International Space University Interactive Space University 2020

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1 Introduction

I applied to participate in the 2020 International Space University Summer Space Program (ISU SSP), originally schedule to be held in Beijing, China. Around January, the location of the venue was moved to Strasbourg, France at the ISU home campus. However, as time progressed, the world conditions proved inhospitable to travel, and the program was canceled. In its stead, ISU created a brand new program, called the Interactive Space Program (ISP). By participating in this program, I became part of the inaugural class of this new program, which was held for 5 weeks from late July to late August in the summer of 2020.

1.1 Myself

My name is Tamir Blum and I am a second year doctoral student at the Space Robotics Lab, within the Aerospace Engineering department at the Graduate School of Engineering at Tohoku University. I am Israeli American, and hope to work in the space industry in the long term, and so I wanted to attend ISU in order to better understand space more holistically, as well as meet future peers and potential mentors.



Figure 1: A photo of Tamir in the ISP20 crew uniform

1.2 International Space University

ISU is an university based in Strasbourg, France that focuses on space. It is taught in English and focuses on what it calls the 3 i's, international, interdisciplinary and intercultural. That said, sometimes additional i's are added, such as intergenerational. What this represents is the diversity that ISU encomposses and the values they try to uphold.

1.3 Interactive Space Program Backstory

In the year 2120, the teams are spread across 3 outer space habitats: one in Earth orbit, one on the Moon and one on Mars, with Earth serving as Mission Operations Control (MOC). These three teams needed to review the space technology of 2020 and to give guidance on how to monitor, prevent and mitigate their effects using this space technology (respectively for each habitat).

1.4 Interactive Space Program

The focus of ISP20 was the usage of space and space technology for the prevention/preparedness, monitoring and mitigation of pandemics.

ISP was created given the COVID-19 induced travel difficulties of 2020, following the cancellation of the SSP program. It is too soon to tell whether this will become a regular yearly program or just a one time event.

ISU is a 5 week intensive program packed with lectures, workshops and a team project. On top of that are additional events, which leads to a very pact schedule. Scheduled on the calendar, each day between 10-11.5 hours. However, in practice, meetings with teammates and other commitments often added several hours each day.

2 Outline of the 2020 Interactive Space Program

2.1 Online Program

Hosting the program online had both advantages and drawbacks which I wanted to touch on briefly.

Perhaps the biggest advantage, which was a favorite of many of the participants, was the introduction of the first ever mentorship program. This allowed participants to talk to past ISU alumni or ISU connected individuals. This will be further detailed below.

One of the biggest drawbacks was not being able to actually see everyone in person, limiting the ability to connect. Having to work in different time zones was also difficult.

2.2 Time Zones

Working internationally online often means having to contend with different time zones. ISP20 structured its work time around European (France) time, particularly, using UTC for every event.

In JST, the typical day would start around 4:30pm and then end between 2am-3:30am. As such, I had to adjust my sleep schedule to wake up and go to sleep later.

In UTC time, the day started at 7:30am and would end around 17:00 UTC on early days or 18:30 UTC on later days.

Between the members and the staff within my own team, there timezones ranged from West Coast, USA (UTC-7) to Japan (UTC+9). While this made it harder to work together all at once, it taught us how to divide work and pass information along to one another.

2.3 Participants

There were 86 participants from 30 countries, with the majority of participants coming from Asia. There was 1 other person from Japan, for a total of 2 including me. Within Asia, the most numerous was India. As the program was online, the class demographics shifted, with many fewer students coming from China, for example (only 1). Israel also had only 1 student (excluding me).

2.4 Faculty and Staff

The faculty and staff during ISP held the daily seminars and workshops, with many being open to have conversations or joining activities outside of the lectures. They came from varied backgrounds including law, engineering, arts and business. Over 100 faculty staff and alumni joined the mentorship program.

2.5 Logistics and Other Details

ISP ISU is a 5 week program conducted online. This program offers participants the chance to interact with hundreds of space professional and access to an extensive network of alumni of over 5000 people from over 100 countries. Additional, many workshops and lectures are held with experts from across the world. The application deadline was 31 May 2020. The tuition fee of ISP20 was 7500 euros.

As a replacement for ISU SSP, I was signed up for two programs: the Southern Hemisphere SSP 2021 (SHSSP) and the brand new ISP 2020. This report corresponds to the ISP, following its completion, but before SH SSP has taken place. The cost for the two programs was 16000 euros, half covered by ISU, half by Tohoku University Dispatch Program. While the original SSP program is a 2 months, in person program providing housing and food, ISP is online and thus is not concerned with housing and food. This has the benefit of making the program cheaper, however, requires a larger time commitment, as I had to cook all the food myself. It also limited our ability to connect, which is easier in person. SHSSP should be in person for about 1 month, which would have been a great supplement to ISP due to the in person component. However, the in person component was canceled and it will take place online instead.

3 Curriculum

3.1 Overview

ISP consisted of daily seminars, workshops and a team project. These were all spread out over the 5 weeks, except for the last week, which was devoted for only the team project.

UTC	W0	W1	W2	W3	W4	W5		UTC	W0	W1	W2	W3	W4	W5		
17:00- 07:30				Freedo	m!			17:00- 07:30		Freedom!						
07:30- 09:30	Freedom!	Daily Seminar						07:30- 09:30	Freedom!		Wor	shop				
10:00- 12:00	Freedom!		Team Mission or Mentoring			Team Mission		10:00- 12:00	Freedom!	Team Mission o Mentoring			or	Team Mission		
12:00- 13:00	Launch	Launch						12:00- 13:00	Launch	Launch						
13:00 - 14:00	Freedom!	Handover OR Public Event OR Refueling						13:00 - 14:00	Freedom!	Handover OR Public Event OR Refueli			vent OR Refueling			
14:00- 17:00	Freedom!		Worl	kshop		Team Mission		14:00- 16:00	Freedom!		Daily S	emina	r	Team Mission		
18:00 - 19:30	Workshop		Free	dom!		Freedom!		18:00 - 19:30	Workshop		Free	dom!		Freedom!		

Figure 2: Example schedules we were given pre mission.

Daily Seminars	
Satellite Telecommunications	Remote Sensing
Spacecraft Engineering	Space Mission Design
Life Support Systems	Space and Society
Tele-education	Economic Aspects of Space Activities
Policy Rationales for Space Activites	Space Players
Tele-medicine and Tele-epidemiology	The Space Environment
New Space and Entrepreneurship	Navigation, Position and Timing
Legal Underpinnings of Space Activities	Biological Contamination
Human Performance in Space	Management of Space Projects
Orbits	

Table 1: A table of all the daily seminars during ISP20

3.2 Evaluation Method

This year, there was no evaluation, only mandatory attendance. There were no quizes or exams.

4 Core Lectures - Daily Seminars

The daily seminars (DS) consisted of 1.5 hour classes taught by various faculty about a wide range of subjects, ranging from law to engineering. Classtime included the lecture itself, along with a short break and a Q&A. The length of each section varied depending on the lecturer. There were a total of 19 daily seminars: Satellite Telecommunication

4.1 Examination

There were no examinations for ISP20.

5 Workshop - IWS

5.1 Overview

The interactive workshops (IWS) allowed for more hands-on sessions, in smaller groups than the core lectures. These were smaller than the daily seminars, with 10-30 students depending on the session. During the IWS, we would often be given a task and be broken down into small groups of roughly 3-6 students.

5.2 Departments

Workshops were 2.5 hours and spread across 5 disciplines: humanities (HUM), engineering (ENG), Business and Management (MGB), Policy, Economics and Law (PEL), and Applications (APP).

We had a total of 10 workshop sessions, however, more than 10 workshops existed, so they tried to give everyone 2 sessions per discipline.

One workshop, for example, was about identify rocks titled Astronaut Field Geology. This is modeled after what an astronaut might have to do when surveying an area, and consisted of an introduction to different types of rocks and how to classify them, followed by sketching and trying to identify a rock we found nearby our houses. I particularly liked this workshop as it was one of the more active workshop and it allowed me to use some of the knowledge I gained in the past semester when I took one of Tohoku University's geology classes. This workshop was taught by Michaela Musilova, who is the director of the Hawaii Space Exploration Analog & Simulation or HI SEAS. This is a long duration analog mission cite in Hawaii simulating Mars conditions.



Figure 3: A drawing of a rock from Sendai's Hiroseigawa river

6 Team Project

6.1 Overview

The team project during ISP started from week 1 and went all the way until the end. The theme of this ISP was about how space technology can help us monitor, prevent and mitigate pandemics. This technology included using satellite sensing technology, as well as tele-medicine enabled by satellite communications/GPS and even biological efforts such as testing drugs in space. In total there were 3 groups, also called habitats. My group was the Moon Habitat, which focused on the monitoring of pandemics. While each group primarily worked independently from the others, we needed to communicate frequently to ensure that our projects would come together synergistically in the end. Each group was responsible with creating a 20 page report, which would be pooled in from the three habitats to form a 60 page report, in addition to a short executive summary at the beginning.



Figure 4: The graphics from each of the habitats and from the executive summary.

6.2 Use of Space for Pandemics

We had 5 weeks to work on the team project. The moon habitat consisted of around 30 students. ISU typically does not give project teams any particular structure, and so it is for each group to form and decide for itself. While this gave us more freedom, it consumed a lot of time. Due to the jam packed schedule, the teams did not have much time to meet the first couple weeks and so it was hard to have an actual conversation with the full team which can be time consuming given the size and number of opinions. This created some friction and inefficiencies.

Roughly 2 weeks were lost in forming the group structure, deciding roles and choosing a starting direction. There were two main factions within the group, the primary which wanted a more flexible structure where we would choose a direction and then people can decide which aspect they would like to work on. the second faction wanted a more authoritarian direction where people would be told where to work without regard for their interests or opinions. The group decided to go with the former option, however, this struggle made the environment at times hostile or toxic. This did however help us connect to each other and better understand one another in the end.

In the end we decided to break the leadership responsibilities into three groups: internal coordinators, who lead team meetings; external coordinators, in charge of outreach to contacts outside of ISU we wanted to talk to; and interhabitat communicators, who would hold discussions with the project coordinators and the other teams in order to make sure the project is driven in the right direct and that all three projects fit together. The internal coordinators and the interhabitat communicators together formed an "executive team" responsible for making decisions to be approved by the whole group. I served as one of lead interhabitat communicators (there was 1 specialist for each of the other teams [2], and 2 leads including me).

Following the actual start of the work, our team decided to look into three main aspects: the medical side, the engineering/data side and misc side (business, ethics, politics). Each of these subjects had a working group, with a leader for each one, which then joined the executive team. As I previously led several work sessions related to satellite data at the start of the team project, I joined the medical group in order to expand my understanding of the science behind pandemics.

The main focus of our research was on the types of data available, what it can be useful for, and where we should go in the future. This ended with a recommendation for the UN to form a pandemic charter similar to the one for disasters, and to try to incorporate private businesses, which are rapidly growing.

We also looked at several case studies to see what precedent there was and how societies have responded in the past. Ebola, for example, was the first time the disaster charter was activated for a pandemic. We found that several pandemics have features that can be tracked more easily than others. For example, with COVID, it is easy to monitor the economic effect of COVID, such as more planes parked at an airport. However, it was harder to try to link this to future infections. Potential work to use AI to make guesses given all the information would take longer than we had during ISU. That said, other pandemics, such as those spread by ticks, i.e. vector-borne diseases, can possibly be related to environmental conditions. Thus, satellites, which can track climate change, can be quite insightful for telling about what areas might be susceptible to these vectors/diseases.

In total, our group probably had about 1 week-1.5 weeks of time to actually work on the project, with this time also being filled with other activities such as seminars and workshops. Several people expressed interest in counting side projects following the end of ISP, such as using satellites for tracking illegal human trafficking or environmental issues.

7 Coaching and Mentoring

7.1 Overview

ISU held coaching sessions and mentorship sessions. The coaching sessions were held between members closely associated with ISU, while mentorship sessions were held by both members closely associated with ISU and former alumni. Coaching sessions were held 1:1 whereas the mentorship sessions typically had 2-10 students. Coaching sessions were also held weekly (depending on the coach and participant), whereas mentorship sessions were held several times a week.

7.2 Coaching Program

Each participant was assigned a coach from the ISU faculty, who they would meet with on a weekly basis. Typically each coach had several participants, however, the meetings were largely held 1:1. The 1:1 atmosphere made it much easier to connect and get closer to the coach. My coach was Professor Mike Simpson, former ISU president. These sessions were incredibly rewarding, as he could give me advice about the team project, as well as about my career and in general we held very interesting conversations. This was probably one of the most rewarding parts of the program.

7.3 Mentorship Program

ISP20 introduced the mentorship program for the first time, possible due to the online nature of this expedition. This was one of the best features of the program, allowing us to talk to past ISU alumni to hear personal stories, get career advice, team project advice and connect with these more experienced individuals. This program was broken down into mandatory sessions in the morning, often with 2 students to 1 mentor, with an optional session in the evening, often with 8 or more students to 1 mentor. In total, there were roughly 8 optional and 6 mandatory sessions, for a total of 14 sessions. While at times it is nice having multiple students in a session, as the atmosphere can be more lively, at other times it can become hard to ask questions. That said, each mentorship session was very different as the format was left up to the mentor and group to decide each time.

Perhaps my favorite session was with John Connolly, who works in the human exploration division of NASA. Hearing him talk with firsthand NASA about the past and future of crewed programs was inspiring and insightful. This is particularly exciting given the renewed intensity of deep space missions, such as the Artemis mission to the moon, along with more private industry in space than ever before. Other mentors include NASA's Steve Brody, NASA Ames chief scientist, Jacob Cohen and Tohoku Univerity's Professor Kazuya Yoshida.

8 Extra Events

8.1 Pre-expedition Workshops

Several workshops were held in the weeks leading up to ISP. This included a 3 hour workshop about wallet design entitled "Design Thinking Workshop" by the NASA Chief Innovation Officer for Engineering, Dr. Omar Hatamleh. This workshop focused on many design principles one needs to take into account when creating a product, such as thinking of the customer as well as a good mix of creativity/realistic thinking. Several communication workshops were led by Imre Végh. This included how to work in a group, as well as the different roles/personalities that people have. During one of these sessions, we took the



Figure 5: John Connolly of NASA

Belbin test, a personality classifier with around a dozen metrics. The communication workshops were some of the most rewarding of all the workshops, and the content was extremely useful for forming the teams.

These workshops were announced a little abruptly and held at early hours such as 2-3am, which made the weeks before ISU a little rough, but the content was good. It is understandable given the last minute planning of ISP, and being a student it is nice as I have a flexible schedule, however it was a little more rough for some of the people who have kids and full-time jobs.

8.2 ISP20 Opening Ceremony

The opening ceremony was live streamed on Youtube and introduced the program to all the participants. It also introduced the participants to the community. Each student was given a plant, to be buried somewhere at the ISU campus, following a USSR tradition, where each astronaut has a tree planted for them before their first trip to space. During the livestream, there were some technical difficulties. A short break in transmission occurred at the beginning, following successful reconnection. During the closing of the ceremony, when countries were being introduced, the connected broke again halfway through all the countries. Students were to be introduced based on nationality, and so I was to be introduced under both Israel and the United States, however, the program finished abruptly after Israel. Thus many countries were left out, however, the participants did not really mind much. This impacted our decision to prefilm the final documentaries.

Link Part 1: https://www.youtube.com/watch?v=Hpo3Blp2hvc Link Part 2: https://www.youtube.com/watch?v=xVKVV6jEp_o

8.3 Crew Talks

One of the events held this year was crew talks, where different participants could sign up to give a short 10-15 min presentation, with optional attendance for everyone. Each session was composed of 5-7 speakers about a range of topics from hobbies to research.



Figure 6: The third crew talk session consisted of 7 people.



A total of 3 of these were held, and I participated in the last one, where I presented about my research and my experience studying abroad in Japan.

Figure 7: The opening slide of my presentation.

During my talk I shared not only about my experience at Tohoku University but of my time around Japan allover. This included visiting onsens, one of my favorite winter activities, as well as learning Japanese and different sightseeing spots within the country.

My presentation was broken down into 3 different parts, starting with my research, talking a tiny bit about my lab, the space robotics lab, and then ending with my experiences in Japan. Many of the participants enjoyed hearing about Japan and expressed an interest to go in the future.



Figure 8: The description of my crew talk shown to the other participants.

8.4 Alumni Conference

An ISU tradition is an annually held in person alumni conference during SSP. Since SSP was canceled this year, they held it during ISP, online. The conference ran 24/7 for 2 days, an entire weekend straight for all the different timezones. NASA Administrator Jim Bridenstine was the keynote speaker, followed by a talk between John Connolly and astronaut Jessica Meir. Other sessions included a talk about the Israeli space program, a talk about the UAE space program, a presentation by a JAXA researcher about Hayabusa 2 and many others.

https://www.youtube.com/watch?v=-dkNl6GZMI8



Figure 9: Jim Bridenstine giving the keynote speech.

8.5 Habitat Competition

8.6 Astronaut Panel

On several occasions, we had the chance to hear from past and current astronauts, including NASA's Jessica Meir, who was part of the first all female space walk.

One event in particular, the astronaut panel, was a discussion of current and past astronauts from 3 different countries: the USA, Russia and Canada. Alongside Jessica Meir, the other astronauts include Canada's Robert Thirsk and Russia's/USSR's Oleg Atlov. The event was moderated by Kris Lehnhardt of NASA. These astronauts are notable not just for their varied countries, but also varied countries. Amongst the three were doctors, scientists and engineers.

This was a great chance to hear not only about what it is like to be an astronaut, but also their respective stories growing up and how they ended up on their path. Oleg Atlov, for example, mentions that he did not actually apply for the role. Instead he was asked to take it. Robert Thirsk mentions he was also interested in sports and had multiple dreams and goals.

Time is left at the end to ask questions. In this case, an online poll was created where everyone could pose a question, and then the other crewmates and staff can either vote it up or down. The questions with the highest votes were asked.



Figure 10: The moderator of the astronaut panel



Figure 11: American astronaut Jessica Meir



Figure 12: Former Canadian astronaut Robert Thirsk



Figure 13: Former USSR astronaut Oleg Atlov



Figure 14: Former Italian ESA astronaut Paolo Nespoli gave multiple talks during ISP

Former Korean astronaut Yi So-Yeon was also present at several events, including making a suprise visit at a cooking session. I unfortunately missed the cooking session as it was around 2 am.

Link: https://www.youtube.com/watch?v=KiF4N-HA-lg

8.7 Dancing

There were daily dancing sessions for 5 minutes before the Daily Planning Conference (DPC). A common song was an ISU tradition, the "Little Apple" dance. There were also two dance parties through ISP, the first during the alumni conference after the space masquerade and a second after the closing ceremony.

Link: https://www.youtube.com/watch?v=Kg8GQxE9yv0



Figure 15: Dance party DJ and Moon habitat crew member Maria

8.8 Closing Ceremony

The closing ceremony was live streamed online. There were two main parts to the ceremony, first the "Mission Documentaries" and then the "Graduation". During the former, each of the 3 teams presented for 30 minutes about their project. All three teams prerecorded the videos with a common theme. The closing ceremony consisted of several speeches followed by each student receiving a certificate virtually.

Link 1: https://www.youtube.com/watch?v=oYDY0qjk80w Link 2: https://www.youtube.com/watch?v=lVRsGuHNNuk

9 Conclusion

Attending ISP20 was really a great opportunity and experience. I was able to network with many people, some older, some younger, and others the same age as me. Some will be my future coworkers, other my mentors. Thus this was a great way to form connections in the space community, which is generally tight nit and small. Due to the online nature, I unfortunately could not experience the program in person, but it was made easier on my PhD schedule with a shorter time frame and without the need to travel. I will have many memories and experiences from ISP that will last my life and will certainly meet some of my friends in the near future. Between the lectures, workshops, projects and all the mentorship/coaching sessions, I feel an even deeper passion for and understanding of space and have clearer goals coming out.

I would definitely recommend ISU to future Tohoku University students interested in space!