



# SPACE STUDIES PROGRAM 2022

PORTUGAL, OEIRAS  
38° 44' 13.4802" - 9° 18' 9.5646"  
July - August

Space Studies Program 2022

Participation Report

Tohoku University,  
Aerospace Engineering  
Master's 1st year

Danish Ai

# SPACE STUDIES PROGRAM 2022



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PORTUGAL  
SPACE

TÉCNICO  
LISBOA

OEIRAS  
VALLEY

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## 1. Introduction

The International Space University (ISU) provided nine weeks from June 25 to August 26, 2022, for the Space Studies Program 2022 (SSP22) in Portugal. It was held at the University of Lisbon (Instituto Superior Técnico) in Oeiras. Since I participated in SSP22 using the International Space University Dispatch Program of the Institute of Fluid Science, Tohoku University, I write a report here.

### 1.1 International Space University

International Space University (ISU) is a non-profit organization established in 1987 as an international higher education institution to promote space development and utilization around the world and to nurture core figures for future space development and its peaceful use. In 1987, the International Space University was founded by three graduate students at the Massachusetts Institute of Technology, Peter H. Diamandis, Todd B. Hawley, and Robert D. Richards. In 1995, the headquarter campus was moved to Strasbourg, France, and a permanent ISU facility was established, making it a more full-fledged organization. Today, with the Central Campus in Strasbourg, hub campuses in the United States and the Asia-Pacific region, and partnerships with leading space agencies around the world, ISU is building a network all over the world. For the past 35 years, it has produced 5,400 graduates in 110 countries, astronauts, entrepreneurs, leaders in the space industry, and government workers. ISU has formed an international space ecosystem. ISU currently offers a one-year Master of Space Studies (MSS) and a one-year Master of Science in Space Management (MSM), two months. Space Studies Program (SSP) and the five-week Southern Hemisphere–Space Studies Program (SH-SSP). In any program, students can learn about all areas of expertise related to space, such as space science, astronautics, systems engineering, space policy and law, business and management, and the relationship between society and space. Students can develop the ability to cooperate and solve difficult problems.

## 1.2 Educational Philosophy

ISU has three "I" in its educational philosophy. Each "I" means the following:

### 1. Interdisciplinary

Provide an educational program that encompasses a wide range of specialized fields such as space science, engineering, economics, space law, and policy, and aims to equip students with the ability to solve complex space development problems while acquiring multifaceted perspectives.

### 2. International

to provide students with the opportunity to build a worldwide network and acquire the ability to solve problems with strong teamwork so that they can participate in international competitions and space projects that require international cooperation.

(Fig. 1.1)

### 3. Intercultural

interact with many people from different countries with various problem solutions and acquire the ability to respond to the multicultural environment of the global space community.



Fig. 1.1 SSP22 Participating Students, chair and TA (TP)

## 2. Overview of Space Studies Program 2022 (SSP22)

### 2.1 Space Studies Program (SSP)

The Space Studies Program (SSP) is a two-month graduate-level program that began in 1988 and is held in different countries and regions from July to August every year. Since people of various nationalities and backgrounds will gather, it is possible to form a very wide-ranging, international, and interdisciplinary connection. As a condition for applying to SSP, academic ability equivalent to that of an undergraduate degree and proficiency in English is required. Under the three "I" mentioned above, ISU seeks students who are unique, self-motivated, and free from prejudice. Excellent knowledge, inquisitiveness, cooperation, and originality in each specialized field are required. In the SSP, which has about 100 participants from about 30 countries, the age group of students is around 22-50. The fourth "I" - intergenerational - is added to the educational philosophy. Table 2.1 shows the previous SSP hosts, the number of participating countries, and the number of participants.

return	year	Host	Number of participating countries	Number of participants
1	1988	Cambridge, USA	21	104
2	1989	Strasbourg, FRANCE	25	125
3	1990	Toronto, CANADA	30	130
4	1991	Toulouse, FRANCE	26	126
5	1992	Kitakyushu, JAPAN	28	98
6	1993	Huntsville, USA	26	125
7	1994	Barcelona, SPAIN	29	106
8	1995	Stockholm, SWEDEN	29	104
9	1996	Vienna, AUSTRIA	26	96
10	1997	Houston, USA	25	88
11	1998	Cleveland, USA	29	88
12	1999	Nakhon Ratchasima, THAILAND	24	81
13	2000	Viña del Mar & Valparaiso, CHILE	26	95

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return	year	Venue	Number of participating countries	Number of participants
14	2001	Bremen, GERMANY	29	95
15	2002	Pomona, USA	30	99
16	2003	Strasbourg, FRANCE	31	107
17	2004	Adelaide, AUSTRALIA	27	114
18	2005	Vancouver, CANADA	27	100
19	2006	Strasbourg, FRANCE	27	104
20	2007	Beijing, CHINA	26	117
21	2008	Barcelona, SPAIN	27	112
22	2009	San Francisco Bay Area, California, USA	35	131
23	2010	Strasbourg, FRANCE	29	120
24	2011	Graz, AUSTRIA	21	119
25	2012	Melbourne, Florida, USA	31	134
26	2013	Strasbourg, FRANCE	24	99
27	2014	Montreal, CANADA	32	123
28	2015	Athens, Ohio, USA	26	99
29	2016	Haifa, ISRAEL	25	103
30	2017	Cork, IRELAND	26	112
31	2018	TU Delft, THE NETHERLANDS	36	135
32	2019	Strasbourg, FRANCE	37	127
33	2020	× (Covid Pandemic)	×	×
34	2021	Granada, SPAIN, Strasbourg, FRANCE	33	111
35	2022	Oeiras, PORTUGAL	37	107

## 2.2 Place

SSP22 was held at the Instituto Superior Técnico in the town of Oeiras, about 10 km from Lisbon, the capital of Portugal. Oeiras was originally a popular summer resort for the aristocracy and wealthy for centuries.

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It was a beautiful city where you can see many buildings with the motif of Vasco da Gama, which can be called a symbol of Portugal. (Fig. 2.1, 2.2)



Fig.2.1 Townscape of Oeiras, Portugal



Fig.2.2 Oeiras, Portugal

During my stay in Portugal, it rarely rained, the weather was always sunny and very pleasant. Although it was summer, it was dry with an average temperature of 25°C to 30°C, the town of Oeiras was relatively cool because it was close to the sea. Unlike the very humid and hot climate of Japan, it is a Mediterranean climate unique to Europe. Most of the SSP took place in the town of Oeiras, and lectures were given at the University of Lisbon, which is the host, but occasionally as part of the program, we went to places like Porto.

## 2.3 General Participants of ISU

SSP22 was held in Portugal for the first time and was held in Europe, so there were about 107 participants from 37 countries despite the influence of COVID (Fig. 2.3).



Fig. 2.3 SSP22 participants (before the party started after the lecture)



However, due to the influence of COVID, SSP was held both online and face-to-face, so the total number of participants was 15 online and 92 face-to-face. Participants were mostly from Portugal, France, the United Kingdom, Israel, and India. There were many participants from the Netherlands, as well as other European and Nordic countries. From this SSP, there were first-time participants from the Maldives. Also, there were some participants from African countries such as South Africa. However, unlike previous years, there were very few participants from Asia except for India, and there was not a single participant from China (although there were usually about 30 participants). (It is thought that the number of participants was small due to the discord with the ISU, which is said to have occurred in the previous SSP, and the influence of COVID). One student from Korea, one from Thailand, and one from Japan was me. the first-year master's students at the Tohoku University.

The average age was 31, the youngest was 22, and I was the 23-year-old, so I participated as a fairly young participant. As for the background, nearly 60% of the participants had engineering backgrounds, which was an unusual feature of this SSP. Other participants had various backgrounds such as law, information science, life science, physics, and architecture. Approximately 40% were bachelor's degree holders, 52% were master's degree holders, 8% were doctoral degree holders, and most of the bachelor's degree holders were currently working participants.

## 2.4 Host

SSP22 was hosted by Portugal Space and the University of Lisbon (Instituto Superior Técnico) (Fig. 2.4 Fig. 2.5).



Fig. 2.4 Host Portugal Space

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Fig.2.5 University of Lisbon (Instituto Superior Técnico)

The University of Lisbon has several campuses scattered around Lisbon, and the location varies depending on the department. Most of the lectures were given at the Instituto Superior Técnico (IST), Faculty of Engineering. But occasionally in the ceremony hall of the University of Lisbon and on the Faculty of Medicine, Science campus. There were cases where events were held in special auditoriums. In addition, the GLEX Conference was held at the Lisbon Congress Centre, Sintra Air Base for the model rocket launch event, briefing session by incubator companies in Coimbra, solar observatory tour, cave exploration experience in São João das Lampas.

## 2.5 Accommodation

SSP22 officials, staff members, and participants stayed at Smart studios Carcavelos. There were washing machines, dryers, and irons on the first basement floor, and the first floor had a lobby, study room, and a relaxing lounge with a TV. The 2nd to 4th floors were guest rooms, and most of the ISU participants were staying. Also, there were several other program participants. In addition, the rooftop was free to come and go, and everyone gathered almost every day until late at night for the Rooftop party. The room is a private room, equipped with a unit bath, small kitchen, bed, refrigerator, and study desk.

It was very comfortable. However, it should be said that it is a characteristic of Europe, there was only a light fan attached to the ceiling, and there was no air conditioning. It was hotter than expected during the day and surprisingly cold at night, so some participants needed blankets and complained about the lack of air conditioning. As for me, I was very satisfied with this environment because I was a student. The room was cleaned twice a week, so there was no problem. For the first week, I needed to buy daily necessities such as drinks, snacks, toilet paper, and detergent, and I was looking for time to go to the supermarket.



Fig. 2.6 Smart studios Carcavelos Exterior (left) Room interior (right)

## 2.6 SSP Daily Life

SSP is basically a very busy program of events, and every day was full of new experiences. I will explain in this section what kind of days and one week I spent during SSP. The place where we participants were staying was about 30 minutes away from the university by bus, and we had to take the shuttle bus at 8:15 every morning to be on time for classes that start at 9 a.m. (Fig.2.7).



Fig. 2.7 Riding the morning shuttle bus

Breakfast was served in the lobby catering from 7 in the morning. The menu was bread, cheese, ham, jams, bananas, apples, coffee, and fruit juices. I was satisfied with this content. Most days, I got up early to finish breakfast, or packed breakfast in a bag and ate it on the bus. However, for two months, the menu was completely fixed for breakfast, so many members seemed to be dissatisfied. The fact that it takes 30 minutes to get to the university was said to be a problem of SSP22, but I was able to talk with many participants and deepen exchanges, so I think it was rather good. After arriving at the university, we relaxed until the start of classes. There was an environment like a courtyard space inside the university and many participants sat in the Yogibo and enjoyed chatting (Fig. 2.8).

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Fig. 2.8 Working on IST University campus (left), YOGIBO (right)

After that, we had two 90-minute lectures (detailed in section 2.9), two-hour lunch (detailed in section 2.8) at around 13:00 in the cafeteria (detailed in section 2.8). Then participate in workshops from 15:00, have dinner in the cafeteria around 18:00, and at 20:00 participate in evening panel sessions, and more. Sometimes all events ended at 21:30 or later, and when I returned to the dormitory, it was usually after 22:30. After 23:00, many people were resting in their rooms or relaxing in the lobby, but they were drinking at the rooftop party. Such weekdays, rarely similar Saturdays, but Sundays were free. Therefore, on weekends, we went out drinking in Lisbon, traveled to Portugal, or spent time in Oeiras. Of course, there were many other events, which will be described in the following chapters.



## 2.7 SSP22 participants

When I graduated from SSP22, I was surrounded by many friends and had many familiarities, but not everything went well from the beginning. I had been abroad many times, and I thought that I would be able to adjust to the surrounding environment quickly. Also, I could use English without any difficulty. However, it turns out this idea was completely wrong. For the first week or two, I was able to interact with and get to know many participants due to my open characteristic, so I thought everything was going well. However, although I gradually became friends with each person, I began to realize that I was not in a group. The participants of the SSP were basically all highly capable and able to interact with their surroundings, but around the third week, some friend groups appeared. Group of Europeans from the Netherlands, Germany, Australia, and France, groups of Indians, and groups of the age group for example. From there, I actively talked with others, worked on lectures and workshops together, and gradually deepened friendships by participating in evening drinks and trips. I became very close to some of the Italian, Portuguese, and French groups. I feel very glad that we became so close that we cried to each other at the end of SSP. I felt that I was finally getting used to the environment, but the situation was not so easy. From week 5, the need for members to collaborate on projects gradually emerged, and we faced new differences. The way of committing to projects differed depending on the cultural differences and work methods, and the way of thinking was different. Not only that, but I had to think about how to become a member who is needed in the project. The successes and failures of each project will be described later. However, by showing what you can do, stop staying in the place so-called Comfort Zone, and trying to take challenges, gradually solved this problem and was able to become a member required by team members. This is another major achievement that I have done at SSP22. In retrospect, all these experiences may be classified as culture shock. Not only the differences in general eating habits and greetings, and personality differences are culture shock, but there is a high level of culture shock in how to proceed with the project, how to perceive it, and how to make harmony with friends.

## 2.8 Dining

SSP22 had catering services for breakfast, a cafeteria for lunch and dinner, and menus at partner restaurants on weekends and holidays. As mentioned above, breakfast consisted of bread, fruit, coffee, and juice for two months. There were quite a few complaints in this regard, but they were never resolved. At SSP, there is a place once a week for participants to share their reflections and requests for staff from the past week. Most of them were dissatisfied with the meal. The complaints from vegetarians and vegans were tremendous, and I felt that all the requests were childish. There were also cultural differences here, and mainly European people had a style of expressing not only their own opinions but also complaints. I remember being surprised and stunned by someone like me who has become accustomed to the culture of reading the atmosphere as we normally do in Japan. Lunch was served in the cafeteria, most of the dishes were Portuguese, and I was able to enjoy all the menus (Fig. 2.9 2.10).



Fig. 2.8 Example of the menu I ate at lunch

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Fig. 2.10 Lunch at the university

Famous dishes in Portugal include Codfish, bakariau croquettes, and pastel de nata for dessert, and I remember they were very tasty (Fig. 2.11).



Fig. 2.11 Examples of Portuguese cuisine

However, most of the dishes were salty, many of the desserts provided in the cafeteria were too sweet, and the white rice was not tasty at all. Therefore, in most cases, vegetables, side dishes, and French fries were the basic menu I took. Dinner had almost the same menu as lunch, and you could order a beer. I had taken it as normal to order and drink beer in the school cafeteria, but when I looked at it objectively, I realized that it was a very rare sight. In addition, meal time in the school cafeteria is also a valuable time to eat with the teachers who were giving lectures at the Core Lecture, and you can talk with astronauts or other experts ( Fig. 2.12). I feel that this was a very valuable time that can only be experienced at SSP.



Fig. 2.12 Me talking to former astronaut Jeffery A. Hoffman (right) during lunch (left)

Eating with such a lecturer was a contest, and I actively tried to sit nearby them. Sometimes I could barely keep up with advanced conversations, but I learned that it is very important to ask questions.

## 2.9 Curriculum

The SSP program is described in Fig. 2.13, it is divided into three phases: "Core Lecture", "Department Activities", and "Team Project".

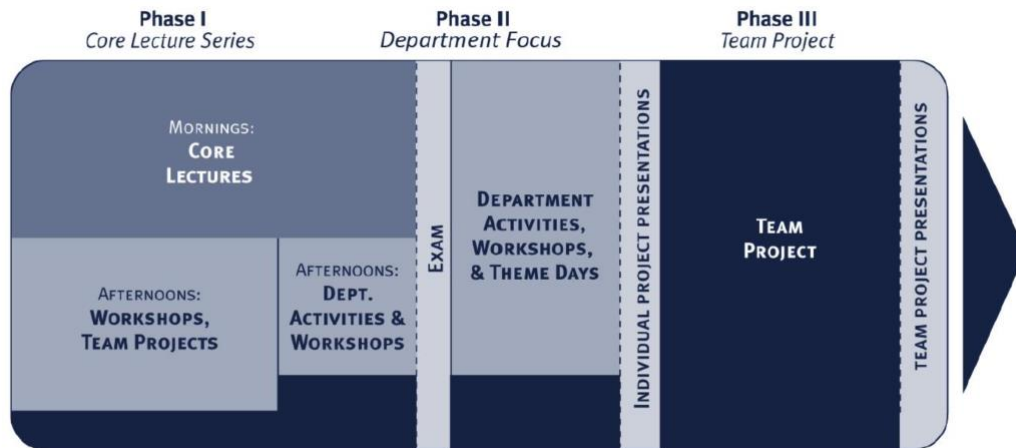


Fig. 2.13 SSP program outline

Details of each activity will be described in Chapter 3 and later, and there were also various workshops to learn how to think and communicate with people. There were two types of workshops, those for all employees and multiple choice, but the elective workshops were workshops on the use of 3D printers on Mars and the Moon, learning the basics and conceptual design of artificial satellites, to develop LEGO robots by Professor Kazuya Yoshida of Tohoku University, and to predict the design of spacecraft moving between planets, learn about the current missions of lunar exploration, think about future missions, discuss risk management and necessary technologies for lunar probes. In this way, SSP prepared a wide range of workshops, and the workshops alone were very substantial. In addition to the content, the workshops are provided by NASA engineers and lecturers who are currently in charge of research and development.



Various events will be described in Chapter 6. "Core Lecture", "Department Activities", and "Team Project" are each rated from A to E. The overall rating is 30% for "Core Lecture", 30% for "Department Activities", and 30% for "Team Project". "Workshop and Attendance" is determined by a rate of 10%. All participating students are allowed to graduate, and the low evaluation is more related to the attendance rate than the grades.

## 2.10 Others

Through this SSP, I discovered how ISU is an international organization. For example, due to the situation in Russia and Ukraine, there were no participants from Russia, or due to the situation in Europe and China, there were no participants from China. At workshops and various events, James Webb Space Telescope was discussed because it was launched recently, and the theme of the team project is dependent on Host. Some are important to Portugal Space. Each SSP has a completely different color. I realized that the important thing is to recognize this situation as objectively as possible and absorb as much as you can.

## 3. Core Lectures

### 3.1 Lecture content

The lecture was held at the largest lecture hall, Lecture Room 1. Each lecture lasts 90 minutes. 45 minutes of explanation by the instructor, 20 minutes content delivery 20~25 minutes was a question-and-answer session. Also, there were engagement activities. We are provided a system that allows you to submit questions from your smartphone so that you can ask questions without raising your hand or if you are not selected during the question-and-answer session. Since the online participants also took joint classes, equality in question time was a slight problem. There were 47 lectures in total, about various fields in line with ISU's educational philosophy of "Interdisciplinary". PowerPoint materials were uploaded to Drive in advance, which were then downloaded and used. In addition, a document called "Core Lecture Study Note" was distributed, which summarized the main points of each lecture, and

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was useful for reviewing the lectures. The specialized fields of study are the same as those of the Department described in Chapter 4: Space Utilization, Space Engineering, Human Activities in Space, Humanities, Business and Management, Space Policy and Economics, Law, and Natural Sciences. In the lectures on space utilization, there were topics on communication satellites, commercial satellites, navigation systems using space, remote sensing, etc., and it was clear that people who are not familiar with space are entrusted with the benefits of space development. In addition, as a feature of this SSP, many participants are from the Air Force. So, some classes touched on the perspective of defense and international cooperation. Other lectures included astronautics, space propulsion, orbital mechanics and rockets, mission design, and satellite subsystems. Since there were lectures from people who are in charge of development at NASA and people who were involved in the Mars mission, not only the basics but the lecture was also given with actual development problems. In the lecture on human activities in outer space. We learned how the microgravity environment affects the human body and what countermeasures are available. In addition, I was able to learn not only the physical effects but also the psychological effects. There are still little data on the changes in the bodies experienced by actual astronauts, and it was very interesting to see what kind of problems could occur when going to Mars. Furthermore, although it is my circumstances, I challenged JAXA's astronaut selection exam and passed the English test. This lecture was given immediately after receiving a notification that I had failed the general examination. Through the lecture, astronauts are very spectacular, but I recognize the difficulties of living in outer space and that more research is still necessary for humans to live on the Moon and Mars. I learned something I didn't know at all. It was an opportunity to reaffirm that I have a lot of knowledge that I lack. In the field of humanities, I learned about the relationship between art and space, the future opening of the universe, the governance of the universe, and the concept of "Spaceship Earth", which considers the earth as a ship. In the lectures on business and management, we learned the basics of business such as the current state of commercial space, financial problems, space business, and business models. In the lectures on space policy, economics, and law, we

discussed the basics of space law, the purpose of government use of space, the differences in the purpose of space development among countries, and learned about intellectual property rights issues. I was hardly familiar with this field, and I remember having a hard time understanding these lectures. Most of the explanations were based on general theories and data that have already been established in business and management, I learned about the growth of the Japanese space industry and the global space budget. After the lecture, I remember hearing other students say that it was too basic and outdated, which made me realize my lack of knowledge. In the field of sciences, there were lectures on the microgravity environment, how to observe the universe, the formation of stars, the solar system, and exoplanets, the environment of the universe, cosmology, etc. Some lectures demonstrated small experiments and question-based classes.



Fig. 3.1 During the core lecture



Fig. 3.2 Playing the guitar as a part of the lecture



I feel that the lecture itself was meaningful as I learned a lot. However, in addition to the speed of the English accent, it was very difficult to understand at first. Another problem was that it took a while to find out how to take notes in the lecture. I took notes on a computer at the beginning, but I realized that I had never taken notes on a computer in an English lecture until now. Therefore, I changed it to a notebook in the middle phase, but it was not possible to review it later. In the end, I decided to listen to the lecture using a computer with references and lecture slides. To summarize the entire core lecture, since I originally studied engineering at university, I could relatively understand lectures on sciences, space applications, and engineering, but I could hardly understand lectures on humanities, business, and law during the lectures because I did not have much background knowledge. However, I was able to get used to the speed of notetaking and English from the middle phase, and I was able to increase the number of questions to ask during the class, which was a point where I could feel my growth. I felt that I would like to take the same lecture again if possible. In the Core Lecture session, there were two exams. Therefore, since all lectures are reviewed anyway, there is a timing to review. However, due to the large amount of content, it was necessary to listen carefully to the lecture.

### 3.2 Test

The examination consisted of two sessions: one at the end of 29 lectures and one at the end of 47 lectures. The first exam consisted of only multiple-choice questions, and almost the same questions were given as the content of the quiz review session (optional participation) held every morning as a review of the Core Lecture. The quiz application called Kahoot! was provided before the test and it was almost the same as the real exam. I studied by doing three or four laps of Kahoot and reviewed lecture notes. I could have spent more time studying, but I was swept away by people around me and went to Lisbon, so there are some points to regret. The first so-called midterm exam had four types of quiz-style questions: fill-in-the-blank questions, true/false questions, multiple-choice questions, and questions answered in one or two sentences. The only evaluation was Pass or not Pass, and we were all able to

Pass, so there was no problem. However, if you could not get a Pass, there were extra classes to get a proper understanding. Since 60% correct is the border of Pass or not, I felt that this test is hard. Also, all the questions were in English. I struggled to answer some of the questions, even if I had studied to some extent, but I was able to successfully Pass it. In the final examination, in addition to the formal questions, you had to answer two essays. Because of this, after the midterm exam, I managed to review the lectures in my spare time. But I found that the other members who had done well on the midterm exam were studying as well. I felt the high level of the ISU participants again. Although I studied on holidays, the atmosphere of the students was very good. We studied until the evening and planned various events such as taking a break on the beach at night (Fig.3.3).

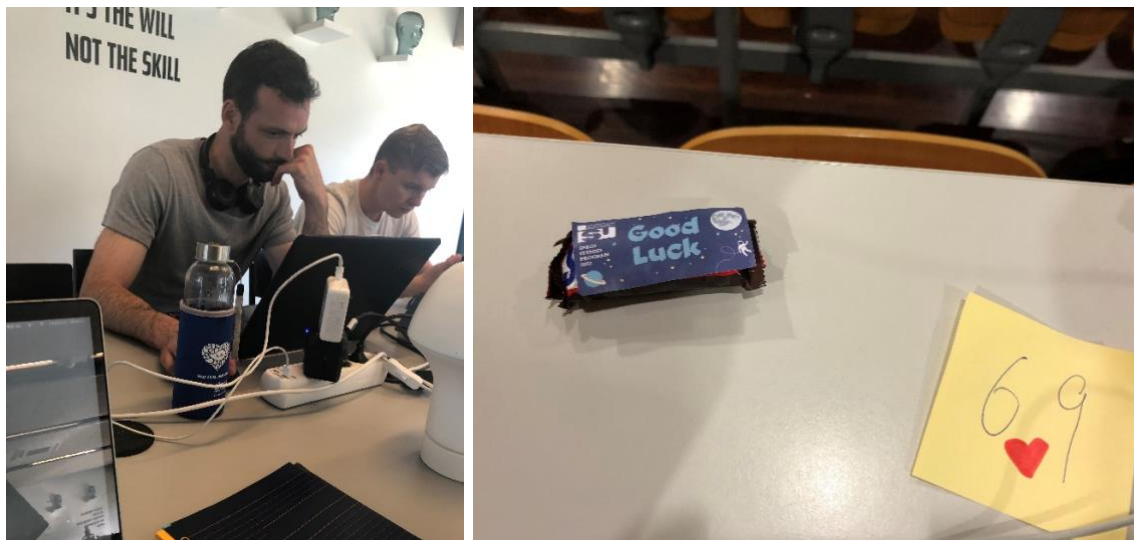


Fig. 3.3 Studying for the exam (left), exam day on my seat(right)

In the final exam, I was able to answer the first part of the quiz quite well. I was not able to answer all the questions with confidence, but I was able to answer most of them. On the other hand, the essay part of the exam was difficult. In the essay, it was important to answer by combining the knowledge of various specialized fields acquired through lectures without being bound by one's specialty. However, I chose a topic that has engineering aspects. We had to write an essay on our laptop.



I was surprised at the speed of other students' writing. Since the time for the exam was limited, I made an outline draft of the essay in Japanese and wrote a full essay in English. In addition, it was so great that we were able to use Google translate in consideration of non-native speakers. So, while making use of all these tools, I was able to write an essay with a word count comparable to that of other native speakers. The results were Pass. I was satisfied with the test itself. However, at the closing ceremony on the last day, 10 excellent students were announced, and I was not called. Although the attendance sheet of the class may have been considered, since it was selected based on the test score, even though I was not informed in advance, I felt regret. In the future, I would like to work even more vigorously.

## 4. Department Activity

### 4.1 Choosing a department

In the Department Activity, students are divided into seven specialized fields: Space Applications (APP), Space Engineering (ENG), Human Performance in Space (HPS), Space Humanities (HUM), Space Management and Business (MGB), Space Policy, Economics and Law (PEL), Space Sciences (SCI). Since ISU has "Interdisciplinary" as its educational philosophy, it was explained that we should pick a department that is different from our specialty. I thought that the ENG and SCI departments would be fun, but I chose HPS (Human Performance in Space) following the recommendation. I was able to belong to my first choice of Department (HPS), but some of the participants were not able to get their preferred choice. We had to write the reason for our wishing department, and the content was also seen. Just as I was challenging the JAXA astronaut selection exam, I wrote about what I was planning to learn at the HPS department.

### 4.2 Activities in Human Performance in Space

The Human Performance in Space (HPS) consists of about 15 members (Fig. 4.1), including young people like me who want to become astronauts. Some people were simply interested in astronauts, some people were from a biology background. There

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were almost no people from medical, and chemical backgrounds. Department time was about 3~4 hours each day. Also, in HPS, various events were prepared. About 1/3 of the time devoted to the department was spent taking classes from specialized instructors, and the rest of the time was prepared for various events. We moved to the Faculty of Medicine campus of the University of Lisbon and visited the internal astronaut medical laboratory (Fig. 4.2). The Astronaut Medical Research Facility had various research equipment such as tilting beds and simulated weightless running machines. This Lab was a newly established facility for conducting new research (Fig. 4.3). We were able to receive demonstrations and explanations of experiments using these measurement devices, which was very meaningful (Fig. 4.4).



Fig. 4.1 Group photo of HPS Department participants



Fig.4.2 Faculty of Medicine, University of Lisbon



Fig. 4.3 Receiving an explanation at a research facility



Fig. 4.4 Weightless treadmill (left), me experiencing tilting bed (right)

By experiencing various experimental equipment, I was able to understand how to reproduce the microgravity situation and conduct medical research even on Earth. For example, using a tilting bed, blood shifts in space can be reproduced considerably by the inclination of about 6 degrees. By conducting various experiments using such test equipment, we will apply a wide range of applications such as new medical care, daily necessities, and activities for astronauts. The HPS department provided special opportunities to experience such equipment.

Since this kind of Lab can't be found everywhere, I was able to acquire very valuable knowledge. The HPS department had events that simulate the actual training of real astronauts, such as cave exploration and diving. First of all, the cave exploration was a full-fledged one-hour expedition, wearing white protective clothing and helmets. We prepared for the exploration by purchasing necessary shoes and other items at a home improvement store. The exploration inside the cave was not just a matter of proceeding to the destination, but also of learning how to use portable X-ray equipment at each checkpoint, how to collect samples, and how to escape from the cave through hands-on experience (Fig.4.5).



Fig.4.5 Photograph of the cave exploration team (left), measuring the cave wall surface (right)

The cave exploration was carried out in two groups, and while one group was inside the cave, the other group participated in a workshop outside to learn simple life exploration methods and methods for identifying components such as rocks (Fig.4.6). We have learned that, even if it is a simple one, it is necessary to have adequate knowledge for actual exploration, and that one cannot become an astronaut without acquiring such exploration knowledge. This is the reason why the actual astronaut selection examination requires all chemical engineering subjects to be taken as part of the general education examinations in STEM fields.

Many people thought that Engineering Department and the science department were the best, but I found this HPS was wonderful. I'm glad I chose this department.



Fig. 4.6 Detection of DNA as a life search (left),  
Using a spectrometer to detect rock components (right)

As another of HPS's special activities, there was a diving experience. Real astronauts wear EVA suits and train underwater for hours. Although there were no actual EVA suits, we were required to wear a diving suit and go underwater to repair a mock spacecraft and conduct a mission. The roles were divided among six astronauts, six backup astronauts, six assistant sevens, one mission commander, and seven flight operators as if it were a real astronaut training exercise. Therefore, only 12 astronauts were allowed to experience diving, and we were required to submit a statement of reasons for our desire to be selected as this diving event astronaut. I took the astronaut selection examination in a timely and wrote about how I failed the examination and how I would make the most of this activity, including my future plans. Unfortunately, I was assigned to be a member of sevens. It seems that the astronauts were made up of members who had no experience in diving, and the backup members were made up of members who had no desire to become astronauts. Sevens is a job that exists, and its role is to install EVA suits and assist astronauts. This time, we were quite busy with the installation of wetsuits, setup of oxygen cylinders, and other tasks (Fig. 4.7). The mission itself took more time than expected due to the inexperience of the astronauts as the first

member and the inability of the Indian man to get used to diving at all. So, we decided to do the mission with backup members. The backup members had diving experience, so in the end, the mission was successful. Personally, I think that the ISU made a mistake in the selection of the astronauts because the first astronauts could hardly dive, and the backup astronauts just performed simple tasks without any explanation. As a sevens, I learned a lot, so I feel that it was meaningful.



Fig.4.7 Me listening to the instructor's explanation as sevens



Fig. 4.8 Diving and completing a mission (photographed by an underwater robot provided by IST)



## 4.3 Assignment

In the HPS department, the final task was to give a 30-minute presentation in a team of three people. The task given to us was to formulate a hypothesis about organs from a medical point of view using data from NASA's experiments about DNA changes in mice conducted on the International Space Station. After analyzing the results using R-studio, the results should be summarized and presented. As I was using R-Studio for the first time and had almost no medical knowledge, it was a very high hurdle for me to complete this task all in English. First, there was a possibility that I could have a hard time forming a team. Due to the restriction of three people, many of the participants ended up working with people from nearby seats. I decided to join a team of an American guy (working at Blue Origin) and an Italian guy (an architect). First, we had to formulate a hypothesis. Although I had no idea, the other two people had already considered the hypothesis about the human lung, so I decided to go with their idea. We hypothesized that weightlessness in space reduces the volume of the lungs that are pulled by gravity, making it difficult to breathe. Since lung-related DNA changes were not measured in NASA's mice experiment, we decided to use data from the quadriceps muscle, which consumes the most oxygen in the body, to make a conclusive association. The American guy had a background in data analysis and based on that knowledge, he was in charge of the data analysis process. The Italian guy oversaw the introductory section of the first section, and I was to state the entire conclusion. To substantiate this hypothesis, we verified it through various literature surveys and by asking questions during visits to medical facilities. In conclusion, the interesting thing is that the specific DNA involved in the lungs is decreasing, because the lungs themselves are functioning well in microgravity conditions. The results showed that breathing was not only normal but also easier to breathe compared to Earth's condition. Based on these unexpected results, we conclude that breathing is relatively easy in space and therefore it is not a priority as a medical problem even on long-duration missions while informing them that various factors can affect the body in space. In making the slides, a unified format was decided by the design advice of an Italian architect,

and we worked all night to complete the presentation slides, which were quite impressive. Presentation practice was limited to the lunch break, and I had to go almost without any script. Although I was more nervous than I had expected, I was able to give a good presentation and was even praised as an excellent presentation (Fig. 4.9).



Fig. 4.9 Presentation (left), receiving a review from the professor (right)

I was able to successfully complete my presentation and learned a lot at the Department, but I was also helped a lot by my team members, and it was also a good experience for me to learn how important it is to be proactive and show what I can do in a team. Based on this experience, I have set a goal to work more vigorously on the Team Project.

## 5. Team Project

### 5.1 Team Project Overview

Team Project is an activity in which SSP participants are divided into four teams, each team discusses how to realize its objectives, and finally proposes a feasible project. In this year's SSP, "Space for non-space" "Space-ocean climate interaction", "International cooperation on the use of Chinese space station", and "Microgravity business space R & D for benefit of people" was provided as themes. I was assigned to the Team Project of "Microgravity Business Space R & D for the



benefit of people" so-called TP Microgravity. The activity in Team Project starts from the first week, but the first was a basic workshop. There were four team projects. As mentioned briefly in section 2.9, there were workshops on communication skills, design thinking, report writing and presentation, and building better teams. After the workshop was over and we learned the faces of the TP Microgravity members, the activities of the Team Project finally began. At first, the chairman gave an overview of TP Microgravity. Mr. Hugo Costa of Portugal Space and other staff members gave examples of new business models, research, and services related to weightlessness environments. He explained the goals and visions of Portugal and the world in the future. We received a wide range of lectures related to weightlessness from various lecturers. To complete a project in a short period of two months, we had to work on TP efficiently. We started by discussing ideas on how to form a team based on the team structure mentioned in the lectures. In addition to team structure, we also had to propose ideas. The decision on the team structure was made earlier than expected, with the leader, deputy leader, schedule management staff, and responsibilities being divided into six areas, similar to those of a department, with each member being assigned to the area in which he or she wished to work. We decided to assign a person to be the leader of each department as Team Lead, and that person would be in charge of his or her department. While I belonged to the Engineering Team because of my engineering background, I was given the important role of Presentation Leader, who was in charge of the final presentation, as Team Leader that I ran for despite my apprehension. I was very worried about whether I would be able to play such an executive role, but I accepted the role to grow myself. After deciding on the roles of each member, the deadline for submitting the Executive Summary, a document summarizing ideas and policies, was approaching, so the departments came up with their ideas, and the final team idea was decided by a vote. As a result, we decided on the idea of developing new medical services by taking advantage of the property of protein crystals to grow pure and abundant in a weightless environment.

## 5.2 Professional Visit

After the idea was decided, there were several opportunities to visit local biological

research facilities as scheduled Professional Visits. (Fig.5.1). We learned what kind of analyzers were used to analyze the actual protein crystals grown in the biological research facility, as well as the various studies conducted using fruit flies (Fig. 5.2). These visits provided an opportunity for each team to collect information on issues that had not been clarified in the preliminary investigation and on matters that would be necessary for the future. As a member of the Engineering team, I especially investigated the necessary information on the conditions and equipment required for protein crystal formation.



Fig. 5.1 Listening to an explanation during a visit to a research facility (left), member of the Microgravity (right)



Fig. 5.2 Inside the research facility

They had shown us the grown protein (Fig. 5.3), and we obtained useful information such as the unpredictable effects of temperature control and vibration, and the unpredictable growth period. The problem is that there are multiple types of laws, and there are few methods that can be developed as a business. After these visits, we decided that the engineering team should be divided into five roles: thermal control, vibration control, overall requirements confirmation, hardware, and launch operations. I was especially in charge of hardware, and thermal design was also involved a little. As an engineering team, we shared what we had researched beforehand, and to contribute to the team, we felt that it was necessary to draw CAD drawings that look authentic. Through such professional visits, we believe that the common understanding of the team has been unified.

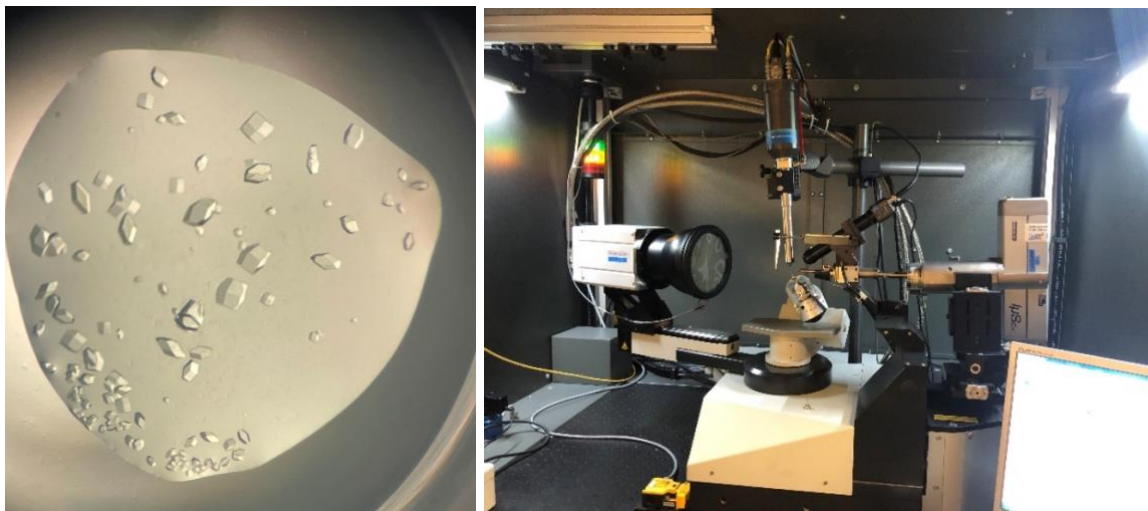


Fig. 5.3 Protein crystals (left), X-ray measuring device (right)

## 5.3 Final Report

In the Team Project, we must create a report of no more than 126 pages and a one-hour presentation. I was not in charge of creating an executive summary, but I had to create some parts related to CAD diagrams. Executive Summary was handled by an Italian with experience in design, and in addition to creating a cover like Fig. 5.4, it was necessary to make the contents easy to see mainly with the figures, not the text. After all, the executive summary officer stayed up all night the day before the submission date.

I was also present with them and proceeded with the work on the CAD drawings. Thanks to that, the Executive Summary was very good, and the level was quite high compared to other TPs. In preparing the Final Report, each specialized team created its part of the report, which was then combined at the end. The Engineering team, in particular, was further divided into subsystems, with each subsystem having a different person in charge of writing a summary of what they were responsible for. To complete the Final Report, we formed an editing team of six people who were good at English, and the editing team checked all the sentences for anything strange in the content and grammar mistakes.

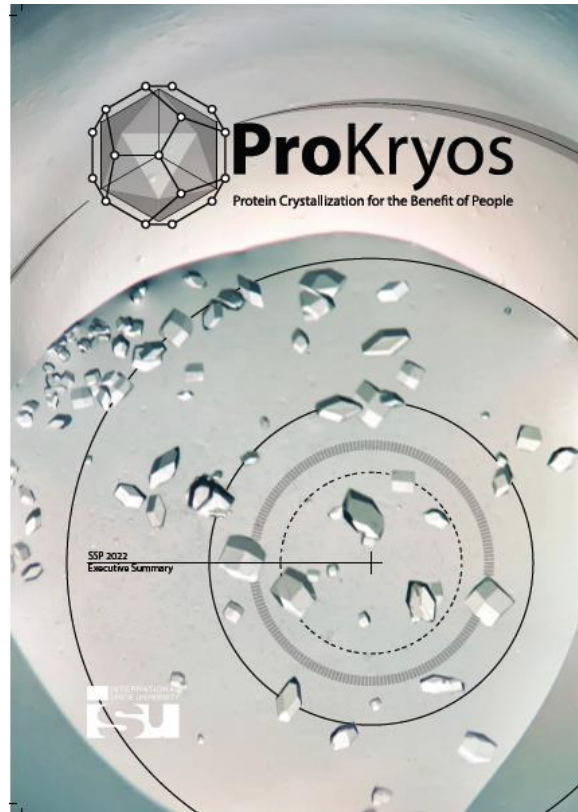


Fig. 5.4 Cover of Executive Summary and Final Report

I was also focusing on CAD drawing creation in the engineering team. As mentioned above, the modules we propose need to be visually appealing for presentations and materials.

After discussing with other members of the engineering team and finishing the conceptual design, I stayed up all night for about two days and created the model shown in Fig. 5.5 in order to contribute to the team, although I was not told of any deadline by the members.

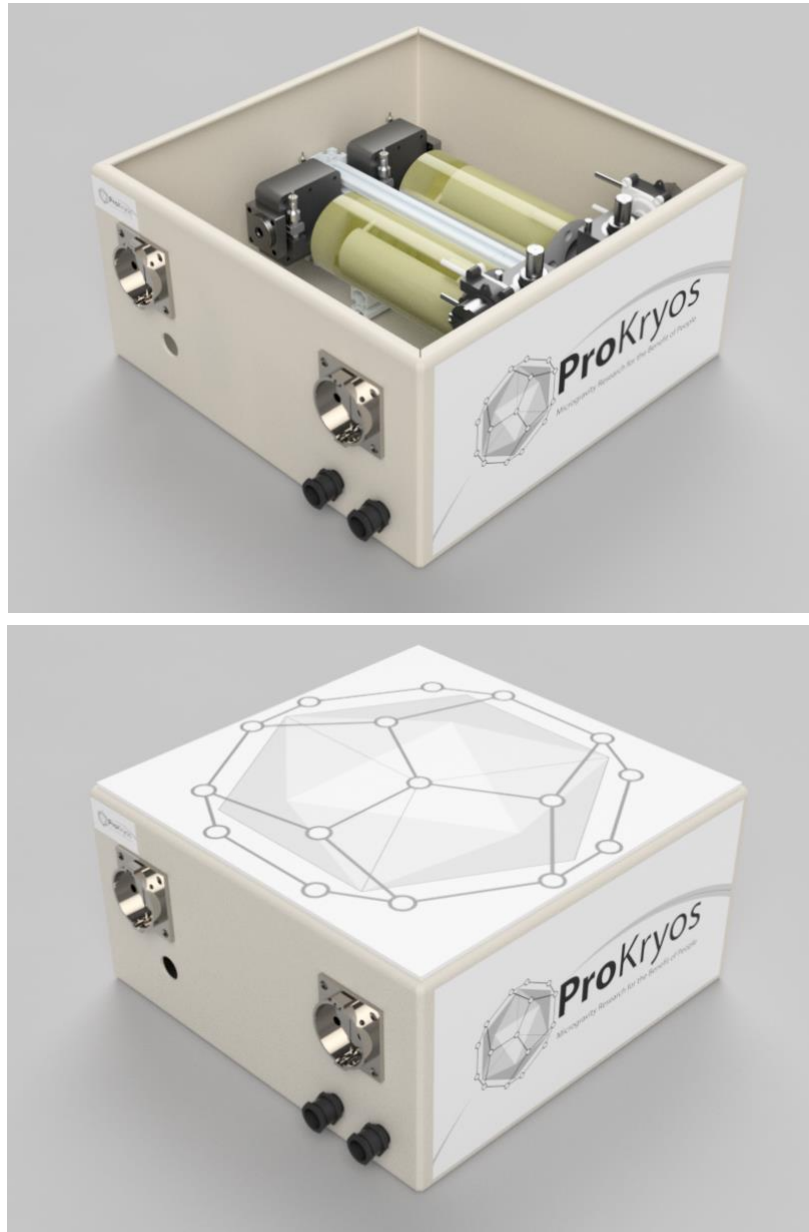


Fig. 5.5 CAD model of protein crystal generation module (top) with lid (bottom)



When I showed this model to the members, they were praised much more than I expected, and I realized that I was able to greatly increase my contribution to the team. In addition, this CAD drawing had a great influence not only on my team but also on other TPs, and TPs who started creating CAD drawings based on this began to appear. There was no end to the praise from other TP friends during breaks. As a result, this CAD model became a major part of the Final Report. In addition, it became such an important element that even now, eight months after my graduation from ISU, when I am preparing the report, I am contacted by people who want to see the photos of the CAD drawings. I learned that cooperation within a team is very important. However, just getting along is not team cooperation. As expected, there were many Indians in the Engineering team, but they sometimes disagreed with some Europeans, and the way they worked was completely different from each other. Furthermore, when it was necessary to rewrite the Engineering section due to the severe evaluation by NASA staff and others, the English-speaking members who had engineering knowledge rewrote the contents because the deadline was approaching. The Indian members were not happy about this but reluctantly accepted it. To sum up, I can say that Europeans need to listen and respect others more, and Indians tend to stick to their way, which can be a problem in international cooperation. I was able to raise my importance in the team through one activity. It was a great experience for me to understand that team cooperation is not possible without such efforts.

## 5.4 Final Presentation

At the same time as the Final Report, the Presentation team was also formed because it was necessary to prepare for the Final Presentation. The Final presentation was not an ordinary PowerPoint presentation, but rather a difficult one in which we had to convey the important points of our mission without omitting anything while adding interesting elements such as putting on a play by ourselves. As the leader of this presentation team, I had to be in charge of everything. First, we discussed presentation ideas and were able to decide quickly. Since it was a protein presentation, we needed to clear the misconception that it was about muscle training,



and the most efficient way to do that was to show a video like a protein commercial. Based on this, we first show videos and role-plays of patients who are seriously ill being treated, and have the patients sit on the stage as if they were in a hospital. After that, the situation in which the patients are watching TV is presented, and each channel is presented using videos and role-plays. In the end, the patient receives future treatment and is easily cured of the disease. By setting a time limit of 5 to 7 minutes for each channel and asking each department to create a TV program to explain the contents, we, the presentation supervisors, did not have to think everything through. I thought it was a nice idea. The ISU staff members who supported the presentation of TPs also liked the idea, and we were able to set the stage easily. There were some accidents in the middle of the commercial, such as being too elaborate on the content of the commercial, spending too much time, and taking a lot of time to shoot the video, but I was confident when everything is completed. I was also the director of these video shootings, and together with an Estonian who was available, we were in charge of the videos from creation to editing. I had two roles to play in the presentation: one as an astronaut and the other as an engineer who developed the module and explained the inside of the module (Fig. 5.6). I was quite nervous because I had to make a presentation in front of many people, but I stood on the stage thinking that I was absolutely confident in the video about the introduction video of the CAD drawings. The presentation itself was fine throughout, and we were able to make a perfect presentation while other teams made simple presentations, speakers were biased, not everyone participated in the presentation, and too much staging made the interludes and other work conspicuous. The judges praised the presentation, saying that the balance between the main points that needed to be conveyed and the comedic elements were just right and that not only was it easy to understand the mission overview but also that they were not bored by listening to the presentation. This was thanks to all the team members who worked together to come up with the story of the presentation and to all the teammates who devised various ideas, and I felt that I was surrounded by a wonderful team (Fig. 5.7). In the end, the Final Report was completed on time, the Final Presentation was highly praised, and the Team Project was a great success.

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Although there were times when I was unable to help due to my limited English ability, I was happy to be able to contribute to the team, even if only a little, by doing what I could to work together with everyone. The TP Microgravity project is still being promoted as one of the Portuguese Space projects, and it was a great result.



Fig. 5.6 Presentation as an astronaut (left) Presentation as an engineer (right)



Fig.5.7 TP Microgravity

## 6. Extra events

### 6.1 Welcome event & Participant Introductions

On the first day, participants gradually checked in to their lodgings, picked up their necessary items (ISU handbook, backpacks, T-shirts, etc.), and spent the rest of the day relaxing. After that, all participants were supposed to gather and participate in the welcome event. During the bus ride, I talked with people around me and felt very threatened by the high level of English and the age of the other participants. At the welcome event, it was like having a catering meal at a venue with a terrace with a view (Fig. 6.1). Many of the participants are workers. For example, working for Blue Origin, Canadian Space Agency, and other space agencies in various countries. The contact with people who are already active at the forefront of the field made me realize the high level of ISU.



Fig. 6.1 Welcome event Terrace (left), Catering seats (right)

Over a meal, they talked about what they were doing and which Team Project they belonged to. I was able to get some idea of the level of English of the other participants at the time of the first session, and I expected that my level of understanding would be about 70% unless I concentrated on listening. After the meal, the participants were briefed about the ISU and gave a light 30-second self-introduction in front of everyone (Fig. 6.2).

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Fig. 6.2 Short self-introduction (left), listening to ISU explanation (right)

## 6. 2 Introduction Day

On the following day, a luncheon was held to introduce the staff, the university, and each activity (Fig.6.3, 6.4).



Fig. 6.3 University guide (left), the introduction of university laboratory (right)

The university was much larger than it seemed, and there were many space-related laboratories. I remember I was very excited to think that I could do the ISU program here.

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Fig. 6.4 Receiving an explanation of activities (left), Staff introduction (right)

## 6.3 Opening Ceremony

The Opening Ceremony was held on the evening of the third day at the ceremonial hall of the university. At the Opening Ceremony, each country entered with its own national flag, and the purpose of SSP18 was introduced. Since I was the only participant from Japan, it was inevitable that I was the only one to carry this flag. I felt like I was representing Japan (Fig. 6.5). After the opening ceremony, a reception was held, and beer, wine, and various dishes were served.

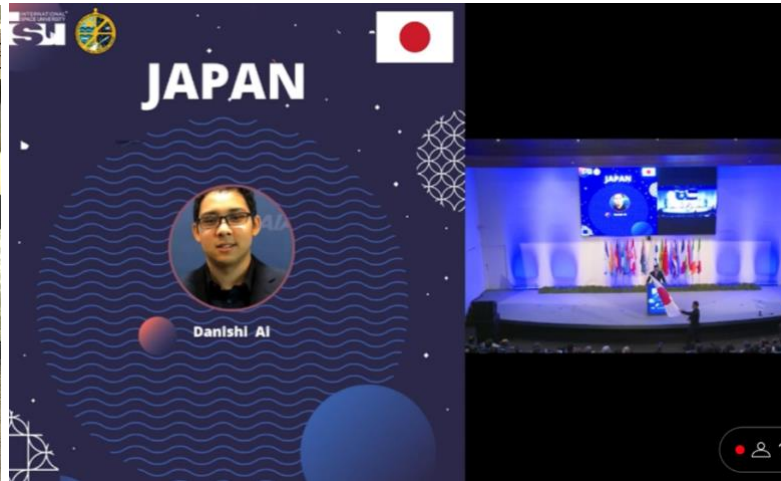


Fig. 6.5 Opening ceremony (left) Holding a flag (right)

## 6.4 My space Journey

Every week from the first day, there was an hour-long My Space Journey session where each participant had 3 minutes to introduce himself/herself, how he/she came to join ISU, and what kind of research he/she has been doing. I was the first speaker because my last name is Ai. I was surprised at the high level and quality of English around me, but I was put in the situation of being the first speaker. I was assigned to make one slide, and I submitted it, but due to some uploading problems, it was shown as an unedited slide. The presentation was suddenly laughed at by everyone, and I was forced by the staff to choose whether to redo the presentation or to present it as it was. However, I could not back down now that I had come this far, so I said I would continue the presentation and presented all that I had thought about. I was able to finish my presentation on time and even received praise from many people who thought that I had intentionally not made slides for my presentation. Here I was recognized by all the participants of ISU-SSP22 (Fig. 6.7).



Fig. 6.7 I to present without slides

During the Core Lecture period, there were panel sessions once or twice a week with astronauts and experts in various fields. The panelists talked about the backstories of astronauts and the James Webb Space Telescope, which had just started its operation.

The session with astronauts was especially interesting for me because I could hear the back stories of astronauts. The session with the astronauts was especially special, and I learned about the mentality that they have in common. In addition, Mr. Jim Green, former chief scientist of NASA and technical supervisor of my favorite movie, *The Martian*, talked about the movie interestingly, and since the theme was about Mars, I couldn't help asking him some questions (Fig.6.8).

## 6.5 Panel Session



Fig. 6.8 Jim Green (left) talking about *The Martian*,  
Former Korean astronaut So-Yeon Yi (right) talking about astronauts

## 6.6 GLEX Conference

In conjunction with the ISU-SSP, the GLEX Conference was held with the Portuguese space industry. The conference was held at a conference hall near the coast of Lisbon, where dinner was served as a reception. It was an interesting event with speeches on NASA activities, the development of services by venture companies, the James Webb Space Telescope, and so on (Fig. 6.9, 6.10).

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Fig. 6.9 Exterior of GLEX Conference (left), the interior of Conference (right)

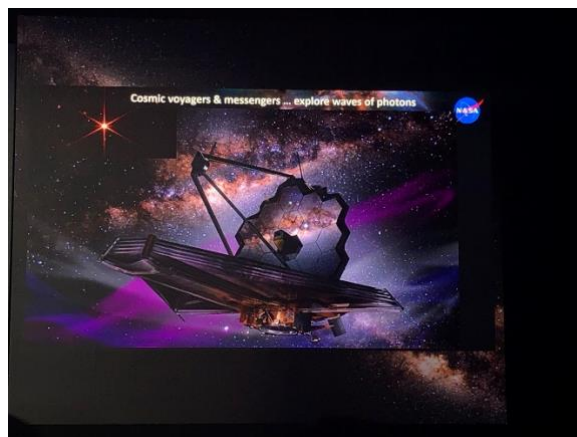


Fig. 6.10 GLEX presentation (left), JWST presentation (right)

## 6.7 Team-Building Exercise

In the team-Building Exercise, Team Project teams were further divided into three teams, and each team built a Rube Goldberg Machine (a device in which a chain of elaborate contrivances is used to make what would normally be a simple task happen. It is like a Pythagorean switch in Japan). The goal of this project was to transport small iron balls using a variety of contrivances, ultimately connecting all the teams' Rube Goldberg Machines, without human hands touching the balls from start to finish. Our team had built a complicated Rube Goldberg Machine, and we had a hard time because the iron ball often stopped in the middle of the machine. At first,

when the ball stopped in the middle of the run, we had to start over again from the first team, but the ball was usually stopped by the fifth team. Eventually, we had to make the final run with support. Our team created the Rude Goldberg Machine shown in Fig. 6.11. Although this activity had nothing to do with space, I think it was good training to improve our imagination because we had to make a Rude Goldberg Machine using familiar objects. Moreover, this activity provided me with training to improve my conceptual ability as a member of the same team. I think it was a very good activity because I could make good friends with the members of the same team through this activity.



Fig. 6.11 Created Rude Goldberg Machine and teammates

## 6.8 Professional Visit (Observatory and Incubator center)

We visited a historical astronomical observatory in Portugal and an incubator center that supports start-up companies. At the observatory, we were briefed at the Museum of Astronomical Telescopes, which is an old astronomical telescope museum, about the equipment used to observe sunspots and other astronomical phenomena. Although there are no new instruments, we learned that many discoveries have been made based on the data obtained over a long period of time. At the Incubator center, we learned about the development of space business, current projects, and how to start a business (Fig. 6.12).



Fig. 6.12 Description of the astronomical observatory (left), group photo at the incubator center (right)

## 6.9 Space Masquerade & Space Costume Competition

The fifth week of SSP is Alumni Week, where many past SSP alumni gather, and on Saturday, a costume competition called Space Masquerade was held. However, there were quite a few people who had prepared very enthusiastic costumes. It was a very fun event, with everyone dressed up as astronauts, aliens, rovers, satellites, etc. I brought an alien mask from Japan. I wore a Daft Punk-style alien mask and suit that I brought from Japan, and it was quite popular.



Fig. 6.13 Space Masquerade



## 6.10 Alumni vs. Space United, Participants Football Match

On the last day of Alumni Week, a football match was held between SSP alumni and SSP18 participants. There were not many participants because many of them were drunk from the space masquerade on the previous day. Many of the SSP18 members who sometimes played soccer on the beach were soccer enthusiasts, and every time they played soccer, it was a lot of fun. The game was played under the scorching hot sun, and although it was quite difficult, I scored one goal and we won 4 - 3 against the alumni.



Fig. 6.14 Football Match Team Photo

## 6.11 Culture night

Culture Night is an event where people from each country and current residents of that country introduce their own country to everyone, and five or six countries were introduced each weekend. The presentations were not at all formal. The presentations were not at all formal, and all countries made their presentations with humor, and all presentations were very interesting. However, people from all countries had a lot to say, and few presentations lasted less than 30 minutes.

I was honestly at a loss because I thought I would be the only one to give a presentation at the Culture Night in Japan. Then, Mr. Konaka, a student who

participated in SSP18, agreed to participate as a helper, and he performed a tea ceremony. In addition, I was asked to introduce two cultures, Uyghur and Japanese, to the other participants, as they had been asking me to talk about my Uyghur background. I asked my parents to send me ethnic costumes by international mail because I had not planned to do so at all. We decided to provide sushi as a meal and contacted the Japanese Embassy to introduce various restaurants, but in the end, we decided to order sushi by Uber for convenience. The beer and other alcoholic beverages were also expensive, so the Korean participants and I went to an Asian store in Lisbon to buy them. In the presentation, I tried to avoid the problems of Uyghur history, such as their culture and cuisine, as much as possible. However, when we showed a two-minute video at the end of the presentation, the audience became too quiet, so we decided to dance. This dance was quite well received by the audience, and I was later told that I was the only one who danced or performed on stage. In my presentation on Japan, I introduced the history and culture of Japan. For example, toilets with bidet, which are common in Japan, seemed to be rare in other countries, and the story about toilets was very popular. Many of the participants were familiar with Japanese anime, and the topic of anime was also well-received. We gave a quiz and gave stickers of JAXA to those who answered correctly. We also introduced Japanese sports such as Kendo and Judo. The Japanese Culture night was a success in many ways, and I was very, very satisfied.



Fig. 6.15 Serving sushi, Ms. Konaka (right)



Fig. 6.16 Dance performance (left) Tea ceremony performance (right)

Culture night was a great success, and I realized that I made a lot of good friends, many of whom told me to let them know if there was anything they could do to help me again.

## 6.12 Talent Night

Talent Night was an opportunity for those who have special skills, even if they are not related to space, to show them off. Many people danced or sang, but there was also a photo exhibition, and some members performed salsa, which they had practiced during SSP, which was very interesting. Although I did not perform in this event, I thought it was wonderful to have the skill to show others.

## 6.13 Closing Ceremony & Reception

The Closing Ceremony was held at the Ceremony Hall, where the SSP Director gave a speech, followed by the closing remarks. From there, the participants moved to Lisbon to receive their certificates in front of the monument featuring Vasco da Gama and received their pins at another venue. I was relieved and happy to have

successfully completed the SSP, but more than that, I felt sad that the SSP was already over. I was the first one to receive the certificate and seeing other participants receive their certificates after I did bring back memories and made me feel even sadder. The participants of SSP22 voted in advance who would give a speech at the Closing Ceremony, and his speech was a condensed version of our memories of the past two months, and it was a very good speech.

In the end, there was a party on the beach and - free time to have fun. It was a great time to be with all the participants. The last Reception ended with a promise to meet again.



Fig. 6.17 Receiving a certificate (left), Closing ceremony presentation (right)



## 7. Conclusion

SSP22 is a very fulfilling program, and I feel that I am very glad to have participated in it, as I was surrounded by many events, tasks, and friends every day, and was able to have valuable experiences that I could not have had otherwise. Through the core lectures, I became familiar with lectures in English, learned about fields outside my own specialty, and learned that even in my specialty, I could not reach a complete understanding without improving my English ability. In the Department Activity, I could learn the knowledge necessary for my future astronauts, the possible effects on the human body, what kind of technologies will be required for future long-term human space exploration, and what problems need to be solved. In addition, even if it was only simulated, they were able to work together as a team to tackle problems and gain experience that they had not had before. Later in TP, as mentioned above, I learned how to express my values to the team and the importance of speaking up actively. The culture shock caused by the differences in countries and regions, such as India, Europe, and the U.S., is not only reflected in differences in food and lifestyle, but also work and team cooperation. I have learned how important it is to make judgments about how I should behave and listen to other people's opinions and ideas carefully. I am glad to have had the opportunity to meet people in the space industry from various countries, people who share the same goals and passions, and space enthusiasts, and I hope to continue to cherish these connections in the future. On the last day, I felt not only loneliness but also another thought. I hope that one day I will grow up to be a great person who plays a role in the space industry, and that I will meet these SSP members again. The inspiration I received from the other participants this time was tremendous. It was a great opportunity for me to find many things that I need to improve. Once again, it was a very valuable experience for me to have such a great experience in the first year of my master's degree.

Finally, I would like to express my deepest gratitude to the Institute of Fluid Science, Japan, for supporting my participation in the SSP and for providing financial support for my travel expenses. Thanks to their cooperation, I was able to participate in the SSP and had a very good experience.