of the projects was to increase partnerships, the network of the consortium widened gradually with additional links to investors and supporting organizations, such as CNES.

Fig. Presentation of EuroSpaceHub consortium at ESC 2024 in Oslo

The tasks which had to be performed can be grouped in two categories:

1. Achieve a number of Key Performance Indicators (KPIs) determined in the contract

2. Analyze the present situation and propose remedial actions.

15.2. Achievement of KPIs

The contract stipulated that during the period covered a number of targets had to be achieved in terms of

- Start-ups created or scaled-up (17)
- Students trained (895)
- Academic Staff trained (160)
- Non-Academic Staff trained (178)
- Partnerships created (20)

The figures between brackets show the number of verified results reported to the client at the end of the project (June 2024 status). They exceeded in all categories the targets set in the contract. As an example, the KPI put for students trained in space entrepreneurship was 600 (at the end nearly 900 were achieved).

Whereas evidently a considerable number was the result of targeted entrepreneurship training sessions in emerging space countries and scientific institutes, the funds also facilitated the organization of a number of different activities such as Hackathons (with secondary spin-off publicity for the ISU programs).

An example of such Hackaton was one organized in 2023 in Bremen at the SpaceTech event, in close cooperation with Leanspace, the company that started in the ISU Incubator.

Fig. The Hackaton participants at SpaceTech Bremen 2023 (co-organized with Leanspace)

15.3. Study Results Delivered

Each partner was responsible for a set of deliverables, while also supporting the deliverables of the other partners. For ISU, these were essential.

- Propose short curricula targeting space related students on entrepreneurship

Based upon the experience with this topic, training courses of different durations (from 3 days to 2 weeks) were designed and implemented, mainly at the location of the different partners of the consortium.

- Propose a business plan workshop and document the results thereof.

A previous work package, executed by another partner, made a survey both in industry and with startups on which skills were mainly lacking when recruiting new staff, involved in business development activities. It has to be noted here that in particular emphasis was made that social and presentation skills were strongly lacking according to this survey.

With this input ISU adapted the Business Plan competition, which was also opened to participants outside ISU. Two competitions were organized with the support of

EuroSpaceHub funding in 2023 and 2024. It might be interesting to note that the winning team of the 2023 competition lead to the creation by MSS alumni of a start-up, **Spectranet**[1] . The idea generated during the workshop was a better used of unused spectrum for topical events.

- Propose a 5-month postgraduate space entrepreneurship course.

Based upon the experience of ISU with designing courses this was the main task assigned to ISU. A 5-month hybrid program was proposed, with one week classwork followed by 3 weeks off-line group assignments. The overall schedule of such course is presented below.

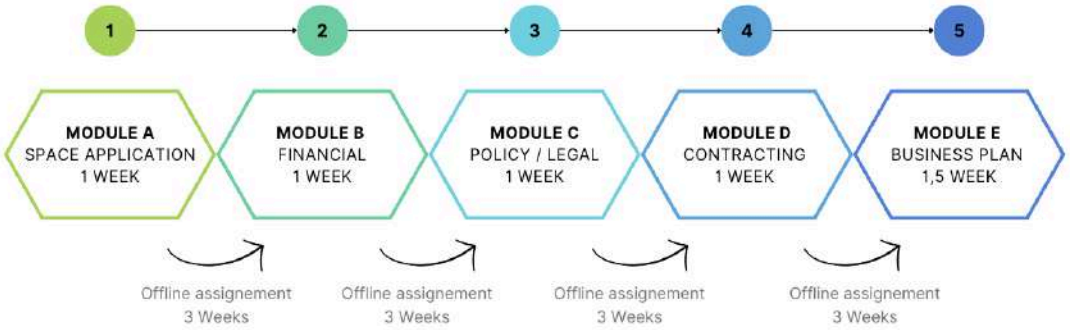


Fig. Top-level proposal for a 5-month post-graduate space entrepreneurship training course

The different modules were detailed in terms of learning objectives and workload proposed and presented to the client in the form of a training plan, expressing the interest of ISU to be willing to organize such course if funding would be provided.

- A benchmarking document with obstacle evaluation from previous cohorts

The EIT each year launches a number of initiatives of two years. EIT refers to this as a cohort in view of the timing, although the topics are in general widespread but mainly hi-tech oriented. It was the task of ISU to contact the cohort which finished and record the obstacles met.

- A suggestion for post-project follow-up measurement.

[1] www.spectranet.eu

In this report a comparison was made by Key Performance Indicators (KPI) used in different sectors. A number of KPIs, tailored to space entrepreneurship, were suggested to the client in case they wished to measure the success of the project.

Overall, the project provided financial means to ISU to experiment with different training models and to organize events, with the purpose to increase visibility to the ISU Incubator. As a secondary effect, ISU improved relations via the consortium with other universities and partners, for the benefit of potential student recruitment.

16. Conclusion

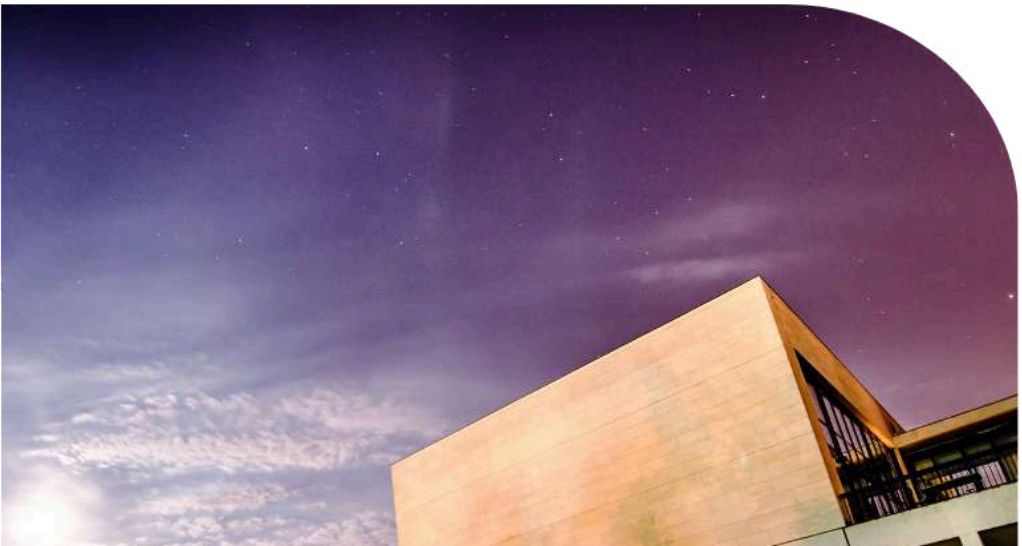
The 2023–2024 academic year has been a year of progress, growth, and innovation for the International Space University (ISU). The successful accreditation and implementation of the Master of Science in Space Studies, along with the continued evolution of the Master of Space Studies and professional programs, reaffirm ISU's commitment to excellence in interdisciplinary space education.

With a strong global alumni network now exceeding 5,800 professionals across 112 countries, ISU continues to shape the future of the space sector. Graduates are finding impactful roles in industry, government, research, and entrepreneurship, further strengthening ISU's reputation as a hub for space professionals.

The university's research initiatives have expanded significantly, with faculty and students engaging in cutting-edge projects that contribute to space exploration, technology, and policy. Strategic partnerships with space agencies, industry leaders, and international institutions have played a crucial role in enhancing the university's academic offerings and global reach.

As ISU looks to the future, its mission remains clear: to foster an international, interdisciplinary, and intercultural learning environment that prepares the next generation of space leaders. With continued innovation in curriculum design, strengthened industry collaborations, and the dedication of faculty, staff, and alumni, ISU is well-positioned to advance space education and contribute meaningfully to the broader space ecosystem.

The coming years will bring both challenges and opportunities, and ISU is well-positioned to embrace them, continuing its leadership in global space education and professional development.



Annexe 1: Faculty List

Click on the link below for a complete list of our esteemed faculty members: Central Campus Faculty Member, Faculty, Adjunct Faculty, and Associate Faculty. Discover the diverse expertise that fuels the success of our institution: Link to ISU Faculty list [2].

[2] https://www.isunet.edu/faculty/

Annexe 2: Research

Publications:

E. Ashworth, A. Fogtman, R. Huerta Lluch, V. Wotring, A. Winnard, T. Weber

The Potential of Health Supplements to Mitigate the Detrimental Effects of Ionizing Radiation: A Systematic Review. J Nutraceuticals Food Sci Vol.9 No.4: 45

R. Cai and S.-Y. Tan (2024), Are There Non-Business Days for Crime? A Small-Area Bayesian Spatiotemporal Analysis of Crime Patterns, Deviant Behavior, DOI: 10.1080/01639625.2024.2387659

R. Cai and S.-Y. Tan (2024), Exploring the relationship between income inequality and crime in Toronto using frequentist and Bayesian models: Examining different spatial scales of analysis, accepted in "Environment and Planning B: Urban Analytics and City Science"

J. Fey and W. Peeters, The Changing Economy of Space Applications and Exploration. A catalyst for International Cooperation? LSE Briefs (accepted for publication)

E.L. Martín, M. Žerjal, H. Bouy, D. Martin-Gonzalez, S. Muňoz Torres, D. Barrado, J. Olivares, A. Pérez-Garrido, P. Mas-Buitrago, P. Cruz, E. Solano, M.R. Zapatero Osorio, N. Lodieu, V.J. S. Béjar, J. -Y. Zhang, C. del Burgo, N. Huélamo, R. Laureijs, A. Mora, T. Saifollahi, J. -C. Cuillandre, M. Schirmer, R. Tata, R. S. Points, N. Phan-Bao, B. Goldman, et al. (2024), accepted by Astronomy & Astrophysics: Euclid: Early Release Observations -- A glance at free-floating new-born planets in the sigma Orionis cluster (arXiv:2405.13497)

D. Massari, E. Dalessandro, D. Erkal, E. Balbinot, J. Bovy, I. McDonald, A. M. N. Ferguson, S. S. Larsen, A. Lançon, F. Annibali, B. Goldman, et al. (2024), accepted by Astronomy & Astrophysics: Euclid: Early Release Observations -- Unveiling the morphology of two Milky Way globular clusters out to their periphery (arXiv:2405.13498)

W. Peeters, The Paradigm Shift of NewSpace. New Business Models and Growth of the Space Economy. New Space (2024) available online under https://doi.org/10.1089/space.2023.0060

R. Ramachandran, B. Sivaraman, J.K. Meka, K.K. Rahul, W. Khan, J.I. Lo, B.M. Cheng, D.V. Mifsud, B.N. Rajasekhar, A. Das, H. Hill, P. Janardhan, A. Bhardwaj, N.J. Mason, B. Sivaraman : Ultraviolet spectrum reveals the presence of ozone on Jupiter's moon Callisto (2024), Icarus 410, 115896

A. Roy, V. S. Surendra, R. Ramachandran, J. K. Meka, S. Gupta, P. Janardhan, B. N. Rajasekhar, H. Hill, A. Bhardwaj, N. J. Mason & B. Sivaraman. (2023): Interstellar Carbonaceous Dust and Its Formation Pathways: From an Experimental Astrochemistry Perspective, Journal of the Indian Institute of Science,103, 919-938

B. Sivaraman, K.K. Rahul, M. Ambresh, D. Sahu, J.K. Meka, S-L Chou, Y-J Wu, Divita Gupta, A. Das, J-I Lo, B-M Cheng, B.N. Rajasekhar, A. Bhardwaj, H. Hill, P. Janardhan, N.J. Mason (2023): N-graphene synthesized in astrochemical ices, The European Physical Journal D 77 (2), 24

V. Venkataraman, A. Roy, R. Ramachandran, H. M. Quitián-Lara, H. Hill, B. N. RajaSekhar, A. Bhardwaj, N. J. Mason, B. Sivaraman (2023): Detection of polycyclic aromatic hydrocarbons on a sample of comets, Journal of Astrophysics & Astronomy, 4, 89

Book chapter:

K.T. Keyser, V.E. Wotring, C.E. Strang, The Role of Acetylcholine and its Receptors in Retinal Processing, Editor(s): Darlene A. Dartt, Encyclopedia of the Eye, Academic Press, 2010, Pages 153e159, ISBN 9780123742032, https://doi.org/10.1016/B978-0-12-374203-2.00204-9.

Conference papers and invited presentations:

T. Adach, D. Ignjatovic, T. D. Mikesell, S. W. Ximenes; Surface And Geotechnical Surveying, A Preparation For Lunar Landing And Launch Pad Construction; VIIth Space Resources Conference – Towards Artemis Generation, Krakow, Poland, 2024

M. Belgiu, Y. A. Asmar, R. V. Maretto, H. La, S. Ronzhin, H. Thiemann, S. Kerkezian, M. Kolehmainen, JD. Bodenan, D. Ignjatovic, N. Peter, P. Partsinevelos, G. Petrakis, C. Maddock, E. Detsis -Gathering, structuring, and analyzing the space-related educational programs and their courses at the bachelor, master, phd, and continuous education levels, in: IGARSS 2024, Athens, Greece, 2024

D. Serrano, R.H.M Valencia, D. Ignjatovic Stupar; Evaluation of the Impact of Illegal Mining on Vegetation in the Venezuelan Amazon through Multispectral Imagery in: 74th Int. Astronaut. Congr., International Astronautical Federation, Baku, Azerbaijan, 2023.

V. Wotring: VIIth Space Resources Conference, Krakow Poland, Keynote Lecture: Technologies to support health in space and on Earth

V. Wotring: Health in Space Symposium – ISU, 12 December 2023. Panel discussion about the use of space for discovery, development, and production of medications.