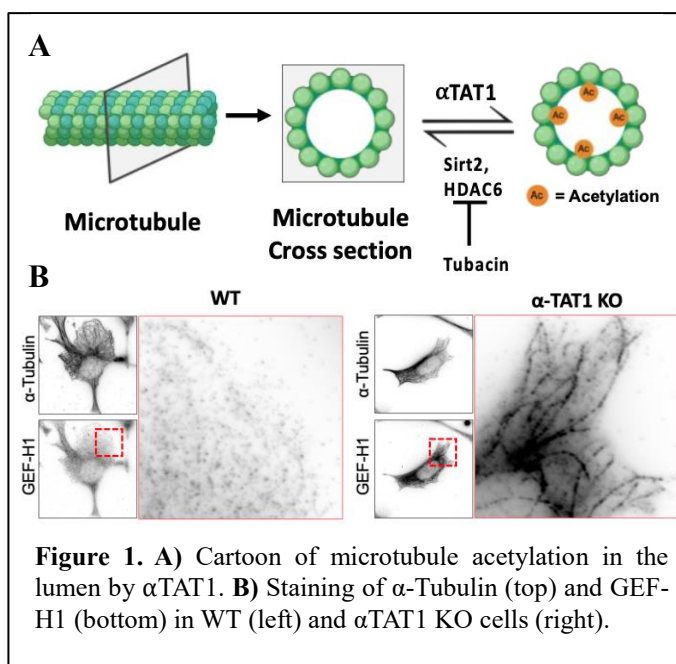


JSPS Summer Program 2024 Research Report

1. Name: Cristian J. Saez Gonzalez	(ID No. SP24001)
2. Current affiliation: Johns Hopkins University	
3. Research fields and specialties:	
Biological Sciences	
4. <u>Host institution: Tohoku University</u>	
5. Host researcher: Dr. Kazumasa Ohashi	
6. Description of your current research	
<p>Cell migration is essential for many physiological processes including embryonic development, wound healing, and immune responses. To achieve efficient cell migration, the cell undergoes a front-and-back polarization. This polarity is regulated and maintained by the actin cytoskeletal and microtubules. As a graduate student at Johns Hopkins University in the Inoue lab, we found that cells lacking α-tubulin acetyltransferase 1 (αTAT1), the sole mediator of microtubule acetylation (Figure 1A), showed an altered actin cytoskeleton with a defect in actomyosin contractility, impacting directional cell migration.</p> <p>Actomyosin contractility is mediated by a spatially restricted activity of Rho GTPase, known as RhoA. Our results shown that these defects are the result of an inhibitory regulation of GEF-H1, a Guanine Exchange Factor of RhoA, through preferential binding to the non-acetylated microtubules (Figure 1B). Additionally, preliminary data showed that after induction of microtubule acetylation, mCherry-GEF-H1 falls of microtubules, suggesting a direct relationship between GEF-H1 and microtubule acetylation (data not shown). Collectively, our data illuminates a role of acetylated MTs as a regulator of directed cell migration by concertedly regulating actomyosin contractility through the sequestration of the Rho-GEF, GEF-H1. Since microtubule acetylation takes place inside the luminal side of microtubules (Figure 1A), we hypothesize that GEF-H1 binds to non-acetylated microtubules either by going into the lumen as a whole or using a part of the protein to gain access to the lumen. To test this hypothesis, we must overcome the resolution limits of light microscopy to achieve sub-nanometer scale.</p>	



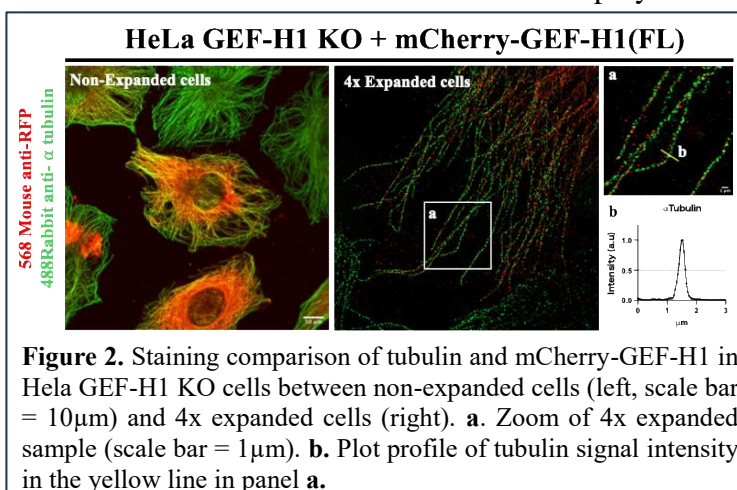
7. Research implementation and results under the program

Title of your research plan:

Using Expansion and Super Resolution Microscopy Techniques to Elucidate the Spatial Regulation of GEF-H1

Description of the research activities:

During my time at Tohoku University in Dr. Ohashi's lab, under the mentorship of Dr. Chiba, I learned, optimized, and performed expansion microscopy to achieve sub-nanometer resolution. Through troubleshooting and optimization, we determined that the best conditions for our experiments involved using HeLa GEF-H1 KO cells transfected with mCherry-GEF-H1 (Full Length, FL), followed by methanol fixation and staining with rabbit anti- α tubulin combined with mouse anti-RFP (which recognizes mCherry-GEF-H1(FL)). As shown in Figure 2, we successfully expanded the cells by a factor of 4x. Analysis of the microtubule size in the expanded sample (Figure 2a) yielded a Full Width at Half Maximum (FWHM) of 215 nm (Figure 2b). Considering the 4x expansion factor, preliminary results indicated a FWHM value of 53.75 nm, achieving sub-nanometer resolution. Additionally, we conducted a co-sedimentation assay to study the binding of GEF-H1 to polymerized microtubules. After ultracentrifugation, preliminary results showed an increased level of GEF-H1 in the fraction with polymerized microtubules, suggesting potential direct binding between GEF-H1 and microtubules. Overall, my summer research provided me with new tools essential for addressing my scientific questions, along with collaboration and support in expansion microscopy from Dr. Chiba.



8. Please add your comments, including any cultural experience during your stay in Japan (if any):

My time in Japan was truly memorable, thanks to the incredibly friendly and supportive people in the lab. They made me feel welcome from the very beginning, and I had an amazing time working with them. Staying with my homestay family was also a wonderful experience. I learned so much about Japanese culture and enjoyed tasting delicious home-cooked meals. Overall, my stay in Japan was enriching and unforgettable.

9. Adviser's remarks (if any): Mr. Cristian Gonzalez participated in our summer program for about two months, during which time he worked diligently to carry out his research plan and achieve his research goals. I believe he has an outstanding personality and excellent research skills. I was particularly impressed by his strong will to solve problems and he was a positive influence on the students in our lab. I am confident that he will conduct excellent research based on the skills he has acquired in this short period of time. I am also confident that we will continue to collaborate in the future.

JSPS Summer Program 2024

Research Report

1. Name: Andrew Deng	(ID No. SP24002)
2. Current affiliation: Texas A&M University	
3. Research fields and specialties: Engineering and Sciences	
4. Host institution: Yokohama National University	
5. Host researcher: Taiga Mitsuyuki	
<p>6. Description of your current research</p> <p>My current research project focuses on the creation of a collision avoidance system that can be used and implemented by ship captains to help reduce the risk of collisions with stationary objects at sea. The project consists of four key objectives with each objective leading up to creating of the decision dashboard. The radar tracking algorithm development (Objective 1) will feed into the Hazard avoidance database (Objective 2) to provide real-time information on nearby hazards and their characteristics. This will be used in connection with the maneuvering model (Objective 3) to create a decision dashboard (Objective 4) able to give maneuvering advice.</p> <p>Objective 1: Algorithm Development</p> <p>This objective focuses on the development of an algorithm that can read raw radar data and classify the objects from the data. The algorithm is built through the usage of machine learning with data obtained from a set sea route.</p> <p>Objective 2: Hazard Avoidance Database</p> <p>A focus group of licensed mariners will be utilized to create a hazard avoidance database using navigation best practices. Given a list of objects, they will be tasked with identifying reasonable margins for safe passing distances as well as an appropriate time to act to avoid collision. The developed database will be used together with the objects identified in Objective 1 to give real-time avoidance advice.</p> <p>Objective 3: Maneuvering Model</p> <p>A multi-tiered maneuvering model will be created. The top tier of the model being a machine learning model capable of estimating the vessel's capability from past maneuvers. The first supporting model will come from the development of an efficient CFD strategy for calculating propeller/hull/rudder interaction of the target vessel. The second will be a minimum maneuvering capability model that will be used to make sure that the model will know what the capability is in the worst-case scenario. Objective 3 uses a combined CFD and ML approach to determine maneuvering capabilities of a specific vessel.</p> <p>Objective 4: Decision Dashboard</p> <p>A client that works without internet will be developed incorporating objectives 1-3 into it. The decision dashboard is the final product of the project and acts as a collision avoidance tool for mariners. The dashboard works by taking the objects detected in objective 1 and using the database from objective 2 and the maneuvering capabilities from objective 3 to provide the mariner auditory and visual aid on the most optimal course of action for avoiding a potential collision.</p>	

7. Research implementation and results under the program

Title of your research plan:

Advancing Maritime Safety Through Radar Image Classification

Description of the research activities:

Research activities had a heavy focus on objective 1. It primarily focused on being able to convert the obtained raw radar data which was presented in a binary ascii form into a readable radar image. This involved reverse engineering some of the code given by an open source sea navigation software called OpenCPN. A majority of the research conducted involved a lot of trial and error on image conversions as seen in the different results below.

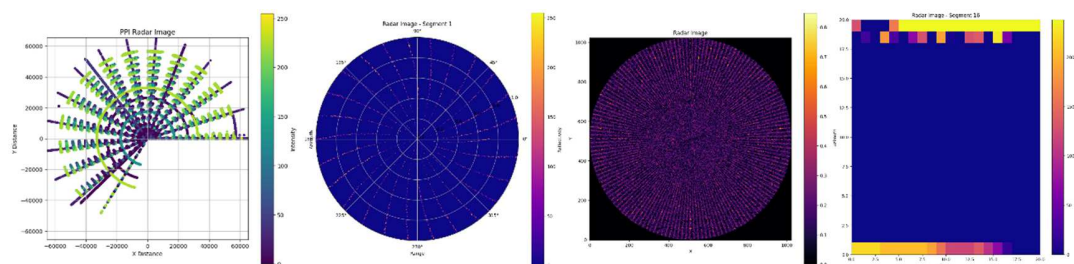


Figure 1 The various results of different reverse engineering methods used on the raw data

While there were many failed attempts as seen in figure 1, a successful image was generated and converted from the raw data towards the end of the fellowship period. This successful image generation allows for the continuation of the object algorithm after the fellowship. It also validates that the raw radar data obtained is indeed readable.

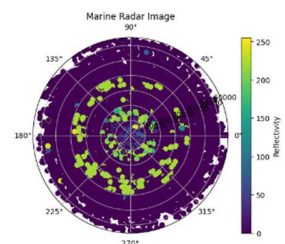


Figure 2 Successful Radar Image

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I have really enjoyed my time in Japan and would love to have another opportunity to return if possible. My experience gave me a new perspective on the differences and similarities between my lab back home and the lab here. My lab was very friendly and welcoming and allowed me to directly experience various Japanese “traditions”. I had a lot of fun traveling around Japan as well and seeing the different culture and sights.

9. Adviser’s remarks (if any):

Research Report

1. Name: Paul TAELE	(ID No. SP24003)
2. Current affiliation: Texas A&M University	
3. Research fields and specialties: Engineering Sciences	
4. Host institution: University of Tokyo	
5. Host researcher: Prof. Takeo IGARASHI	
6. Description of your current research <p>For people studying Japanese as a foreign language, kanji script writing is an important skill to learn, but also has a high learning curve for people with English language fluency. Therefore, in Japanese foreign language instruction, instructors often introduce various pedagogical methods such as (1) written techniques and (2) visual structure for novice students to more effectively achieve mastery of proper Japanese kanji script writing. One aspect of my current research first focuses on interviewing instructors and observing classrooms of foreign language courses that teach novice kanji script writing lessons. Afterwards, the research utilizes those insights to justify algorithmic design decisions for a writing-based intelligent tutoring system, which provides automated feedback and assessment of novice students' classroom kanji writing performance. Another aspect of my work focuses on writing-based intelligent tutoring systems for novice foreign language instruction of Japanese kanji script writing, with further research exploration of the first method and expanding to the second method. I also conduct additional qualitative studies for further insights in developing a more comprehensive writing-based intelligent tutoring system for kanji script writing instruction.</p>	

7. Research implementation and results under the program

Title of your research plan:

Automated Assessment and Interaction Techniques for Intelligent Tutoring Interfaces on Novice Kanji Writing Instruction

Description of the research activities:

My research activities consist of three primary areas:

The first area was pedagogy design studies, where I derived qualitative design insights from Japanese foreign language instructors in Japan. The activity consisted of recruiting and interviewing instructors from Japanese foreign language programs in Tokyo and Osaka, qualitatively analyzing the raw interview data, and deriving insights from the analysis to propose a set of kanji writing assessment features.

The second area was recognition algorithmic design, where I designed algorithms for automatically assessing the previously derived features, and then evaluating and optimizing their effectiveness on students' kanji writing as training data. The activity consisted of coding and evaluating the algorithms with remote researchers at my home institution and seeking guidance on correctness with in-person research at my host institution.

The third area was user interface development, where I developed the writing-driven interactive components of the intelligent tutoring system for kanji writing. The activity consisted of exploring existing state-of-the-art kanji writing-based educational software applications for intuitive interactive features, developing the user interface that combines the developed algorithms and observed interactive features, and combining them into a minimally viable prototype that received consultation from researchers in Tokyo on the viability of its intuitiveness and stability.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

During my stay in Japan, my cultural experiences include bathing in a traditional onsen in Hakone, learning how to make traditional ramen in the Shin-Yokohama Ramen Museum, visiting famous temples and shrines in Kyoto, and watching a professional Japanese baseball game in the Tokyo Dome.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Griffin B. WERNER	(ID No. SP24004)
2. Current affiliation: University of Hawai‘i at Mānoa	
3. Research fields and specialties: Humanities and Social Sciences	
4. Host institution: Miyagi University of Education	
5. Host researcher: Prof. Taketo TABATA	
6. Description of your current research <p>My dissertation project explores the way in which 20th century Japanese philosophy, in dialogue with French, German, and American political theory, can inform an understanding of what I call Contemporary American Nihilism. I argue that nihilism, as it manifests in the United States in the 21st century, can be characterized as a force of homogenization, one which drives contemporary life toward future annihilation. Nishitani Keiji’s Zen Buddhist conception of nihilism in Japanese culture greatly informs my thinking on the relationship between nihilism and one’s personal experiences of anguish and despair. Confronting nihilism, I argue, involves contending with experiences of nothingness in community.</p> <p>Philosophy for children (p4c) Hawai‘i is an innovative approach to education that transforms educational experiences by engaging people in the activity of philosophy. In both Hawai‘i and Miyagi, educators use p4c in order to open students up to different ways of thinking, motivating them not to be in a rush to find the correct answer and instead feel comfortable exploring philosophical problems which often don’t have obvious solutions. Educators used p4c in Miyagi to address trauma after the 2011 Tohoku earthquake and tsunami, and I have personally witnessed the positive effects that such a pedagogical style has on students. The theory and practice of p4cHI informs how I understand Contemporary American Nihilism as a problem to be lived rather than one to be solved. Living in our current age of nihilism involves contending with homogenizing forces through practices which empty our individualistic ways of thinking and being such that we can attend to experiences of nothingness in community.</p>	

7. Research implementation and results under the program

Title of your research plan:

Theorizing Education through Zen Buddhism and Philosophy for Children (p4c) Pedagogy

Description of the research activities:

My research activities consisted of three major elements:

1. Philosophy for children (p4c): At the Miyagi University of Education attached elementary school, Sagae High School in Yamagata, and Wakabayashi elementary school, I visited teachers and participated in p4c activities and learned about the differences and challenges of doing p4c with Japanese students compared to students in Hawai'i. Furthermore, in Rome, at the World Congress of Philosophy (WCP), I met with various scholars and chaired a panel about p4cHI and its implementation around the world.
2. Nishitani Keiji: with my host researcher, TABATA Taketo, we started reading one of Japanese Philosopher Nishitani Keiji's untranslated essays. After the JSPS Summer Program is complete, we plan to continue reading it together and eventually translate it into English. We also met with various scholars of Nishitani Keiji in Tokyo, Kyoto, and Rome. We traveled to Tokyo to a conference on Nishida Kitaro, where we met with several scholars and discussed Nishitani's theory and the growth of Japanese philosophy scholarship in Japan and in the English-speaking world.
3. Tabata-sensei and I started writing a co-authored article about the influence of German Philosopher Jurgen Habermas on the theory of p4c.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

During the weekends, I was able to visit many independent bookstores and cafes in Sendai, Kyoto, and Tokyo. This gave me an overall impression of the local culture in these areas. While in Kyoto, I met with a Japanese philosophy scholar who showed me Kyoto University, the Philosopher's Path 哲学の道, and many nearby temples. We discussed the history of Japanese philosophy, visited the grave of philosopher Kuki Shuzo, and discussed the Zen Buddhist practice of Nishida Kitaro and Nishitani Keiji. I am very grateful for the opportunity to visit the birthplace of Kyoto School Philosophy.

9. Adviser's remarks (if any):

He was sincere and eager to learn. He showed his talent in the practice of p4c at Japanese schools. Many teachers learned p4c facilitation skills from him. His knowledge of Nishitani is deeper than that of Japanese researchers, and he has passion to learn more about Nishitani. His idea of linking Nishitani philosophy, nihilism, and p4c is unique. I learned a lot about Nishitani's philosophy from him. The new paper we are writing together will be very important and have implications worldwide.

(SP24005) Research Report

1. Name: Alex S. RATERINK	(ID No. SP24005)
2. Current affiliation: Rice University	
3. Research fields and specialties: Biological sciences	
4. Host institution: Kyushu University	
5. Host researcher: Prof. Hiroshi OCHIAI	
6. Description of your current research <p>The three-dimensional organization of the genome in the mammalian cell nucleus is directly related to gene expression, changing over time and with respect to cell phenotype. Much remains unknown about the causal link between structure and function, particularly at the scale of individual cis-regulatory elements (CREs) in a single cell's nucleus during interphase, largely because there are few techniques capable of studying these dynamics. In my current research I work on developing a catalytically dead CRISPR/Cas9 labeling approach enabling temporally extended, widefield, fluorescent tracking of specific genomic loci in live human cells. This innovative method uses a mutated form of Cas9 that binds but does not cut DNA, allowing for precise localization of genomic regions without altering the DNA sequence. The advantage of this technique is that it enables the tracking of specific genomic loci in live cells over extended periods, which is crucial for understanding dynamic chromatin arrangements and their influence on gene expression. Coupled with the MS2-MCP reporter system, which visualizes RNA transcripts in living cells, this approach allows for the real-time observation of CRE dynamics and their transcriptional consequences.</p>	
7. Research implementation and results under the program Title of your research plan: Regulatory factor clustering near the <i>Nanog</i> gene and the effects on transcription.	

Description of the research activities:

Transcription of genes in mammals occurs in “bursts”, characterized by ON and OFF states in which a gene is active and transcribing or inactive, respectively. One way that this bursting is regulated is by clustering regulatory factors (RFs), or proteins that recruit or modulate transcriptional machinery, near the gene. RF localization around a gene is typically studied by ensemble averaged and fixed cell methods, limiting understanding of how gene expression is regulated in a dynamic individual cell. STREAMING-tag, developed in Prof. Ochiai's lab, allows measurement of a gene's location and transcriptional intensity simultaneously in live cells through fluorescence microscopy, and combining this with fluorescent tagging of certain RFs allows tracking of RF clusters in the cell's nucleus, enabling the measurement of the distance between a nearby RF cluster and the gene of interest while recording transcriptional state. In my research, I extended this work on the *Nanog* gene in mouse embryonic stem cells to study the localization of a variety of RF clusters involved in various steps of transcriptional regulation. Med1 is a subunit of the Mediator complex, which helps recruit necessary transcription machinery. Med1 showed a slightly smaller, but not statistically significant, cluster-gene distance when the gene was ON compared to when it was OFF, a result in line with previous data on some of the other Mediator subunits. Taf1, a subunit of transcription factor II D that promotes formation of the pre-initiation complex, showed clusters that were closer when transcription was ON but the difference was not statistically significant. Paf1, a subunit of the Paf1 complex (Paf1C) which plays a role in the whole process of transcription, showed clusters that were again slightly, but not significantly, closer when the gene was ON. These RFs are known to be involved with transcriptional regulation at *Nanog*, suggesting that they are transiently localized near the gene to activate transcription before diffusing away, or that they stay relatively stationary near the gene body after transcription is completed. Finally, preliminary timelapse experiments demonstrated the possibility of measuring cluster-gene distance over a bursting event, enabling better understanding of the RF cluster dynamics and their effects on transcription.

8. Please add your comments, including any cultural experiences during your stay in Japan (if any):

Overall, the experience was enjoyable, productive, and engaging. For cultural experiences, I was able to view the Hakata Gion Yamakasa festival in Fukuoka City, as well as the Hinokuni Matsuri (Fire Festival) in Kumamoto City.

9. Advisor's remarks (if any):

Alex demonstrated strong research skills and significantly contributed to our understanding of transcriptional regulation at the *Nanog* gene. His proactive engagement with lab members and enthusiasm for Japanese culture, as seen through his participation in local festivals, enriched his experience and ours. I have high expectations for his future success in the field.

JSPS Summer Program 2024

Research Report

1. Name: Nathan J. MCGREGOR	(ID No. SP24006)
2. Current affiliation: University of California, Santa Cruz	
3. Research fields and specialties: Mathematical and Physical Sciences	
4. Host institution: Tokyo Institute of Technology	
5. Host researcher: Prof. Hidenori GENDA	
6. Description of your current research: I am interested in the formation, evolution, and geodynamics of rocky bodies, specifically Venus and small bodies such as asteroids. Most of my work involves numerical simulations of thermal evolution and elemental, isotopic, and petrographic analyses of meteorites. My areas of focus include delivery and loss processes of volatiles during accretion, cycling and storage of volatiles within interiors, and magma redox mechanisms in planetary environments.	
7. Research implementation and results under the program Title of your research plan: Constraining the impact origin of Phobos through evaporative loss modeling of different impactors Description of the research activities: In this project, I developed a comprehensive methodology to investigate Phobos's volatile depletion and isotopic fractionation, focusing on its formation from an impact-generated debris disk around Mars. This work involved an extensive literature review, particularly on the thermodynamic processes governing volatile loss and isotopic fractionation during the formation of small planetary bodies like Phobos. I formulated equations to model the thermal evolution of debris disk particles, incorporating both their cooling behavior and the associated loss of volatile elements. Additionally, I focused on the isotopic fractionation processes that would have occurred during Phobos's accretion. To carry out these simulations, I gained access to the numerical code necessary for volatile loss modeling and familiarized myself with its application. These steps culminated in the successful drafting of a project proposal for my qualifying exam, which lays the groundwork for my dissertation. Having established the theoretical framework and gained access to the computational tools needed, I am now in the implementation phase. Over the next year, I will develop and refine the numerical simulations to accurately predict volatile loss and isotopic fractionation. The first phase of this work will involve validating the simulations using known datasets to ensure the reliability of the models. Once this is complete, I will run simulations that replicate the conditions under which Phobos formed, enabling us to make predictions about its final composition. These results will not only help test the impact-origin hypothesis but also provide valuable insights for future observation and sample return data from the upcoming JAXA Martian Moons eXploration (MMX) mission. Looking forward, I will assess the simulation results by spring 2025, with the goal of completing a draft of the research paper by summer 2025. I also plan to present my findings at several planetary science conferences in 2025 and 2026, contributing to the broader scientific discussion on Phobos's origin and volatile depletion. This research will provide key insights into the formation and evolution of Mars's moons, while also preparing for the forthcoming MMX mission to Phobos.	

8. Please add your comments, including any cultural experience during your stay in Japan (if any): My time at Tokyo Tech during the JSPS summer program was a transformative experience, both professionally and personally. I had the opportunity to collaborate with students and professors in my host lab, present my work during group meetings, attend workshops and conferences, and learn about research from a new cultural perspective. My labmates made me feel welcome, inviting me to daily lunches and celebrating my achievements with me both in the office and during a memorable dinner outing. Immersing myself in the Japanese work culture was eye-opening; I observed how different the work environment and routines were compared to what I was used to in the USA. These interactions deepened my understanding of how research is approached globally, and I learned valuable lessons that will shape my future work.

One of the highlights of my stay was participating in a three-day homestay with a local family. They picked me up at Tokyo Tech and took me to Kamakura, where I explored beautiful shrines and temples while learning about the rich history and cultural significance of these landmarks. The family treated me to traditional Japanese meals and even invited me to a local community party, where I got to wear a yukata, learn traditional dances, and bond with local community members. I also had the pleasure of walking their Shiba Inu, Mon, every day, which led to meeting even more people in the neighborhood. The family's warmth extended to inviting their extended family over for a traditional dinner, complete with a stunning shamisen performance. The connection I built with them was so strong that we still keep in touch, and I plan to visit them during my next trip to Japan.

During my time in Tokyo, I stayed in international housing on campus, which provided great opportunities to experience Japanese culture firsthand. I explored Tokyo extensively and had the chance to travel throughout the area. One particularly memorable day was spent with my host researcher's secretary, who generously gave me a tour of Ueno, brought me to several fascinating museums, cooked a delicious dinner, and capped off the evening by watching fireworks with her friends. The entire experience—both on and off-campus—allowed me to truly immerse myself in Japanese life, and I look forward to visiting both my host institution and the wonderful people I met when I return.

I cannot express enough how grateful I am to JSPS, my host researcher, and my host institution for making this incredible experience possible. From start to finish, I enjoyed every moment of the program. The orientation week was especially valuable, offering insightful presentations on the Japanese language, history, art, and culture, which helped me better understand and appreciate the environment I was about to immerse myself in. Learning the language was both challenging and rewarding, and it deepened my engagement with the local culture. I am unbelievably thankful for the opportunities this program provided, for the kindness and support I received from everyone involved, and for the chance to experience Japan in such an authentic and meaningful way. This program has left a lasting impact on me, and I will carry the lessons and memories with me throughout my career.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Dillon E. SLOAN	(ID No. SP24007)
2. Current affiliation: University of North Carolina, Chapel Hill	
3. Research fields and specialties: Biological Sciences	
4. Host institution: University of Tokyo	
5. Host researcher: Prof. Masahide KIKKAWA	
6. Description of your current research Craniofacial malformations represent the largest category of birth defects and a major expense to the healthcare system and affected families. Mutations in the understudied gene CCDC32 (Coiled coil domain containing protein 32) were recently found to underlie such birth defects via a developmental syndrome that causes microcephaly, bilateral cleft lip/palate, and many other defects. Preliminary cellular data show CCDC32's involvement in endocytosis and ciliogenesis, although molecular data to explain these functions is lacking. My current research addresses the molecular mechanism of CCDC32 function by a combination of high-resolution cryogenic electron microscopy (CryoEM), biochemical reconstitution, and live-cell fluorescence microscopy. My data details novel features of the role of CCDC32 in ciliogenesis, as well as of the interaction of CCDC32 with a key endocytic regulator, the adaptor protein 2 (AP2) complex. Given the expertise of the Kikkawa lab at the University of Tokyo in CryoEM to study ciliary proteins, I sought to conduct collaborative research via the JSPS summer program to better understand the molecular function of CCDC32.	

7. Research implementation and results under the program

Title of your research plan: “Cryo-electron microscopy study of the Adaptor Protein Complex 2 and its understudied co-factor CCDC32”

Description of the research activities: We had planned several types of CryoEM samples to prepare for analysis. These included samples with purified components of the AP2 protein complex and its co-factor CCDC32, with and without the addition of various types of liposomes. The plan also included preparing samples of cilia that were formed in control cells and cells that lacked CCDC32, although we were unable to complete this for unforeseen technical reasons. The research activities consisted of screening the prepared samples for subsequent data collection. The screening efforts lasted through the first month, and concluded with obtaining a dataset of electron micrographs that is still being processed. During the second month, necessary maintenance on the cryogenic electron microscope was performed and therefore could not be used for much of the time. Instead, this time was spent preparing new samples and analyzing their quality by using negative stain electron microscopy. With guidance from experts in the laboratory, I received further instruction on data processing and analysis, and was able to develop a computer algorithm that can analyze the size of molecules within the negative stain dataset. Finally, in the last week, we began another CryoEM dataset collection on newly prepared samples. This dataset appears the most promising and will continue after this summer, and will help us understand the function of CCDC32 and how it promotes cell health and development.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

My time in Japan was quite enjoyable and marked with the meeting of many new friends who I intend to keep in contact with after I return to the United States. I enjoyed several of the most wonderful eating experiences. My favorite includes a *tachigui* restaurant called Tokyo Light Blue near the Hongo campus of the University of Tokyo. It serves the most excellent *udon* I have had in my entire life, and it would be worth another trip to Japan just to enjoy it. I was matched to spend a weekend with a wonderful Japanese host family. We were surprised to have much in common, and spent a lot of time in conversation. During my first visit with them, I got the choice to sleep in a normal bed or experience sleeping in a traditional *yukata* on a *futon*, which I chose and quite enjoyed. We visited again on other occasions as well, including to enjoy dancing to traditional Japanese folk songs during a *Bon Odori* festival that lasted long into the night.

9. Adviser's remarks (if any):

JSPS Summer Program 2024

Research Report

1. Name: Edwin F. Umanzor	(ID No. SP24008)
2. Current affiliation: The University of Arizona	
3. Research fields and specialties: <div style="display: flex; flex-wrap: wrap; justify-content: space-between; padding: 5px 0;"> <div style="width: 30%;">Humanities</div> <div style="width: 30%;">Social Sciences</div> <div style="width: 30%;">Mathematical and Physical Sciences</div> <div style="width: 30%;">Chemistry</div> <div style="width: 30%;">Engineering Sciences</div> <div style="width: 30%; background-color: yellow;">Biological Sciences</div> <div style="width: 30%;">Agricultural Sciences</div> <div style="width: 30%;">Medical, Dental and Pharmaceutical Sciences</div> <div style="width: 30%;">Interdisciplinary and Frontier Sciences</div> </div>	
4. Host institution: The University of the Ryukyus	
5. Host researcher: Dr. Yu Matsuura	
6. Description of your current research <p>Insects commonly harbor diverse and long-lasting associations with bacterial symbionts, which play crucial roles in ecology and reproduction. Many of these symbionts are maternally (vertically) inherited and provide nutrients that are deficient in the host's diet, thereby enhancing their transmission. Some symbionts accomplish this not by supplying nutrients, but by manipulating host reproduction. Reproductive manipulation is one of the most enigmatic biological phenomena, and the predominant cause is cytoplasmic incompatibility (CI). This occurs when CI-symbiont carrying males with modification factors mate with females lacking the CI symbiont, resulting in few or no offspring. Through rearing and crossing experiments, I discovered the intracellular symbiont <i>Lariskella</i> causes CI in the leaf-footed bug, <i>Leptoglossus zonatus</i>, a seed-feeding pest of tree crops in Western USA. However, the genetic basis of CI, and functional diversity between different <i>Lariskella</i> strains is still unknown.</p> <p>To gain insight into the genetic structure and diversity of <i>Lariskella</i>, we proposed the following project: <u>1) acquisition and analysis of a complete genome sequence of <i>Lariskella</i> in the leaf-footed bug and elucidation of <i>in situ</i> localization pattern of the bacterium.</u> <u>2) characterizing <i>Lariskella</i> diversity in locally significant pest insects that have been little explored for <i>Lariskella</i>,</u> e.g., leafhoppers and planthoppers, such as <i>Amrasca biguttula</i>, but we will also sample stinkbug groups and allies where <i>Lariskella</i> is better known, including the endemic squash leaf-footed bug <i>Leptoglossus australis</i> and the mirid bug <i>Taylorilygus apicalis</i>.</p>	

7. Research implementation and results under the program

Title of your research plan: The role of the intracellular symbiont *Lariskella* in a leaf-footed bug, and its prevalence in Okinawan insects

Description of the research activities:

1) acquisition and analysis of a complete genome sequence of *Lariskella* in the leaf-footed bug and elucidation of *in situ* localization pattern of the bacterium.

Unfortunately, the coverage from our *Lariskella* sequences was not enough for us to be able to assemble a *Lariskella* genome during my summer visit. I did gain experience with valuable informatics tools, such as fastqc and NanoPlot using the Bioconda installation channel, and I will continue to use these tools in my research. In addition, we visited OIST and met with Dr. Filip Huznik whose lab recently found *Lariskella* in a nematode, and has had to enrich *Lariskella* DNA before sequencing. Finally, a fluorescent microscopic method (fluorescence *in situ* hybridization (FISH)) that specifically targets *Lariskella* enabled us to observe *Lariskella* in the reproductive tissue of leaf-footed bug males, which is consistent with a symbiont that causes cytoplasmic incompatibility (CI).

2) characterizing *Lariskella* diversity in locally significant pest insects that have been little explored for *Lariskella*

We collected/screened a total of 239 samples from Okinawa across 15 different insect species. We used diagnostic PCR to identify *Lariskella* in the butterfly, *Chilades pandava*, the weevil, *Episomus mori*, the plant bug, *Physopelta gutta*, and the local mirid pest, *Taylorilygus apicalis*. We believe this is the first time these species have been found to harbor this symbiont.

8. Please add your comments, including any cultural experience during your stay in Japan (if any): I greatly enjoyed getting to know the members of my lab. I was able to join lab parties, outings to local Japanese bars, and also a mochi making class. My host also cooked Takoyaki for us. I also had a great time with my host family during the culture exchange. I was able to visit Okinawa World and it was nice seeing how a Japanese family spends a weekend.

9. Adviser's remarks (if any): Mr. Umanzor painstakingly tackled the issues we had with the low DNA titer of our target bacterium in search for an improved protocol of DNA extraction and whole genome sequencing, and we reached our conclusion within a very short time frame. He also managed to conduct FISH experiments and fluorescent microscopy, and understood the background knowledge very quickly, which was remarkable. His further screening efforts of local insect populations did have positive results. I cannot be more than certain that our future project will develop based on these trials and become a milestone in the field.

JSPS Summer Program 2024 Research Report

1. Name: Cherryle Heu	(ID No. SP24009)
2. Current affiliation: University of Hawai'i	
3. Research fields and specialties: Environmental Sciences	
4. Host institution: University of Tokyo	
5. Host researcher: Dr. Tomo'omi Kumagai	
6. Description of your current research Soil moisture accounts for 0.05 percent of Earth's freshwater yet assumes a vital role in our climate, Earth system, and human society. The dynamic behavior of soil moisture describes the critical processes in hydrology, such as soil water retention, subsurface transport, and surface runoff. Additionally, it is a necessary component in agriculture production as well as a predictive variable in creating alert systems for natural hazards such as floods and landslides. As such, understanding and simulating soil moisture are critical in ensuring sustainable resource management while optimizing the capacity to mitigate and respond to environmental hazards and risks. My research is driven by the ranching community in New Zealand who are continuously needing to monitor their land based on climate and natural conditions. In particular, understanding soil moisture is valuable and significantly influences crop yields and forage production. In instances of drought, irrigation is relied on to supplement the water deficit and requires effective management to ensure timing and quantity meet the production needs. Thus, monitoring and understanding soil moisture dynamics is critical to provide resource managers in this sector with the proper data and tools to make informed decisions and optimize water utilization during irrigation. Further, there is a growing demand for soil moisture prediction models to improve planning and efficiency during irrigation practices. In response to this demand, along with increasing access to data and computing power, there has been a growing focus on achieving soil moisture prediction using machine learning technology, a form of artificial intelligence, in the last five years. While many studies have shown that machine learning is a viable tool for predicting soil moisture, it requires substantial observational data for input. Meanwhile, other time series prediction methods, such as AutoRegressive Integrated Moving Average (ARIMA), are less computationally demanding and more accessible to resource managers. Thus, I am developing soil moisture prediction models and comparing the performance metrics between statistical models (ARIMA) versus machine learning models to determine whether statistical methods are just as viable as machine learning.	

7. Research implementation and results under the program

Title of your research plan:

Evaluating Soil Moisture Predictions: Machine Learning Approaches vs. the Hydrus Hydrological Model

Description of the research activities:

My research in Japan is focused on soil moisture predictions in the context of soil moisture. Dr. Kumagai's lab has collected extensive field data in Japan that spans over six years. Using that data, I sought to apply my machine learning skills to the lab's data to predict soil moisture at 10cm depth and evaluate its accuracy and useability compared to that of traditional hydrological models.

With the help of my lab mates, I processed the field data and experimented with different machine learning setups to see what configurations would yield the highest accuracy. The process involved extensive procedures and a cycle of trial and error to test what data and model configurations would be useful for prediction. At the end of the fellowship period, I successfully developed a machine learning model that could predict the timing of soil moisture peaks one hour in advance using only climate data such as solar radiation, precipitation, and relative humidity, without needing soil moisture data as input. However, there is still some ways to go to predict precise soil moisture values and eliminate noise. My research process has also led to additional potential research questions and avenues that could be explored, such as developing a machine learning model to predict soil moisture at varying depths and identifying what climate variables made the most contributions to making predictions.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I feel incredibly fortunate to have been part of such a welcoming and supportive lab during my time in Japan. The insights and experiences I gained in my field of study, as well as the overall academic environment, have been invaluable. Thanks to the support of fellow JSPS researchers and my lab, I gained invaluable cultural and academic experiences during my time here. I deeply appreciate the connections I have made, and I hope to maintain these relationships and eventually return to Japan to further my research and strengthen my ties to the country.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Joseph Iseri	(ID No. SP24010)
2. Current affiliation: University of Hawaii at Manoa	
3. Research fields and specialties: Humanities	
4. Host institution: Osaka University	
5. Host researcher: Prof. Matthew BURDELSKI	
6. Description of your current research <p>Reading, and its counterpart writing, are some of humankind's greatest technologies. Their impact on shaping human history precludes even the documentation and mass distribution of that history. Beginning in the 70s, research on reading began to address literacy's relationship to sociality, moving away from an understanding of reading as a process of cognitive mechanisms and towards an appreciation of reading as a socially and culturally-bound activity (e.g., Heath, 1983). While the previous literature has addressed reading in contexts where print literacy is low (Cole & Scribner, 1981) or emerging (Besnier, 1985) in adult populations, few studies have addressed early reading in highly literate societies (cf. Heath, 1983). Recently, more attention has been placed on early reading through the use of detailed microanalysis of reading events (e.g., Johnstone, 2017; Krytzis, 2017; Takada & Kawashima, 2019; Ozaki, 2024), however exploration of how these events relate to the overall trajectory of literacy development in the explored society are limited.</p> <p>This research project seeks to explore how reading in early childhood is evidence of and a resource for children's linguistic and social development in Japan. Through the use of multimodal Conversation Analysis (CA), this study investigates the process Language Socialization (Schieffelin & Ochs, 1984; Ochs & Schieffelin, 1986), or the process of how novices (illiterate children) become experts (literate adults) through interaction with experts (their caregivers).</p>	

7. Research implementation and results under the program

Title of your research plan: Socialization in Kansai Contexts – Literacy in early childhood in Japanese homes

Description of the research activities:

During my fellowship, I was able to collect two types of data: literacy events in the home environment of preschool aged children (aged 1-6) and routine activities in a preschool, including a focus on literacy activities. I was able to obtain approximately 6 hours of data from families and 40 hours of data from preschools.

The first data set (i.e., home literacy events), including the supplementary interviews and survey data from parents, showed that parents in general do not place a great deal of emphasis on their preschool children's acquisition of print literacy, which is in line with findings of previous studies (i.e., Mason et al., 1989; Tobin et al., 1989). Additionally, it uncovered that reading is primarily taken up as an opportunity for parents to develop intimacy with their children both physically (i.e., the embodied activity of reading) and emotionally (i.e., the opportunity to engage in phatic interaction with children during reading). In this way, children's reading is socialized to be a form of play and a means of bonding between parents and children, rather than purely as a means to disseminate information (cf. Heath, 1983) or as a part of their moral training (cf. Moore, 2008). Parents' orientation to children's preferences of reading material and how that reading material is interacted with (e.g., child-lead reading sessions) also show how reading practices reflect the child-centered nature of the Japanese society (Clancy, 1999).

Preliminary analysis of the second data set (i.e., literacy activities in preschools) coincides with previous findings reported in the literature regarding the lack of emphasis on formal reading instruction and the creative uses of literacy in play (i.e., Mason et al., 1989; Tobin et al., 1989). However, important discoveries were made regarding the role of peers and teachers in the use of and orientation to printed text. For example, the data set contains many instances in which children 'read' books to each other in ways that are sensical to themselves, but not in ways that resemble print literacy as it is traditionally defined. Further analysis will focus on how these interactions figure into the larger socialization process to what constitutes 'reading' and what social or cultural value reading has in the early childhood of Japanese children.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

This experience provided me a first-hand impression of the Japanese work environment. I was glad to be able to experience a piece of Japanese work culture during my tenure as a visiting researcher and working in close coordination with my host.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Eric J. VERBEKE	(ID No. SP24012)
2. Current affiliation: Princeton University	
3. Research fields and specialties: Mathematical and Physical Sciences	
4. Host institution: University of Tokyo	
5. Host researcher: Prof. Radostin DANEV	
<p>6. Description of your current research</p> <p>Biological sciences are continually evolving to produce larger, richer and more challenging data to analyze. In the field of computational microscopy, it is common to analyze terabytes of data collected from a single experiment. My current research focus is developing efficient algorithms and statistical validation frameworks for image data with an emphasis on data collected from electron microscopes.</p> <p>Cryogenic electron microscopy (cryo-EM) is an imaging technique capable of recovering the high resolution 3-D structure of biomolecules. By determining near-atomic resolution structures of the molecular machines in our cells, we are better able to characterize how they function and control the emergent properties of life. While cryo-EM datasets allow us to gain novel insights into how cells work, they produce huge, extremely noisy and high dimensional data which is challenging to analyze.</p> <p>Informative metrics are therefore a crucial component in cryo-EM data analysis. In recent work, I have been developing statistical metrics for both supervised tasks, where the ground truth is available, and unsupervised tasks, where no ground truth exists. This latter task is particularly challenging and important in microscopy since we often do not have any ground truth.</p> <p>Typically, a form of cross-validation is used to assess the quality of data in cryo-EM, known as the Fourier shell correlation (FSC). For this approach, the data is split into half-sets and the correlation is computed across frequency shells. However, in some applications, splitting the dataset is not desirable or not possible. We recently developed a method for computing the FSC from a single measurement and showed the necessary statistical conditions under which it works. Following from this approach, my research goal at The University of Tokyo is to assess the signal to noise ratio of cryo-EM images using correlative methods.</p>	

7. Research implementation and results under the program

Title of your research plan:

Estimation of the spectral signal to noise ratio from noisy images

Description of the research activities:

Cryogenic electron microscopy (cryo-EM) is an imaging technique capable of recovering the high resolution 3-D structure of biomolecules. Typically, thousands of images containing many instances of the biomolecule are needed to obtain a structure. Due to the low electron dose required for imaging, and variable sample quality, the signal to noise ratio in cryo-EM is low. In this project, we investigate an approach for estimating the spectral signal to noise ratio (SSNR) from each image in a dataset post-hoc. Our method could be used to boost the signal of the final 3-D reconstruction by only using images with high SSNR. Additionally, our method could be used for training of learning based approaches to recognize high quality images during acquisition.

In the Danev lab, I built on existing theory to describe an approach for estimating per image SSNR by computing the correlation between reprojections of a 3-D structure obtained from standard data processing and each particle image in the corresponding dataset. These results were then validated using simulated data. Next, I used data collected from the Danev lab to assess the SSNR of each image in a cryo-EM dataset. A summary of the method developed is shown in Figure 1.

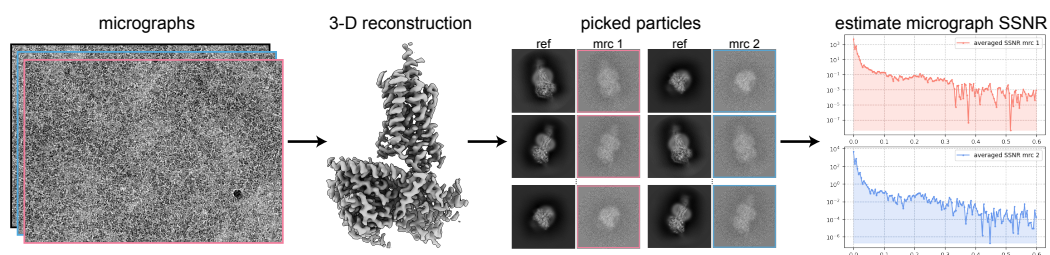


Figure 1. Proposed method for estimating per image (micrograph) SSNR.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

My time in the Danev lab allowed me to better appreciate the research environment and everyday lifestyle of Japan. I am thankful to Prof. Danev and JSPS for giving me this opportunity. Outside of the lab, I was able to visit several beautiful cities near Tokyo as well as other nearby prefectures.

9. Adviser's remarks (if any):

JSPS Summer Program 2024

Research Report

1. Name: Kelsey Milian	(ID No. SP24013)
2. Current affiliation: City University of New York (CUNY) Graduate Center	
3. Research fields and specialties: Humanities	
4. Host institution: Kansai Gaidai University (Hirakata, Osaka)	
5. Host researcher: Philip Flavin	
6. Description of your current research <p>My present research is focused on Japanese perceptions of Latin American popular music. As an ethnographic research project, my investigations required entering specific spaces in Osaka and Tokyo that facilitate and share Latin American popular music such as salsa, bachata, cumbia, and especially reggaeton. As the reggaeton genre has explored global popularity, this research inquiry is interested in how such a genre is being received and shared within Japanese communities and physical spaces. This research study is interested in the types of cross-cultural relationships resulting from sonic exposure to Latin American popular music and Japanese culture.</p> <p>These Latin American genres carry a rich and complex history of acculturation and transculturation. This means the dissemination and creation of such genres of music take on new meanings and reactions from the diasporic communities that help produce and share them with audiences worldwide. To locate reggaeton music within the Japanese music scene, it was crucial to explore the possible streams of historical interactions of music and culture between Latin America and Japan. Pablo Borchí studied how such interactions between Japanese pop cultural aesthetics have manifested through the performance of Latin American music, such as salsa, cumbia, tango, rumba, and Latin jazz. Researchers Darío Tobón Montoya and Rafael Reyes-Ruiz have traced the presence of Latin American music in Japan as early as the 1920s with the integration of Tango. Themes of replication and cultural authenticity interlock with conversations about Latin American cultural stereotypes on aesthetics, language, and feeling. Japanese interest in Latin American music has created spaces of musical universality. This suggests that salsa, bachata, merengue, and cumbia are genres without borders that encourage inclusivity for all to experience, Latin Americans and non-Latin Americans alike.</p> <p>Concerning reggaeton specifically, this contemporary Latin American music genre can trace its origins to the transatlantic slave trade in which the specific rhythm “tango de congo” was brought from the Bantu-speaking peoples of the Congo region of Africa. These processes brought about the sharing of dances, music, sounds, and practices that developed this specific rhythm in Eastern Cuba, now called the “habanera rhythm.” Eventually, it spread into other areas of the Caribbean, taking on influences from Jamaican dancehall reggae and translating its lyrics to Spanish in Panama. These fusions eventually immigrated to various Latin American countries, including Puerto Rico, where the foundational rhythm of “Dembow” cemented itself as the primary rhythmic pattern for contemporary reggaeton music. As the reggaeton genre has explored global popularity, this research inquiry is interested in how such a genre is being received and shared within Japanese communities and physical spaces.</p>	

7. Research implementation and results under the program

Title of your research plan: “Bad Bunny, Yonaguni, and Japón: Japanese Perceptions of Latin American Popular Music”

Description of the research activities:

In the field of Ethnomusicology, the primary focus of our research is to adopt an innovative approach to ethnographic fieldwork for research inquiry and investigation through musical experiences. The unique methods of investigation for this project involved comprehensive participant observation, where I would frequent Osaka and Tokyo clubs, restaurants, bars, and weekly daytime and nighttime events that exclusively played and performed Latin American popular music. These physical spaces, owned and operated by Latin American and Latin American/ Japanese individuals, provided a rich data source. Research in these spaces included taking classes alongside Japanese attendees who frequently attend salsa classes 2-3 times a week. I also interviewed attendees, Latin dance instructors, and DJs who have established residencies in these spaces. These interviews, conducted in person or through Zoom, were granted permission for audio and video recording. Other research methods included attending special events where DJ collectives would perform the Latin American genre, reggaeton, for one night only or every weekend. Through visual documentation, physical and digital flyers of Latin music events were collected, and video recordings of special dance events, Latin parties, and specific DJ sets were next to the DJs themselves. My research relied heavily on social media platforms such as Instagram and Facebook, which served as the primary tools for DJs, organizers, and musicians to provide information on upcoming Latin American events.

What started as an investigation of Japanese perceptions of Latin American popular music has revealed various approaches toward sharing sonic elements of Latin American culture and identity in Japan. Specific Latin-American enclaves (physical venues), events, DJ collectives, and organizers have taken on “cultural bearer” roles in Tokyo and Osaka to share, educate, and raise awareness of an existing Latin-American presence within Japanese society. Music and dance are regarded as universal tools that transcend language barriers, in which rhythm and melody create sentiments and spaces of inclusivity. These experiences are curated and cultivated by a combination of “cultural bearers,” with a majority identifying as Latin American and Japanese citizens, explicitly taking on the professions of DJs, event organizers, and dance instructors. Navigating a world of speaking Spanish and Japanese, these DJs curate specific playlists for the various Latin events and collectives they participate in. Most stated that their primary goal is to expose Japanese people to Latin American music and culture and raise awareness of their multi-racial and multi-ethnic identities as Latin American and Japanese individuals. Of the DJs interviewed, the leading Latin American nationalities represented are Peru, Colombia, Cuba, Puerto Rico, Brazil, and Mexico. Historically, Japanese immigration to Latin America dates to the 1880s, with some of the first Japanese colonies established in Peru, Brazil, and Mexico. However, this research identified

three distinct categories or approaches to disseminating Latin American popular music within Japan: cultural enclaves, spectacles, and community events, which are split into open outdoor events and nightlife events.

Category no.1, “Cultural Enclaves,” refers to the physical spaces within Tokyo and Osaka that curate elements of Latin American popular music and incorporate Latin American cuisine, visual aesthetics, and artifacts from specific countries such as Peru, Cuba, Colombia, Puerto Rico, Mexico, and Brazil. These spaces are generally owned and operated by a combination of Latin-American and Latin Japanese people. Various owners immigrated to Japan from their home countries over 30-40 years ago and are bilingual or trilingual speakers. The clientele and genres of Latin American music being played make these spaces incredibly distinct. These locations operate on the longevity and exposure of Latin American music such as salsa, bachata, merengue, and cumbia. A robust schedule of Latin American music paired with daily dance instruction will often occur in these physical spaces. Dance instructors are usually Latin-American immigrants living and touring within Japan. Other spaces include Japanese dance instructors training and dancing for over 30 years. Most attendees are Japanese citizens between the ages of 30 and 60. When interviewed about what attracts them to Latin American music and dance, most indicated that it is based on past proximity and exposure to Latin American culture during their lifetime. I conceptualized their responses into three main aspects, “proximity and exposure” which is a result of having traveled to one or more Latin American countries, having a positive experience, and wanting to find a similar experience once returning to Japan. Other aspects include attendees' strong affinity toward Latin American culture and music due to being married or having a Latin American partner. This aspect also extends to friendships with Latin American individuals who introduce them to music and cuisine.

Category no.2, “Spectacles,” is a hyper-specific event of Latin American popular music, almost exclusively playing reggaeton, mainly drawing in an international clientele. These events are created by Latin American event organizers and promoters who sell a “one-night-only” experience of Latin American music. These events occur once or twice a month in major cities across Asia. I researched a current event called “Yonaguni Fiesta,” which promotes a one-night Latin party in a large nightclub in Tokyo, Osaka, Okinawa, Kyoto, and Nagoya. These events host over 2000-4000 attendees. These events provide stimulating sensory elements, including fog machines, foam, confetti, T-shirt cannons, and professional photographers, to create an unforgettable night of Latin American music. Because these events draw in more of an international crowd, the Latin American music selection is narrowed to more mainstream music that might incorporate pop, dance-pop, electronic, hip-hop, and disco elements.

Category no.3, “community events,” are developed by DJ collectives and organizers that center on Latin American popular music with the intention of “community building” within Japanese day and nightlife. This category is split into two sub-areas: “open outdoor events” comprising a network of long-established musicians, DJs, Dance collectives, and event organizers who have close relationships with Japanese institutions, communities, and local community members. These events are often open to the public, organized during the day, and operated in public parks or beaches. Event organizers have long-established relationships and permits from Japanese municipalities that grant permission for these weekly events. They

generally attract a network of Latin American music fans but aim to expose more Japanese communities to Latin American music and culture, aiming for these “cross-cultural experiences” and eventually developing political relationships and policies around Latin American communities living and working in Japan. “Nightlife events” are organized by DJ collectives in Japanese-owned night clubs. These are weekly events of DJ collectives that build up a Latin-American music setlist and perform every weekend at specific clubs around Roppongi and Shinjuku. The DJ collectives comprise Latin-American, Latin-American/Japanese, and Japanese DJs. These collectives are typically built within a friendship and DJ community, promoting each other on social media to gain exposure and residences in these spaces.

This research revealed diverse approaches to facilitating and exposing Latin American popular music within Japan. Ultimately, each approach targets a variety of listeners and attendees: international audiences, Japanese citizens with affinities towards Latin American culture from positive past experiences, Latin American individuals, or enclaves creating and craving a piece of Latin American culture within Japan. This includes multiracial and ethnic individuals who navigate a Latin American and Japanese identity. These Latin American events even attract those who stumble across a public park, tuning into the dembow rhythm of reggaeton and other Latin American popular music.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

My research inquiries led me to find a rich set of data that has the potential to be an ethnomusicological research book on Latin American experiences in Japan, through musical transculturation and acculturation. Ultimately, it also led me to develop long-lasting relationships with my main interlocutors and informants I can now call friends and collaborators. These experiences have led me to attend various Jazz, Japanese folkloric and Cumbia fusion concerts, meeting musicians and even performing alongside them.

My research evidently took me to various areas of Japan, as I followed specific events and performers to Okinawa. These cultural experiences allowed me to participate in food tours, ferry rides to beautiful islands, and conversations within Japanese and Spanish speakers. Living in two major cities for the past two months involved distinct experiences as well, as Tokyo provided a vibrant night life culture. Osaka embodied more intimate spaces where deep conversation could flourish.

I also had the chance to experience various outdoor excursions that involved going to the lavender fields at Lake Kawaguchiko and being able to see Mount Fuji.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 SP24014 Research Report

1. Name: MAGGIE REED	(ID No. SP24014)
2. Current affiliation: UC BERKELEY	
3. Research fields and specialties: Mathematical and Physical Sciences	
4. Host institution: High Energy Accelerator Research Organization (KEK)	
5. Host researcher: Prof. Masashi Hazumi	
<p>6. Description of your current research</p> <p>The cosmological evidence for dark matter as a stable, noninteracting, nonrelativistic phenomena has motivated GeV-scale mass searches for decades. However, null results have encouraged experimentalists to look at other possible dark matter candidates. Our present research focuses on the light dark matter regime, from keV to GeV scales. We utilize cryogenic operating (milli Kelvin) detectors. These detectors are Transition Edge Sensors (TES)- a superconducting material stabilized in the middle of its superconducting transition. Paired with cryogenic electronics (like a Superconducting Quantum Interference Device or SQUID), our detectors are sensitive to small temperature fluctuations within the material substrate. Low mass dark matter could interact directly within our detector, producing these detectable fluctuations.</p> <p>Our collaboration is already conducting dark matter searches and advancing detector thresholds across multiple institutions. I have been working under Matt Pyle's research group at UC Berkeley for 3 years, improving our cryogenic experiment via hardware upgrades focused on infrared background mitigation, running dark matter searches on both crystal scintillating targets and prototype detectors, and conducting data analysis.</p>	

7. Research implementation and results under the program

Title of your research plan:

Advancing Quantum Sensor Systems for Light Dark Matter Detection

Description of the research activities:

I finished designing an infrared tight box, meant to mitigate background sources and shield the detector, and also fabricated the box at KEK. The box was fabricated flawlessly and will be used in many detector runs to come.

Working closely with a postdoctoral fellow at KEK, I installed a suite of warm electronics necessary for future work on the Kamioka dark matter project. This suite of electronics includes: two direct current power supplies to provide power for instruments, waveform generators to operate detectors, oscilloscopes to tune and operate critical low noise amplifiers, Programmable Feedback Loop amplifiers, a control box to interface with the amplifiers, and operating software to properly communicate with the low noise amplifiers. I also built a circuit board which was designed to provide signal filtering for our sensitive detectors. Additionally, I trained the postdoctoral student (Dr. Khai Bui) I worked with, on the operation and layout of all the electronics and programs I installed.

The ultimate research goal was to complete the above, and to tune a two series array of quantum amplifiers. However, due to significant unseen processing delays, the amplifiers were set to arrive after my stay in Japan. Thus, I instead made sure the system I had built was ready for when they did arrive, and personnel were trained properly.

In order to test the fridge power noise background, we took a dark matter sensor and installed it into the system. If the detector was able to “transition”, that is, if we were able to read its electrical resistance go to zero at very low temperatures, the power noise in the fridge was low, and we are ultimately able to run more sensitive devices.

Our resistance test showed that we were unable to properly transition a device, and so more work must be done to mitigate power noise.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I very much enjoyed my stay in Japan and had a formative experience! Collaborating with members of my scientific community and making connections in another country were invaluable to me. I am sure to return to continue my work!

9. Adviser's remarks (if any):

JSPS Summer Program 2024
SP24015 Research Report

1. Name: Myrine A. BARREIRO-AREVALO (ID No. SP24015)
2. Current affiliation: The University of Texas Rio Grande Valley
3. Research fields and specialties: Biological Sciences
4. Host institution: Tokyo Institute of Technology, Earth-Life Science Center
5. Host researcher: Prof. Tomoaki MATSUURA
6. Description of your current research This project investigates the impact of different fabrication methods on the membrane composition of Giant Unilamellar Vesicles (GUVs). GUVs are critical models for understanding cellular membranes and their properties. We employed various techniques, including electroformation, microfluidics, and thin-film hydration, to create GUVs and analyzed their lipid composition using High-Performance Liquid Chromatography with Evaporative Light Scattering Detection (HPLC/ELSD). Our results reveal significant differences in membrane lipid profiles depending on the method used, highlighting how fabrication techniques can influence GUV membrane characteristics. This comparative analysis provides insights into optimizing GUV preparation methods for specific research applications and advances our understanding of membrane biology.
7. Research implementation and results under the program Title of your research plan: Comparative Analysis of Method-Specific Variations in Membrane Composition of Giant Unilamellar Vesicles

Description of the research activities:

Over the summer, the project made substantial progress in the study and production of Giant Unilamellar Vesicles (GUVs) using a variety of methods, including electroformation, interface passage, and microfluidics. Early efforts involved mastering these techniques and comparing their efficacy in producing uniform and stable GUVs. Notably, microfluidics consistently produced more uniform GUVs compared to electroformation and transfer methods, as indicated by FACS analysis. Lipid quantification via HPLC/ELSD revealed challenges in detecting lipids at lower concentrations, but adjustments such as increasing injection volumes showed promise. The project also explored the effects of different buffers, such as HEPES and MilliQ, on GUV stability and size distribution, with HEPES proving useful for maintaining large GUVs in small quantities. Additional experiments with eggPC and POPC lipids further refined the understanding of how these lipids behave under different conditions, with reproducible results aligning with previous observations.

In the latter half of the summer, the focus shifted to optimizing and finalizing analytical methods, including HPLC and MS, for detecting and quantifying the various chemical species used in GUV preparation. Key activities included developing calibration curves, refining FACS measurement conditions, and collaborating closely with the Suzuki Lab at Chuo University to advance the microfluidics aspect of the project. The team also explored new collaborations and discussed the potential for continuing the research next summer, indicating the project's success and future potential. Visits to other labs, such as the Xu Nanofluidics Lab at Osaka University, provided additional insights into cutting-edge techniques and broadened the project's scope. Overall, the project achieved significant milestones in GUV fabrication, analysis, and method optimization, setting the stage for continued research and development.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

Experiencing Japan was like stepping into a world where the past and present coexist in the most fascinating way. I was captivated by the calm of traditional tea ceremonies and the beauty of ancient temples, which offered a serene contrast to the dynamic buzz of cities like Tokyo. I enjoyed wandering through meticulously designed Japanese gardens and indulging in delicious, authentic sushi and ramen. What struck me most was the way Japanese culture places such importance on respect and etiquette, which was evident in every interaction. Japan left me with a deep appreciation for the country and I appreciate JSPS giving me the opportunity to have this experience.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Jordan Scharnhorst	(ID No. SP24016)
2. Current affiliation: University of California, Santa Cruz	
3. Research fields and specialties: Mathematical and Physical Sciences	
4. Host institution: Nagoya University	
5. Host researcher: Prof. Francesco Buscemi	
6. Description of your current research: <p>My research since 2019 has focused on theoretical aspects of thermodynamics, cosmology, and their intersection - particularly the 'past hypothesis' (the hypothesis that the early universe had a low entropy compared to today) and how the 2nd law of thermodynamics relates to cosmology. I have also studied primordial black holes, gravitational waves, and hawking radiation in cosmology. In a series of papers [2302.10188 and 2312.08508], my collaborators and I raised the possibility of detecting graviton emission from primordial black holes at modern gravitational wave detectors, like LIGO. We computed the greybody factors associated with evaporation of the spin-2 graviton on the brane and in the bulk in extra-dimensional cosmological scenarios.</p> <p>The vast majority of my work has been devoted to the notoriously thorny issue of entropy in cosmology. A main subject has been the "Cosmic Initial Entropy Problem" (CIEP), which refers to the discrepancy between the observation that the early universe was in thermal equilibrium and the past hypothesis. The early thermal equilibrium indicates that entropy was at a maximum, but the past hypothesis argues that the early entropy of the universe was low in order for the 2nd law to be true. In a paper with my PhD advisor [2309.08662], I developed a cosmological model which is designed precisely to answer this question. The model has a fixed phase space in which the matter degrees of freedom coexist with the space-time degrees of freedom, and has the relevant physical effects of clustering, expansion, freeze-out. This, combined with observational entropy, could be the groundwork to understanding a more complete picture of how cosmology might source the 2nd law of thermodynamics, which has remained an unending and major source of mystery in physics since the days of Boltzmann.</p>	

7. Research implementation and results under the program

Title of your research plan:

Observational Entropy for Non-Equilibrium Thermodynamics in Cosmology

Description of the research activities:

Prof. Buscemi and I worked on developing the proper mathematical formalism that allows us to apply observational entropy to the aforementioned mechanical cosmology model. In the process, we extended classical observational entropy to general classical priors, in analogy to what he has done for quantum observational entropy. This is necessary since energy is constrained to be 0 in General Relativity and the proposed model, which is an issue for standard observational entropy since macrostates that are large in the total phase space might be much smaller on the allowed energy shell $E = 0$.

The classical extension we constructed corresponds to the canonical mappings between quantum and classical structures. In particular, the volume terms necessary to compute the entropy become phase space integrals instead of Hilbert space traces. In cosmology, some such integrals famously cannot be done. So, we had to construct the coarse-graining in a way that makes physical sense while avoiding the need for such integrals. This corresponds to a fine-graining in the scale factor, while coarse-graining in the position and energy of the gas, using the prior that $E=0$. Now, I am working on implementing our results in a simulation and the final result will be exactly what is proposed in the end of [2309.08662]: self-consistent, time-dependent entropies of matter in the universe.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I had an incredible experience in Japan, so I am very thankful to JSPS! I practiced my Japanese while making new friends and ate delicious vegetarian food. I spent a lot of time visiting local temples and was endlessly astounded with their beauty and peace. Japan's cities are perfect for taking an evening walk - the sunset over the city skyline is beautiful. Japanese culture is so welcoming that it's very difficult to leave, so I sincerely hope I can return soon.

JSPS Summer Program 2024

Research Report

1. Name: Arvind Pujari	(ID No. SP24102)
2. Current affiliation: University of Cambridge	
3. Research fields and specialties: <div style="display: flex; flex-wrap: wrap; padding: 5px;"> <div style="width: 33%;">Humanities</div> <div style="width: 33%;">Social Sciences</div> <div style="width: 33%;">Mathematical and Physical Sciences</div> <div style="width: 33%;">Chemistry</div> <div style="width: 33%;">Engineering Sciences</div> <div style="width: 33%;">Biological Sciences</div> <div style="width: 33%;">Agricultural Sciences</div> <div style="width: 33%;">Medical, Dental and Pharmaceutical Sciences</div> <div style="width: 33%;">Interdisciplinary and Frontier Sciences</div> </div>	
4. Host institution: Tokyo Institute of Technology	
5. Host researcher: Prof. Hajime Arai	
6. Description of your current research <p>The increasing prevalence of electric vehicles requires batteries with high energy storage densities to be developed. This means that they should have a high capacity (enabling a high range) without weighing too much (reducing the rolling friction of the vehicle). A battery consists of three components: the positive electrode (cathode), negative electrode (anode) and an ionically conducting electrolyte between them. The electrodes are usually powders coated on a metallic current collector, which allows for the conduction of electrons. When the battery is charged, lithium-ions are extracted from the crystal structure of the positive electrode, travel through the electrolyte, and are inserted into the negative electrode. One approach to make energy-dense batteries is to increase the thickness of the electrodes, so that the proportion of the active components (electrodes) increases with respect to the inactive components (separator, current collectors, and cell casing). However, the development of thick electrodes is hindered by two main challenges:</p> <p>1. State-of-charge heterogeneities: An electrode is a porous structure, which allows for penetration of the lithium-based electrolyte through it. This allows for electrochemical reactions to occur in the entire electrode. However, if the electrode is very thick, and the charging is very fast, lithium-ion cannot effectively diffuse through the entire structure. This means that parts of the electrode directly in contact with the electrolyte/separator react much faster than parts further away.</p> <p>2.Degradation: During charge/discharge the amount of lithium that is reversibly extracted is reduced, resulting in lower capacities. Usually, the lithium is lost to undesirable reactions. Understanding the origin of side-reactions is critical for battery longevity.</p> <p>It is important to study state of charge (SoC) heterogeneities and degradation in real-time (during charge/discharge). However, existing techniques like X-ray photoelectron spectroscopy, are expensive and hard to access. During my PhD, I have developed a cost-effective technique called diffuse reflection spectroscopy (DRS) to study lithium-ion batteries. The extraction of lithium-ions (during charge/discharge) causes an accompanying change in the electronic structure of the electrode, which manifests itself in changed optical properties. Through DRS, I capture these changing optical properties as the battery is charged and discharged. I then correlate these changes in optical properties with degradation and SoC heterogeneities, providing a cost-effective technique to study batteries in real time.</p>	

7. Research implementation and results under the program

Title of your research plan:

Unveiling the effect of laser processing on LiFePO₄ batteries through *operando* confocal microscopy

Description of the research activities:

As mentioned previously, as lithium-ion batteries charge and discharge, the brightness of the positive electrode (cathode) changes due to the changing electronic structure of the material. Prof. Arai's group at Tokyo Tech has significant expertise in observing this colour change in battery cross-sections in real-time through a technique known as confocal microscopy. This involves slicing the entire battery and optically observing the electrode along its thickness. This allows for a visualization of the brightness changes in regions close to and far away from the separator and electrolyte, allowing for the optical measurement of the aforementioned SoC heterogeneities. My group in Cambridge specializes in electrode structuring for improved battery performance. For this project, I prepared electrodes in Cambridge that were laser processed (i.e. they had holes drilled through them by a laser) to allow for improved electrolyte penetration, and thus, better battery performance. During my fellowship, I performed confocal microscopy measurements on the laser processed electrodes to reveal how their performance improved because of the structuring. Usually, these measurements require complicated facilities such as synchrotrons, however we could obtain similar information at a much lower cost using confocal microscopy. This project allowed me gain a new perspective on reflectance measurements in batteries, and will lead to more collaborations between our groups.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I was wholeheartedly welcomed by my host group, who introduced me to many local delicacies and kindly invited me to multiple lab celebrations. I also visited the Chuo-Shinkansen (maglev bullet train) test facility with some of my Japanese colleagues, which was an amazing experience for a train enthusiast like me. The homestay program organized by JSPS was one of the other highlights of my experience here, and I really enjoyed staying in a traditional Japanese house making food with them. My host family also took me to a language-exchange potluck, which was a fantastic experience. I was also fortunate to participate in Bon Odori festivals in both Tokyo and Hokkaido.

9. Adviser's remarks (if any):

Mr. Arvind Pujari worked hard with the research, collaborating with Japanese researchers and students, overcoming the language barrier. Thanks to the results he obtained here, his and my labs are going to collaborate further. He prepared a few documents written in English, explaining how to use the lab tools with Japanese descriptions, and left them to us, which I really appreciate.

JSPS Summer Program 2024

Research Report

1. Name: Katherine Hester Atkinson	ID No. SP24104)
2. Current affiliation: University of Birmingham UK	
3. Research fields and specialties: Biological Sciences	
4. Host institution: Tokyo Institute of Technology	
5. Host researcher: Professor Hiroshi Kimura	
6. Description of your current research My research project focuses on understanding the mechanisms by which cells acquire new identities during development. A cell's identity is determined by which genes are on or off. This is reflected in how the DNA is packaged. DNA is spooled around proteins called histones which are chemically modified in ways that reflect the function of the associated DNA. I am interested in how these histone proteins are passed on during cell divisions. In particular, a type of cell division producing one stem cell and one specialized cell (asymmetric cell division). If during asymmetric cell divisions the histone proteins and their modifications are passed on unequally to the two cells this could be a mechanism by which their different identities are established. If this is the case, it's possible that it is not functioning properly in human diseases where cell identity is inaccurately specified. I am developing systems where the process of asymmetric cell division can be studied in lab grown cells and the histone proteins can be tracked. I use protein coated beads to stimulate asymmetric cell division. A tag on histone proteins that can bind a very bright fluorescent dye allows labeling of histones that are present before cell division starts, which carry modifications, and new unmodified histones in different colors. A powerful microscope can then follow what happens to them when the cell divides. As it is the histone modifications that encode information it is important to understand how they are distributed. Techniques available in my home laboratory allow me to look at modifications, but not in live cells which doesn't provide detailed information about when the modifications were put in place relative to the cell dividing. The Kimura laboratory has developed innovative systems to label histone modifications in living cells. This includes a reagent called a Mintbody (Modification specific intracellular antibody) and different types can label different modifications in living cells. By applying this along with live imaging techniques to my asymmetrically dividing cells I hope to better understand how the different cell identities are established during asymmetric cell division.	

7. Research implementation and results under the program

Title of your research plan: Tracking modifications to understand how cells acquire new identities during development.

Description of the research activities:

1. Making cell lines.

Using cells in which the histone protein itself has a tag on it, we made cells that also contained mintbodies – allowing labeling of both histone modifications, and the histones themselves.

This was done by putting the genetic sequence for the mintbodies into cells. The cells which had taken up the mintbody genetic sequence were selected for first using antibiotics and then using cell sorting machine.

Cell lines containing mintbodies which label two different modifications were produced. The modifications are called Histone 3 Lysine 27 trimethylation (H3K27Me3) and Histone 3 Serine 10 phosphorylation (H3S10Ph)

These specific modifications were chosen because: H3K27Me3 has a key role in silencing cell type specific genes and therefore in defining cellular identity and H3S10Ph is important during cell division and could inform how chromosomes are segregated to the two cells.

2. Evaluating the cell lines

I then tested how this combination of histone labeling and mintbody labeling worked in living cells. A microscope takes pictures of living cells at intervals so how they change over time can be studied. This showed that old and new histones can be labeled in different colors along with labeling of the modifications, as shown below.

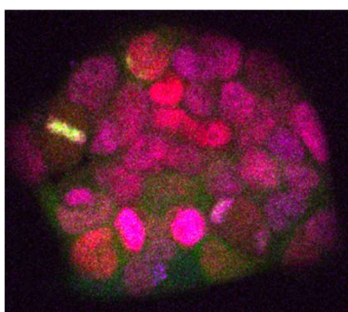


Figure 1: Cells were labelled such that the old histones are purple, the new are red and the histone modifications are green. An example image showing all three labels of cells expressing the H3S10Ph mintbody is shown.

3. Following what happens during asymmetric cell division.

We used live cell imaging to follow histones and their modifications during asymmetric cell division induced by the beads. Although no obvious differences

were observed between cells, the data from this experiment will take some time to analyze completely. I also repeated this at higher magnification- to detect subtle differences.

In summary, we were able to develop a system for the study of transmission of histone modifications across asymmetric cell division in living cells. On my return to the UK, I hope to complete analysis of the data generated, and to continue to use this system to study how cellular identity is established.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I am very grateful to the JSPS summer program and my host laboratory in Japan. Access to the cutting-edge expertise and facilities here has really helped me make progress with my scientific research in a way that would not be possible without this collaboration and support. I have really enjoyed my time in Japan and would love to return one day.

9. Adviser's remarks (if any):

JSPS Summer Program 2024

Research Report

1. Name: Matthew T. Littlehales	(ID No. SP24105)
2. Current affiliation: Durham University	
3. Research fields and specialties: Mathematical and Physical Sciences	
4. Host institution: RIKEN Center for Emergent Matter Science	
5. Host researcher: Dr. Tomoyuki Yokouchi	
<p>6. Description of your current research</p> <p>My current research focusses on understanding both the nature of incommensurate magnetic structures in magnetic skyrmion hosting materials, their primary stabilizing interactions, and how we can control them for future applications. Magnetic skyrmions are nanoscopic whirls of magnetism which hold promising properties for future data storage and novel computing methodologies. Primarily, they can be efficiently driven by external perturbations such as electrical currents and their small size offers enhanced data density for storage applications. In addition, skyrmions demonstrate a number of other emergent physical properties owing to the emergent electric and magnetic fields caused by the non-trivial topology of the magnetic structure. One such property is the emergent inductance, whereby energy can be stored in a system through a conversion between electric and magnetic fields and is a current area of interest within the skyrmionics community.</p> <p>A large proportion of my PhD has focused on the current driven dynamics of magnetic skyrmions in complex geometries through the development of a so-called “skyrmion injector” device. This concept utilizes the dependence of the skyrmion stability on the sample thickness to build magnetic field and temperature conditions in which skyrmions are locally stable in only one section of the device. Through current driven transport, the skyrmions can be driven into a spatially separated region of the device in which they are intrinsically unstable but are long-lived in a metastable regime.</p> <p>At RIKEN Center for Emergent Matter Science, I planned to further investigate this concept and fully characterize the device using electrical transport techniques, demonstrating it’s viability for a wide variety of unconventional computing techniques. Additionally, we planned to investigate the potential of an emergent inductance signal from the skyrmion state itself and time-permitting investigate the influence of the sample geometry on the inductance.</p>	

7. Research implementation and results under the program

Title of your research plan:

Emergent electromagnetic properties of skyrmions in complex 3D geometries

Description of the research activities:

During my stay at RIKEN CEMS I have learned numerous new techniques including maskless UV lithography, electron beam evaporation, and lock-in electrical transport measurements. Using my prior experience with focused-ion-beam fabrication methods, alongside these new techniques, I have fabricated a number of different devices to characterize the motion of skyrmions across 3D step-like nanostructures. Unfortunately, the preliminary data suggested that the motion of skyrmions across the step was not possible in the chosen material and geometry, likely due to the sample thicknesses and magnetic properties of the chosen material.

However, during the project, I aimed to characterize the onset of skyrmion motion at a threshold current density. Within these measurements, I successfully managed to measure an emergent inductance from a skyrmion phase that likely comes from the skyrmion motion itself. In addition, with increasing current density the sign of the inductance changes indicating that the origin of the signal also varies with increasing current density. Initial thoughts suggest that this may come first from the onset of skyrmion motion and then the creation/annihilation of skyrmions at the sample boundaries, leading to a complex non-linear dependence of the inductance on both excitation frequency and current density.

I plan to present these results and the preliminary analysis within a RIKEN CEMS group meeting after the project ends and discuss publishing the results after some further analysis.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

This trip was a brilliant experience and I'm very grateful to JSPS for giving me the opportunity. Not only has the excellent research opportunity had a good impact on my future direction as a researcher, but I have also thoroughly enjoyed the cultural experiences throughout my stay. In particular, the homestay weekend was one of the best experiences I had in Japan, I learnt so much about Japanese culture and enjoyed spending time with a lovely Japanese family. I also really enjoyed seeing some of rural Japan with other JSPS fellows including hiking a section of the Nakasendo trail, climbing Mt. Jinba, and visiting Takayama and Kamikochi in Gifu prefecture.

9. Adviser's remarks (if any):

During the Summer program, he worked enthusiastically on his research project. He acquired valuable skills in transport measurement techniques including maskless UV lithography, electron beam evaporation, lock-in measurement, and data analysis. Despite his short stay, his dedication led to the observation of novel transport phenomena related to the current-induced dynamics of skyrmions. This discovery is particularly significant in the context of current research trends on finite-frequency nonlinear transport responses in topological spin textures. We plan to submit this result to a peer-reviewed journal.

JSPS Summer Program 2024 Research Report

1. Name: Miss Madeleine Reid	(ID No. SP24106)
2. Current affiliation: King's College London	
3. Research fields and specialties: Biological Sciences	
4. Host institution: Tohoku University	
5. Host researcher: Professor Juro Sakai	
<p>6. Description of your current research</p> <p>The aim of my PhD research is to investigate the beneficial role of intermittent cold exposure (ICE) in the treatment of obesity-related disorders. Specifically, I look at the relationship between brown adipose tissue (BAT), white adipose tissue (WAT) and the liver, with a particular focus on metabolic dysfunction-associated steatotic liver disease (MASLD). Current research shows that cold exposure can alleviate adiposity in the liver, due to increased BAT activation and WAT beiging (when WAT develops a BAT-like phenotype), but little is understood about the mechanism of this, or its bench-to-bedside potential. As such, my research is divided into pre-clinical and clinical projects.</p> <p>In my pre-clinical project, mice were fed a high fat diet (HFD) and exposed to ICE conditions (4°C, 3hrs/day, 3 days/week) for up to 8 weeks. Preliminary results indicate successful induction of thermogenic genes in BAT and WAT, as well as expression changes in lipid metabolism-related genes in the liver, related both to HFD and ICE.</p> <p>My clinical study consists of pediatric MASLD patients taking part in a 1-day cooling study in which they wear a specially designed cooling jacket for 1 hour. The aim is to develop a non-pharmaceutical treatment option for obesity and related disorders. Results so far show significant differences in the skin temperature and thermal imaging data between lean control participants and MASLD patients, as well as cold-induced changes in blood glucose of MASLD patients.</p>	
<p>7. Research implementation and results under the program</p> <p style="margin-left: 40px;">Title of your research plan: Roles of JMJD1A in cold-induced improvement of MASLD.</p> <p style="margin-left: 40px;">The Sakai lab has extensively demonstrated the importance of Jumonji Domain-Containing 1A (JMJD1A), a histone demethylase, in BAT thermogenesis and WAT beiging. Additionally, JMJD1A has been reported to modulate fibrosis via the induction of peroxisome proliferator-activated receptor gamma (PPARγ), a key nuclear receptor crucial for cellular metabolism, in cultured hepatic stellate cells. However, physiological roles and therapeutic potential of JMJD1A in the progression of MASLD in vivo, remain undetermined.</p> <p style="margin-left: 40px;">We hypothesise that cold acclimation may improve MASLD in the association of expression of JMJD1A in the liver, and this may be associated with PPARγ demethylation. Investigating this mechanism further could provide valuable insight to inform future treatments for metabolic disorders.</p> <p style="margin-left: 40px;">Description of the research activities:</p>	

Adult male mice (n=28) were randomly divided into two groups: normal chow (NC, n=8) and high-fat diet (HFD, n=20) for 5 weeks at room temperature. Weekly weighing showed significant weight gain in the HFD mice. A glucose tolerance test (GTT) was conducted at 5 weeks following 6-h fasting, confirming glucose intolerance in the HFD mice, indicating metabolic dysfunction. Following 1 week of recovery on their respective diets, all mice were moved into single-housing.

Subsequently, the HFD mice were randomly divided into two groups; one stayed at RT for 7 days (HFD-RT, n=8), while the other underwent continuous CE at 8°C for 7 days (HFD-CE, n=12). The NC mice remained at RT for this duration (NC-RT). Daily weighing revealed significant weight loss in the HFD-CE group, with echo-MRI data showing a cold-induced fat mass reduction. Mice were then sacrificed following a 3h fast, and blood and tissues including BAT, WAT, liver and skeletal muscle were harvested. This data has provided a convincing basis to continue with the experiments planned in the JSPS programme.

My remaining time in the Sakai lab was spent learning their protocol for chromatin immunoprecipitation (ChIP), a technique that I was not previously familiar with, and optimising this for liver tissue. This will be crucial for investigating the role of JMJD1A in the liver samples collected. The samples have now been shipped to my university in London, for continued experiments, including ChIP.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

My time in Japan has been highly productive. I have established a strong collaborative relationship with Professor Sakai and his research group, which we plan to continue after I leave Japan. I have shipped my samples back to the London, which will enable me to continue working on this project and conduct a thorough analysis.

I have also been able to experience a wide range of cultural activities during my stay in Japan, exploring much of the Tohoku and the northern prefectures. This included trips to Matsushima Bay, Zao town, Yamadera, Nikko, Tokyo, Lake Tazawa, and Hiraizumi, where I enjoyed hiking, visiting waterfalls, temples, onsens, and even a samurai castle. Additionally, I experienced the Tanabata festival in Sendai, and tried a wide range of traditional foods.

9. Adviser's remarks (if any): All the plans she made were executed flawlessly and without any delays, which is truly impressive. She worked exceptionally well with our Sakai Lab members and facilitated an excellent opportunity for international collaboration with the UK. She demonstrated hard work, diligent study habits, and took responsibility for organizing the shipping. She is incredibly smart and talented. At Sakai Lab, our primary focus is on adipocyte biology, but we understand the importance of expanding our research to include liver diseases like MASLD (Metabolic Dysfunction-Associated Steatotic Liver Disease). I hope this collaboration can be extended beyond this project into a long-term international partnership aimed at treating metabolic diseases. Additionally, it is wonderful that she had the chance to experience various aspects of Japanese culture and travel, enriching her understanding of Japan beyond just the scientific perspective.

JSPS Summer Program 2024
SP24107 Research Report

1. Name: Narin Aker	(ID No. SP24107)
2. Current affiliation: University College London (UCL)	
3. Research fields and specialties: Social Sciences	
4. Host institution: Osaka University	
5. Host researcher: Dr. Kokoro SHIRAI	
6. Description of your current research My PhD research aims to investigate inequalities in palliative and end of life care for people with dementia from Black African and Caribbean backgrounds and explore ways to improve access and engagement with healthcare services. I interviewed African and Caribbean people in the UK with dementia, family carers, and healthcare professionals working with these groups. Interviews explored care needs, barriers and facilitators to accessing care and support, and preferences and experiences for end of life care. I also hosted co-design workshops with participants to discuss how to produce a tool/resource aimed at healthcare services to help improve access to care for these populations.	

7. Research implementation and results under the program

Title of your research plan:

Health, happiness, and wellbeing for Naraha residents

Description of the research activities:

Between 2011 and 2015, the town of Naraha in Fukushima was evacuated due to the Fukushima nuclear disaster. Since restrictions were lifted, residents have started moving back in. The research team I am working with at Osaka University are conducting a longitudinal study with older Naraha residents; doing annual health and wellbeing checks, including for hearing, memory, and cognitive impairment. I have been using the qualitative data from this study to explore what residents' sources of happiness and wellbeing are. I translated the Japanese data for analysis and coded the the data. Some of the most common themes identified were family (particularly grandchildren), food and drink, friends, good health (their own and that of others), and hobbies (particularly nature and gardening).

Key quotes and demographic data will be used to write up the findings, with the aim to publish at a later date. I hope to continue working with my host department and do more research together in the future.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I was able to travel to many places in Japan and have some brilliant experiences. It is a beautiful country, rich in culture, history and good food. Throughout my time here I have met so many interesting people and have learned so much. I was also able to learn more Japanese than I thought I would, which helped a lot. At Osaka University, I took part in a weekly Japanese conversation group called *Takenoko Nihongo Table*. This was a great opportunity to practice my Japanese, and have informal conversations with my Japanese partner about everything from where we're from, places to visit in Japan, and what we did on the weekends. I hope to visit Japan again in the future, both to travel and do more research, and I am also planning to continue with my Japanese language learning.

9. Adviser's remarks (if any):

JSPS Summer Program 2024

Research Report

1. Name: Gabrielle Blewitt	(ID No. SP24108)
2. Current affiliation: Lancaster University	
3. Research fields and specialties: Engineering Sciences	
4. Host institution: Ritsumeikan University	
5. Host researcher: Dr Atsushi Kakogawa	
6. Description of your current research My current research involves the production and control of an autonomous soft worm-like robot for the exploration of legacy pipework at the decommissioned nuclear site Dounreay in Scotland. The goal of the robot is to locate the position of radionuclides within the pipework so that it can be removed safely. The pipework is too small (50mm \varnothing) for 'off the shelf' solutions. The main goals of my PhD are to a) fabricate a soft worm-like robot for 50mm diameter pipes, b) implement a control system for autonomous navigation of different pipe junctions and, c) Implement Serial Localization and Mapping (SLAM) using computer vision, mechanical modelling and 6-degree of freedom inertial odometry.	

7. Research implementation and results under the program

Title of your research plan:

Using computer vision to control the diameter of a wheeled pipe-inspection robot.

Description of the research activities:

Hardware:

- Replace the camera at the head of the robot: Production of a new printed circuit board for fitted lighting as well as a new 3D printed case to hold the camera in place. (For higher resolution).

Software:

- First motion parallax was tested to detect diameter change. Due to a combination of issues, namely:
 - 1) Motion blur.
 - 2) Lack of features for tracking.
 - 3) The required change in pipe diameter to be detected was too small to produce a detectable motion parallax.

Motion parallax was a desirable option as the phenomenon does not present as much bias to the scene of the data. In other words, it could be used for pipes of different materials etc.

- Next, I tried using traditional computer vision methods such as segmentation and contour analysis to isolate the shadows at pipe junctions. Size, circularity and changes in brightness of the shadows were monitored. Successive behaviour of these features could be used to detect a junction and decide whether the junction was a turn or change in diameter. The distribution of dark pixels in brightness-thresholded images was used to estimate a direction vector for turns.

Integration with firmware and UI:

- The algorithm was developed in C++. Serial communication directly through the C++ program was tested but it was unreliable and caused the program to crash.
- The algorithm was then moved to a Dynamic Link Library (DLL), where it could be called from a C# Windows Form. The windows form can be used as a user interface it also can use the information it receives from the vision algorithm to send serial commands.

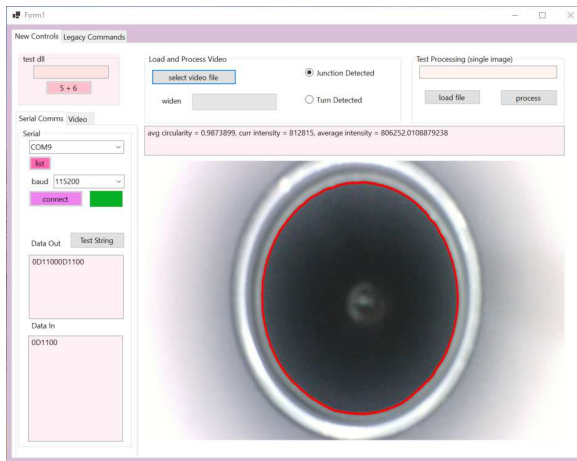


Figure 1 - Snapshot of Windows Form

Unfinished work:

- The required serial protocol to communicate with the robot has not yet been implemented. Hence thorough testing and debugging of the software and integration has not been performed.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

During my stay in Japan I have has the opportunity to visit multiple sites, especially in the Kansai area. I've particularly enjoyed exploring the more rural areas of Japan and taking in its natural beauty. I've tried as much Japanese food as I can and think my favorite Japanese dish has to be cold udon noodles (especially in this heat).

I would like to thank JSPS, and Ritsumeikan University for this excellent opportunity. I've enjoyed it thoroughly.

9. Adviser's remarks (if any):

JSPS Summer Program 2024

Research Report

1. Name: Maxwell Alexander Cutler	(ID No. SP24109)
2. Current affiliation: University of Nottingham	
3. Research fields and specialties: Biological Sciences	
4. Host institution: Kyoto University	
5. Host researcher: Prof. Shoji Takada	
<p>6. Description of your current research</p> <p>The aim of my present PhD research involves the development and application of coarse-grained molecular dynamics (MD) simulations of RNA and protein complexation. In recent years, a wealth of structural information surrounding the structure of RNA-protein complexes has been elucidated as a result of improvements in experimental methodologies, however no such technique can directly observe dynamics on the molecular scale. The assembly and behavior of a molecule in solution is rarely intuitive from a static picture, MD seeks to extract this information by utilization of experimental data in conjunction with knowledge of underlying physical principles to bridge the gap between experiment and function.</p> <p>Computation of atomic coordinates over time in this manner is not without its own caveats, the difficulty of simulation increases dramatically with increasing system size, timescale, and conformational heterogeneity. As a result, no such MD methodology is yet able to simulate large RNA-protein complexes over biologically significant timescales. A promising alternative is coarse-grained molecular simulations, where we represent groups of atoms with similar roles with a coarse-grained bead, using a careful choice of parameters to mimic the all-atom system.</p> <p>We are currently working on developing such a model to accurately describe the RNA-protein interactions formed in the complex <i>Tetrahymena</i> Telomerase. This complex is a ribonucleoprotein (RNP) with significant interest in cancer research as its production</p> <div style="display: flex; align-items: center; justify-content: center; margin: 10px 0;"> <div style="border: 1px solid red; padding: 5px; margin-right: 10px;"> <p>A)</p> </div> <div style="margin-right: 10px;"> <p>B)</p> </div> <div> <p>C)</p> </div> </div> <p>is often upregulated in rapidly dividing tumor cells, enabling further growth. Telomerase assembles in a hierarchical fashion, propagated by structural changes which occur during each binding event allowing the subsequent steps. In the computational study of these dynamic binding events, we hope to further the understanding of how such RNPs achieve this stepwise assembly pattern, and in doing so provide a computational methodology applicable to the wide range of RNP complexes that exist in nature.</p>	

7. Research implementation and results under the program

Title of your research plan:

Molecular Dynamics Simulations of RNA Regulation of Transcription Factor Condensation

Description of the research activities:

Transcription factor (TF) proteins are known to form phase separated droplets via the condensation of a variety of proteins involving TFs, mediator protein, and polymerases, as well as various DNAs and RNAs. The localization of such results in a dramatic enhancement of transcription at the site of formation. The RNA produced, has been shown to either promote further condensation, or dissolve the condensates in a concentration dependent manner, suggesting that RNA has a regulatory role in its own rate of production.

To study the molecular driving forces behind this behavior, the work we have completed thus far has involved:

- Conducting simulations of a heterogeneous mixture of TFs and mediator proteins using the Takada lab protein model, building on previous work.
- The programming of my home lab's three interaction site (TIS) RNA model into the molecular dynamics software GENESIS, followed by validation of the TIS model in against experimental data.
- Parameterization of an RNA-protein interaction potential to be used in simulations containing TFs, mediator protein, and RNA.

Following on from this, simulations of the TF and mediator protein mixture will be conducted with varying concentrations and lengths of RNA and the behavior of the condensate, and the RNA-protein interactions formed in each case will be analyzed.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

Upon arriving in Kyoto, I had the opportunity attend and present my home research in the form of a poster at the IUPAB2024 conference 'Rocking out Biophysics', which allowed me to discuss my own work, and hear about a great deal of current research on a global scale. Alongside this, I feel that working on a somewhat adjacent project to my home research has greatly improved my knowledge and versatility within my field which has been an enjoyable and invaluable experience.

9. Adviser's remarks (if any):

Following discussions on the integration of an RNA model that Max is familiar with and a protein model we have, Max put forward programming and parametrization for simulations of RNA-protein mixed condensates, which was a great starting point for productive simulations to come. In addition, probably, his visit to our lab must have influenced many graduate students in our lab. Thanks, Max!

JSPS Summer Program 2024
Research Report

1. Name: Anthony Kwong	SP24110
2. Current affiliation: University of Manchester	
3. Research fields and specialties: Biological Sciences	
4. Host institution: University of Hokkaido	
5. Host researcher: Professor Masayo Soma	
6. Description of your current research	
<p>Vocalisation is a complex phenomenon observed across many species. While researchers have sought universal patterns in vocalisation, the emergence of these patterns in different species remains an open question. Given the strong social learning component in vocalisation, the extent to which certain patterns are innate is still debated. Songbirds provide a compelling model for exploring these processes due to the diversity and sophistication of their songs. Among songbirds, Java sparrows stand out as a popular caged bird, particularly in Japan. In this species, only males sing, and juvenile males learn their songs from their fathers.</p> <p>My research focuses on modelling birdsong evolution using Java sparrows as a model species. The dataset features a cross-fostered population hosted by the Soma Lab at Hokkaido University. This data is particularly valuable because the social and genetic relationships of the birds are fully known. I develop mathematical models to describe how genetics and social learning interact to shape birdsong evolution.</p>	

7. Research implementation and results under the program

Title of your research plan: Innate learning biases in Java sparrow songs.

Description of the research activities:

Male Java sparrows sing and dance as part of their courtship displays, suggesting that sexual selection plays an important role in song evolution. Previous research in Java sparrows has investigated female song preference through a series of playback tests on female birds. The results show that females tend to prefer songs like their fathers'. However, under the female selection hypothesis, both males and females contribute significantly. Males generate a range of songs, and females select desirable songs from what is available. Some song types, which females might find neutral, may still become more prevalent simply because males prefer to sing them. This could be due to certain song types being easier to learn or having utility beyond attracting mates, such as communication.

Our project aimed to study innate learning biases using playback experiments with juvenile male birds. Initially, we planned to simulate artificial songs under different parameters to determine which song types were more attractive to the juvenile males. However, after careful consideration of our hypothesis, we decided on a better approach by directly analysing the songs of male juveniles.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I thoroughly enjoyed my time in Japan, particularly working at the Soma Lab at Hokkaido University. Everyone was incredibly welcoming and supportive as I settled in. I especially appreciated connecting with my colleagues over lunch. Visiting the Hokkaido countryside with Soma-sensei was a truly fascinating experience.

9. Adviser's remarks (if any):

I appreciate Anthony's openness to new experiences, which is crucial not only for cultural exchange but also for scientific collaboration. Our work together, both in the lab and personally, has been highly enjoyable and productive. Anthony has made significant progress on his PhD and related applications, and we have discussed ideas for future collaboration. His willingness to embrace new experiences is essential for appreciating cultural differences and greatly benefits his scientific endeavors.

JSPS Summer Program 2024

Research Report

1. Name: Dr Bethany E Higgins	(ID No. SP24111)
2. Current affiliation: City, University of London	
3. Research fields and specialties: Medical, Dental and Pharmaceutical Sciences	
4. Host institution: The Graduate School for the Creation of New Photonics Industries	
5. Host researcher: Professor Katsuhiko Ishii and Professor Ryo Asaoka	
6. Description of your current research	
<p>Introduction:</p> <p>Glaucoma remains the leading cause of irreversible blindness worldwide and poses a substantial public health challenge. As this progressive optic neuropathy unfolds, it is marked by the gradual damage to the optic nerve and ganglion cells, which in turn gives rise to corresponding visual field (VF) defects. VF defects refer to abnormalities in the field of vision, which is the entire area that can be seen when the eyes are focused on a central point. These impairments can manifest as areas of reduced light sensitivity, loss of vision (blind spots), or alterations in the perception of brightness or colour.</p> <p>The VF test serves as a crucial metric in both the diagnosis and ongoing monitoring of glaucoma. This is often referred to as static VF test because a set of predetermined locations in the VF are tested, according to different patterns. The 24-2 test pattern is the most commonly used in clinical practice and provides coverage of both central vision and the mid-periphery. However, the central VF is only sparsely sampled with this pattern, and this can lead to early central defects being missed. This is problematic, because even early central VF defects have been shown to affect the quality of life in patients with glaucoma. Moreover, central VF defects are more common in patients with normal-pressure glaucoma, which constitutes up to 92% of open-angle glaucoma cases in the Japanese population. The 10-2 pattern, instead, offers a more spatially detailed assessment of the central VF and has been suggested as an alternative to detect such early defects.</p> <p>Research Objectives:</p> <p>The primary aim of this research is to assess if interleaving VF tests provides additional information for detecting overall glaucoma progression. Additionally, the study aims to investigate if interleaved testing enhances the detection of macular defect progression.</p>	

7. Research implementation and results under the program

Title of your research plan:

Advancing Glaucoma Progression Detection through a Hybrid Visual Field Testing Strategy

Description of the research activities:

Over the past two months, I focused on analysing retrospective, longitudinal visual field (VF) datasets from glaucoma clinics in Hamamatsu, Tokyo, and Kyoto, provided by Professor Asaoka. These datasets required extensive organisation, and I developed an R function using DeepL to translate Japanese surgical details and doctors' comments. After cleaning the data, unreliable VF tests (those with over 20% fixation losses or 15% or more false positives) were excluded. Data were deemed suitable if they included at least four 10-2 tests and four 24-2 tests over more than a year. This 'real-world' dataset was used to simulate 'high-density' datasets, one representing VF damage progression and one representing no progression for both 10-2 and 24-2 tests. These simulations involved monthly VF assessments over two years, conducted using R software. Various testing strategies were then created from these, including using just the 10-2 test, just the 24-2 test, combined tests, and alternating between them. To evaluate these strategies, I employed hierarchical modelling to analyse pointwise rates of progression. In glaucoma, there's no definitive way to confirm progression, so the effectiveness of each testing strategy was measured by comparing the proportion of eyes identified as progressing at 95% specificity (Hit-rate). While not exactly sensitivity, a higher hit-rate at the same specificity suggests increased sensitivity, which serves as a useful indicator. The analysis is ongoing, but preliminary results suggest that alternating between 24-2 and 10-2 VF tests does not improve the detection of overall progression. However, it does identify more cases of macular progression compared to using the 24-2 test alone and this is clinically relevant.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

My time in Japan has been truly enriching, both professionally and personally. I was able to collaborate closely with colleagues, build lasting friendships, and immerse myself in the research community. The experience was not only academically fulfilling but also personally rewarding—I've almost forgiven them for making me do karaoke at my leaving do! This opportunity, generously supported by JSPS, has been invaluable in advancing my research and broadening my global perspective.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Tim Jantarungsee	(ID No. SP241125)
2. Current affiliation: University College London	
3. Research fields and specialties: Humanities	
4. Host institution: Keio University	
5. Host researcher: Professor Christopher Tancredi	
6. Description of your current research Broadly speaking, my research concerns the description and analysis of how meaning emerges and is interpreted in natural languages. Utilising evidence from a diverse set of languages, I form hypotheses on how to represent meaning in natural language using formal tools such as logic and computation. More specifically, my current interest is in how languages express “modality”; expressions which refer to situations and events that may not necessarily be true in the actual world. This includes expressions of necessity, possibility, evidentiality etc. Additionally, I am interested in how languages express time (“tense” and “aspect”), including the overall temporal reference of a sentence and the internal temporal structure of events and states. My research uses formal tools to represent these phenomena that may be considered universal across languages or language specific.	

7. Research implementation and results under the program

Title of your research plan: Decomposing Ability Modals (tentative)

Throughout the JSPS summer programme I narrowed down a specific research topic within my current interests with my host researcher. We decided that among the broad topic of tense, aspect and modality, there was little research on the formalization of “ability modals”, words that depict the ability of a subject (e.g. “can”, “able to” etc. in English). There are several interesting semantic “puzzles” and interactions with these words, and their exact nature in the semantic framework of possible-world semantics has not been concretely defined.

Description of the research activities:

I engaged in regular meetings with my host researcher in which we developed our research plan from the ground up. Firstly, we narrowed down the scope of our research topic to ability modals in natural language semantics. We then continued to discuss and work towards an analysis for a future publication.

Throughout my stay I was also able to meet with researchers in the same field affiliated with other institutions through which we have formed novel collaborations for projects pertaining to lexical semantics. Moreover, I was able to give a talk at another institution and form further connections with faculty and graduate students.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

9. Adviser’s remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Daniel Barker Flores	ID No. SP24113
2. Current affiliation: Department of Politics and International Relations, University of Oxford	
3. Research fields and specialties: Social Sciences	
4. Host institution: Waseda University	
5. Host researcher: Professor Atsushi Tago	
<p>6. Description of your current research</p> <p>My current research focuses on the intersection between politics and organized crime. In my PhD research, I study how organized criminal groups control territories in Latin American cities, and how State interventions into these territories affect the dynamics of governance and control.</p> <p>While in Japan, I sought to expand the empirical scope of my research. Of course, the Japanese context is very different to those which I have investigated to date. Nonetheless, there is still ample room for developing interesting cross-national comparative research. Indeed, some of the initial questions I sought to answer whilst undertaking research in Japan were as follows:</p> <p>Over the last two decades, Japanese law enforcement agencies have been highly successful in cracking-down on organized crime. This can be evidenced by the significant reduction in the membership of the country's main organized criminal groups, as well as their withdrawal from many economic activities. What is particularly impressive is that the Japanese authorities have been able to achieve this outcome without provoking a significant violent backlash. Organized criminal groups have neither used violence to "lobby" State actors to change policies, nor have they sought to capitalize on State repression by violently contesting their rivals' turf, nor have they fragmented violently. This is crucially important for both policymakers and scholars alike, as outcomes such as these are by no means guaranteed. That is, State crackdowns on organized crime can often directly trigger acute escalations in violence. Indeed, at the same time that Japanese law enforcement agencies effectively countered organized crime, Mexican authorities attempted a crackdown of their own, leading to a dramatic expansion of organized criminal groups across the country and an appalling escalation in violence. This leads us to ask, why do we see such variation resulting from crackdowns on organized crime? What were the factors undergirding the retrenchment of Japan's organized criminal groups? How can we learn from Japan's law enforcement successes and apply these lessons to other contexts? Indeed, is this success replicable elsewhere?</p>	

7. Research implementation and results under the program

Title of your research plan:

Cross-National Lessons in Policing: Learning from the success of Japan's Crackdown on Organized Crime

Description of the research activities:

Whilst in Japan, I made extensive use of Waseda University's library to carry out a review of relevant scholarly material on policing and organized crime in Japan. This was immensely beneficial in acquainting me with the particularities of Japanese law enforcement and local politics, as well as how these have historically intersected and interacted with organized crime throughout the 20th Century. The material I engaged with helped orient me, familiarize me with the nuances of Japanese politics—which I had previously understood only quite superficially—and thus provided me with a far stronger empirical basis on which to develop a cross-national comparative study going forward.

While in Japan, I also met with several other researchers at different universities across the country. These scholars were extremely gracious and welcoming, and we had extremely productive conversations—relating to violent conflict, organized crime, and comparative politics. This also helped inform my work, and I got a lot out of these meetings. Based on these interactions, I see ample opportunity for future collaborations with Japan's research community. Scholars here are producing highly innovative and fascinating research, and I am eager to deepen my linkages with them going forward.

Professor Tago, my host, also organized a fantastic weekly seminar. This was a very enriching experience, and it was a true pleasure to be able to participate, and pose my questions to both junior scholars and renowned researchers alike.

I express my heartfelt gratitude to everyone who made this visit possible, particularly my host, Professor Atsushi Tago.

JSPS Summer Program 2024 Research Report

1. Name: William Law	(ID No. SP24114)
2. Current affiliation: University of Southampton	
3. Research fields and specialties: Humanities	
4. Host institution: Meiji University	
5. Host researcher: Prof. Hideto Fujii	
<p>6. Description of your current research</p> <p>My thesis focuses on the railway systems of Britain and East Africa in the immediate post-war era through to the independence of Kenya, Uganda and Tanzania in the 1960s. Primarily, I am interested in how railways were operated in Britain's former colonies and how far transnational dynamics impacted the management and day-to-day operations of railways in East Africa.</p> <p>In addition, my research considers railways and their operations in the context of the end of the British Empire more broadly. This includes how railway manufacturers in Britain pivoted in response to the opening of formerly closed markets, a process which presented new opportunities to competing manufacturers in countries such as France and Japan. It also asks how far new technologies led to changes in the market, particularly around high-speed rail and ideas of modernisation.</p> <p>This led to increased competition on the global stage, but these changes also played out in the daily lives of railway workers and communities, who often shaped these new technologies in fascinating ways. One relevant example is the Shinkansen, which not only shaped British Rail's response to high-speed rail but was itself impacted by the actions of anti-noise pollution campaigners in Nagoya.</p> <p>By focusing on people's engagement with railway infrastructures, I aim to determine what railways systems meant to people across geographies, timeframes, and power. As well as producing a thesis from my research, I am keen to use the findings to potentially inform museum displays of railway heritage objects.</p>	

7. Research implementation and results under the program

Title of your research plan:

Anglo-Japanese Relationships in the Age of High-Speed Rail

Description of the research activities:

My research focused on the period of 1970-75, when Japan National Railways (JNR) was addressing Shinkansen noise pollution which affected, among others, residents of Nagoya. While I originally planned to carry out a comparative study of how English-language newspapers in Japan mirrored or diverted from the reporting of 'Shinkansen disease' in UK-based newspapers, my time in Japan revealed far more than I expected about Anglo-Japanese cooperation at this time.

Through the *Japan Times*, held within the collections of Meiji University, I discovered that Anglo-Japanese links were formed between railway workers belonging to trade unions in the UK and Japan. For example, trade union members working for JNR travelled to the UK seeking support. I also consulted local Japanese newspapers at the National Diet Library, where I found details about links between trade unions and the Nagoya residents, as well as details about a letter exchange between UK and Japanese campaigners. In a separate journal, I found out about reciprocal exchange visits carried out by railway engineers in the UK and Japan. Taken together, these will contribute to outputs that are much richer and incorporate a wider range of voices than I first imagined possible.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

My time in Japan exceeded my expectations in many ways, but not least in the number of genuine connections I was able to make at my host institution and beyond. I feel especially privileged to have been given such a warm welcome to Japan by my host family, who patiently guided me around Tokyo. Whether or not I return to Japan, I will treasure these memories and friendships as a reminder of the wonderful time spent here.

9. Adviser's remarks (if any):

JSPS Summer Program 2024
Research Report

1. Name: Arthur Morris	(ID No. SP24115)
2. Current affiliation: University of Cambridge	
3. Research fields and specialties: Mathematical and Physical Sciences	
4. Host institution: Institute of Solid State Physics, University of Tokyo	
5. Host researcher: Prof. Takashi Oka	
6. Description of your current research My PhD research is broadly concerned with the theory of topological insulators and superconductors. Specifically, I am principally interested in multi-gap topology and the properties of superconducting materials exhibiting a non-zero Euler class.	
7. Research implementation and results under the program Title of your research plan: Exploration of multi-band topological Floquet-Andreev states Description of the research activities: Previous work identified the influence of the topology of a chemical reaction network on the dynamics of the concentrations of the chemicals in the system. In particular, it demonstrated a one-to-one correspondence between the generators of the (co)homology group of the hypergraph, and conserved quantities of the system under time-dependent reaction processes. However, this work investigated only the case where the number of molecules is large enough to warrant a continuum description of the concentrations. In fact, for many biological systems this assumption is not justified, and the precise number of molecules plays an important role in the dynamics of the system. We have been analysing this case by looking at the homology groups of the hypergraph with coefficients in \mathbb{Z} instead of \mathbb{R} , which maintains all information about discrete chemical processes. In addition, in this limit the chemical reactions must instead be described by probabilistic Markov equations, which recover the continuum equations of motion. By mapping the Markov equation to a Doi-Peliti equation, it is possible to describe the system using a non-Hermitian Hamiltonian. This mapping thus allows the properties of the system to be probed using well-understood techniques from quantum mechanics. This work is ongoing, and we are currently trying to determine if there is any analogous correspondence between the conservation laws in the Markov/Doi-Peliti equation, and the integer cohomology groups of the hypergraph. Another aspect of this work that we have looked at is the possibility of defining a	

<p>topological phase of matter on a hypergraph. This would be analogous to the surface code, which is a topological phase of matter which may be defined on any n-dimensional surface described by a simplicial or CW complex. The surface code has a ground state which has a degeneracy which reflects the topology of this surface, as encoded by the homology groups of the chain complex, and we believe that it is also possible to define a Hamiltonian with a ground state degeneracy equal to the dimension of the nontrivial hypergraph homology group. The difficulty with defining such a model lies with finding the correct form of the stabiliser operators. We have made some progress in this direction, and we now plan to test the applicability of the operators we have found by using numerical simulation.</p> <p>Both pieces of work described above are still ongoing, and we intend to continue the collaboration after the conclusion of the programme.</p> <p>During my stay at the ISSP, I also took part in two research trips, firstly to the University of Kyoto to visit the group of M. Sato and K. Shiozaki, and then to OIST where I visited the Quantum Matter Unit. At both institutions I gave a talk about my work and met with the members of the groups to discuss the overlaps between our work. These talks proved very insightful and have helped me to understand aspects of my own work that were previously unclear.</p> <p>I am grateful to JSPS for providing the funding for this research, and also for the additional research expenses which enabled me to visit other universities during my stay.</p>	<p>8. Please add your comments, including any cultural experience during your stay in Japan (if any):</p> <p>I greatly enjoyed my stay in Japan and had the pleasure of visiting a variety of different places in the country, and experiencing a rich array of different cultures along the way. Highlights included the homestay experience in Chiba, the amazing biodiversity of Okinawa, and the incredible temples and castles in Kyoto.</p> <p>9. Adviser's remarks (if any):</p> <p>It was a great pleasure to have Arthur as a guest member in our group. He gave an excellent talk on his latest work on topological states characterized by Euler and Hopf invariants. We have initiated several research projects that are challenging and interesting.</p>
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JSPS Summer Program 2024
Research Report

1. Name: Mischa Emery	(ID No. SP24116)
2. Current affiliation: University of Liverpool	
3. Research fields and specialties: Biological Sciences	
4. Host institution: University of Tsukuba	
5. Host researcher: Naoki Okamoto	
6. Description of your current research <p>PhD project: Diet, ageing and prostate cancer using the fruit fly (<i>Drosophila melanogaster</i>) as a model system.</p> <p>Prostate cancer (PCa) is the most prevalent cancer for ageing men, with a 1/3 of cases in the UK affecting those over 75. Significant knowledge gaps exist for the mechanisms that drive the growth of treatment-susceptible and late-stage treatment-resistant PCa cells. PCa research has lagged behind other cancer types, partly due to poor mouse cancer models.</p> <p>The field of PCa modelling using the fruit fly, <i>Drosophila melanogaster</i>, is progressing quickly. The male reproductive system of <i>D. melanogaster</i> comprises of testes, accessory gland, ejaculatory duct and ejaculatory bulb. The accessory gland (AG) contains two cell types, main and secondary cells. The secondary cells (SC) share many characteristics with the human prostate and are the focus of using <i>D. melanogaster</i> as a model for PCa.</p> <p>So far, I have characterised the secondary cells of <i>D. melanogaster</i> in aged flies that are maintained as virgins or allowed to mate freely (“mated”). The initial nuclear size experiment used 1 and 3 day old virgin males and aging experiments used 1, 3 and 5 week old virgin and mated flies. Flies were imaged with immunohistochemistry for nuclear size and fluorescence-lifetime imaging microscopy for metabolic status.</p> <p>I have found that as previously reported, in early adult life (day 1 to 3 following eclosion), there was a significant increase in SC nuclear size in virgin flies. At weeks 1 and 3, I found no differences in nuclear size between virgin and mated flies but at week 5 there was a significant reduction nuclear size of virgin flies. At weeks 1 and 3 glycolysis was higher in mated flies however, at week 5 there was no difference in glycolysis level between virgin and mated flies.</p>	

7. Research implementation and results under the program

Title of your research plan:

Hormones and Prostate Cancer: An Experimental Approach using the Fruit Fly as a Model

Description of the research activities:

My previous work has shown an increase in glycolysis in mated flies compared to virgin flies as they age to 3 weeks old. It is currently unknown what pathways drive these changes, but we hypothesised that insulin signalling may be involved. To achieve this, I imaged accessory glands (AG) with a marker for the transcription factor FoxO; when insulin signalling occurs FoxO can be observed in the cytoplasm.

At fixed time points (1, 3 and 5 weeks old) the AG of the flies were stained with FoxO. Initial observations show a FoxO signal in the cytoplasm in the 1-week-old flies, both virgin and mated, with a lack of signal localisation with the nuclei. This suggests insulin-signalling is active in these cells. The surrounding main cells appear to have lower levels of FoxO, this may reflect the activity differences between the two cell types. To understand insulin signalling further, I used genetically modified flies where parts of the insulin signalling pathway were disrupted or always activated within secondary cells. It is not yet clear if there are differences in FoxO signalling in these flies.

On returning to Liverpool, I will analyse the images to quantify the FoxO signal within the secondary cells.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I have felt fully supported throughout my JSPS project, from writing the application to my final week at the University of Tsukuba. I am very thankful to my supervisor, Naoki Okamoto, for taking me on as a summer student and for all the help and kindness he has shown me and the group PI, Ryusuke Niwa, for welcoming me into their lab.

During my time in Japan I was lucky enough to visit Nikko during my home stay, to hike part of the Nakasendo trail with other JSPS students, to climb Mount Tsukuba and attend the Matsuri festival in Tsukuba.

9. Adviser's remarks (if any):

Although I did not have prior acquaintance with Mischa Emery or her supervisors, I am very pleased to have had the opportunity to be involved in her research project as an advisor through the JSPS Summer Program. Mischa is already a well-established PhD candidate with a solid scientific background, and she independently designed and executed most of the experiments. Given that the project focused on aging, it was quite challenging for a short-term project, but thanks to her excellent planning and execution skills, she successfully completed the experiments as scheduled. I am deeply grateful to the JSPS Summer Program for providing this wonderful opportunity, and I would like to express my sincere gratitude and respect to Mischa for coming to the University of Tsukuba, Japan.

JSPS Summer Program 2024 Research Report

1. Name: Adam McKenzie	(ID No. SP24117)
2. Current affiliation: University of Glasgow	
3. Research fields and specialties: Humanities Social Sciences Mathematical and Physical Sciences Chemistry Engineering Sciences Biological Sciences Agricultural Sciences Medical, Dental and Pharmaceutical Sciences Interdisciplinary and Frontier Sciences	
4. Host institution: University of Tokyo	
5. Host researcher: Professor Yoshiaki Nakano	
6. Description of your current research My current research focuses on MOVPE growth and characterisation of III-V compound semiconductors for photonics applications, primarily in the fabrication of laser diodes including distributed feedback (DFB) and photonic crystal surface emitting (PCSEL) lasers. I have extensive experience in industrial R&D, with my PhD having been co-funded by Sivers Photonics and an Industrial Fellowship from the Royal Commission for the exhibition of 1851. I am currently a Research Associate at the University of Glasgow, having completed a successful Knowledge Transfer Partnership with Vector Photonics, and from October will begin an 1851 Research Fellowship at Glasgow to pursue my own research vision for void retaining epitaxy as a platform for next-generation semiconductor devices.	

7. Research implementation and results under the program

Title of your research plan:

Error-tolerant optical processors integrated on an InP platform

Description of the research activities:

Initially, I engaged with post-graduate researchers in Nakano-Tanemura group in discussions about their research activities, developing my own understanding of photonic integrated circuits and optical processing. Together, we discussed the requirements for an InP-based platform for on-chip optical processing, and ran initial designs ideas for realising such a system. Due to maintenance issues with the group's MOVPE reactor during my visit, I was unable to proceed to growing the structure required for fabrication of test structures; however, the initial designs can be taken back to Glasgow to be grown there, allowing for collaboration to continue into the future. During my time in the group, I also co-supervised a number of international undergraduate internship researchers who had joined the lab for six weeks this summer. This allowed me to develop my own supervision skills, an exposed me to a wider spectrum of research activities and themes within the group. Additionally, I co-lead the writing of a joint EPSRC-JST application between UofG and UTokyo (worth in excess of £1.5m) to facilitate future collaboration between our universities on advanced semiconductor research – a decision on the outcome of this application is due in September. Furthermore, I have explored funding routes to bring a UTokyo delegation to Glasgow next year to celebrate the links between our universities, and build further research collaborations. Finally, I have used this experience as an opportunity to expanded my network in Japan beyond UTokyo by visiting other universities (Tohoku, Hokkaido, Kyoto) and companies (Sumitomo, NTT). In doing so, I have developed new contacts with whom I am in active discussions about opportunities for collaboration and joint funding applications.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

The opportunities provided by JSPS and SOKENDAI for meeting and engaging with other fellows at the beginning and end of the programme were excellent and really built on the strength of the programme. Additionally, the opportunity to participate in home stay was an amazing experience. I am now good friends with my host family and met with them many times throughout my stay for further cultural experiences – this is a connection and friendship that I will carry with me for the rest of my life. Overall, my experience of life in Japan during this visit has been first class, and it will be invaluable to my professional and personal development as I move into the next stage of my career.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Lilian GENILLER	(ID No. SP24201)
2. Current affiliation: Montpellier University, Institut Charles Gerhardt Montpellier	
3. Research fields and specialties: Chemistry	
4. Host institution: Kyoto University	
5. Host researcher: Prof. Hirohisa OHMIYA	
6. Description of your current research My current research in France is the development of new photoinduced methodologies. During my PhD, I focused my research on the development of photocatalytic reactions and especially on photoredox methodologies (photoinduced redox reactions) and metallaphotoredox methodologies (merge of photocatalysis and transition metal catalysis) using nickel as the transition metal catalyst.	

7. Research implementation and results under the program

Title of your research plan: Development of new photocatalytic reactions : metallaphotoredox using cobalt as the transition metal allowing coupling reactions between amines and alkenes.

Description of the research activities:

The targeted reactions is coupling reactions between amines and alkenes allowing hydroaminoalkylation of alkenes, especially styrenes moieties.

My work is focused on the exemplification of the reaction by varying the alkenes and on the elucidation of the reaction mechanism.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

The opportunity to work with a Japanese team was very interesting concerning both cultural and professional point of view. The way of working and organizing the day was very different from what I know in France and required an adaptation which taught me a lot professionally and opened me up to another culture.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Manon MIRAN	(ID No. SP24202)
2. Current affiliation: Sorbonne University	
3. Research fields and specialties: Biological Sciences	
4. Host institution: Tokyo University	
5. Host researcher: Prof. Sakai & Dr. Nishikawa	
6. Description of your current research	
<p>Chronic kidney diseases are a major public health issue due to their debilitating effects on the patients and the high cost of the treatments in advanced stages of the disease. They affect more than 10% of the world's population and this number increases each year. Therefore, it is crucial to study those diseases to have a better understanding of their mechanisms in order to improve the daily life of the patients.</p> <p>The objective of this interdisciplinary project is the development of an innovative microfluidic glomerular filtration barrier-on-chip that reproduces the capillary wall of the glomerulus involved in blood filtration. Several steps are needed in order to achieve this objective:</p> <ul style="list-style-type: none">i) Development of the basement membrane based on a type IV collagen hydrogel and its integration into the microfluidic device.ii) Differentiation of human induced pluripotent stem cells into glomerular endothelial cells and podocytes on each side of the previously formed membraneiii) Integration of sensors allowing the real-time impedance measurement of the membrane that reflects its physiopathological modifications.	

7. Research implementation and results under the program

Title of your research plan:

Optimizing Co-Culture Conditions for iPSCs Differentiation into Kidney Podocytes and Mesangial Cells

Description of the research activities:

In the glomerulus, three main cell types co-exist: podocytes, endothelial cells, and mesangial cells. The latter is often overlooked, despite growing evidence highlighting its significance. This study focuses on differentiating iPSCs into podocytes, which are crucial kidney cells responsible for blood filtration, with the presence of mesangial cells to enhance podocyte-specific markers. To achieve this, iPSCs were first differentiated into the intermediate mesoderm (IM) stage, a precursor stage before podocyte formation. Simultaneously, iPSCs were also differentiated into stromal cell progenitors, the precursors to mesangial cells. The cells were then co-cultured on opposite sides of a porous membrane for several days. The entire differentiation process takes about a month, limiting the experiment to a single iteration. A key consideration in co-culture experiments is the choice of media, as it must be compatible with both cell types. Due to time constraints, we were unable to test all possible media options and opted to use the media used for IM cells differentiation into podocytes. We discovered that this media was incompatible with mesangial cell culture. Furthermore, as this was a novel experiment, several conditions needed optimization, leading to the development of a new protocol. The experiment will be continued in the future by a PhD student of the laboratory.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I am deeply grateful to JSPS, Sakai-sensei and Nishikawa-sensei for giving me the opportunity to visit Japan for the first time. During these two months, I immersed myself in a completely different culture, experienced a unique approach to laboratory work, and encountered a new way of thinking. I met wonderful people, whom I hope to see again in the future. The homestay gave us an unforgettable glimpse into everyday life in Japan. Summer in Japan isn't just about extreme heat, humidity, and typhoons; it's also about fireworks, festivals, beautiful flowers like hydrangeas, and so much more!

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: GREENDA Sabrina	(ID No. SP24203)
2. Current affiliation: Université Claude Bernard Lyon 1 - CRNS	
3. Research fields and specialties: Chemistry	
4. Host institution: Department of Chemistry (WPI-SKCM2) – Hiroshima University	
5. Host researcher: Prof. Katsuya INOUE	
<p>6. Description of your current research</p> <p>The aim of my thesis rests on the synthesis of Molecular Magnets based on boron-nitrogen ligands and we wanted to reach two molecules : (i) a new borazine derivative functionalized by nitroxide radicals and (ii) sandwich compounds made of diazadiborolyl ligands and lanthanides for the design of molecular magnets. These two kind of molecules have never been reported in the literature in our knowledge. My work is mainly devoted to the chemical synthesis of these systems and the study of their magneto-structural properties.</p> <p>Molecular magnets have interest for the miniaturization of storage units, for quantum computing, but also for the development of multifunctional systems, thanks to the flexibility of molecular chemistry.</p> <p>During the first years of my thesis, I was able to synthesize the first molecule and to study the structure by single crystal X-Ray diffraction and the magnetic properties by EPR measurement and magnetic susceptibility measurements.</p> <p>For this synthesis and the interpretation of the results, I was greatly inspired by the work of prof. Katsuya Inoue (ref. [1] and [2]). This stay in Hiroshima under the supervision of prof. Inoue was therefore a golden opportunity to discuss my research results directly and to carry out complementary experiments. The aim of my stay here was to work on the second topic of my thesis and to carry out organic synthesis at Hiroshima University. The aim was to investigate the possibility of synthesizing diazadiborolyl derivatives under inert conditions.</p> <p>[1] S. Hayami, K. Inoue, <i>Chem Lett.</i>, 1999, 28, 545–546. [2] F. Kanno, K. Inoue, N. Koga, H. Iwamura, <i>J Phys Chem.</i>, 1993, 97, 13267–13272.</p>	

7. Research implementation and results under the program

Title of your research plan:

Molecular magnets made of boron and nitrogen atoms : synthesis and magneto-structural properties

Description of the research activities:

My time at Hiroshima University was divided into two main parts.

(i) The first month was devoted to numerous discussions aimed at rationalizing my research results. Through the many seminars held in the laboratory, I was also able to discover and exchange with colleagues here, which enabled me to develop new avenues of research in order to go further in the characterization of my compound.

During this first month I also had the opportunity to attend the summer school/symposium in Hokkaido (WPI-SKCM² Summer School at (HU)² + joint WPI-ICReDD Research Symposium) where I had the chance to present my results during a poster session and an oral presentation. Once again, I was able to exchange ideas with researchers who are experts in my field of research.

(ii) The second part of my stay was dedicated to organic synthesis under inert conditions to form the ligands that will be used for the sandwich complexes. The main aim was to study the feasibility of this study, and our results were positive following initial NMR characterization.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

My stay in Hiroshima went very well, and I will have very fond memories of both the research and life outside the laboratory.

I really enjoyed the after-works with my colleagues (restaurants, karaoke, etc.).



With the supervision of my host Prof. Inoue, I have applied for the position of assistant professor for a 2-year period starting in April 2025. I will have an answer by mid-October

9. Adviser's remarks (if any):

Nothing to report

JSPS Summer Program 2024

Research Report

1. Name: Eva Gril	(ID No. SP24204)
2. Current affiliation: EDYSAN, UMR CNRS – University Picardie Jules Verne, France	
3. Research fields and specialties: Biological Sciences	
4. Host institution: Laboratory of Ecosystem Management, Research Faculty of Agriculture, Hokkaido University, Sapporo, JAPAN	
5. Host researcher: Professor Junko Morimoto	
6. Description of your current research Forests are heterogeneous and dynamic ecosystems. As a PhD student, I investigated the buffering effect of forest canopies on temperature – or forest microclimate – and its impact on understory vegetation in a climate change context. Management operations like thinning modify forest structure, and thus its microclimate. I have been modelling forest thermal landscapes at fine spatio-temporal scales, using LiDAR remote sensing. Forest management can enhance or mitigate the effects of climate change on plant communities through microclimate temperature amplification or buffering.	
7. Research implementation and results under the program Title of your research plan: “Forest recovery after landslides: using remote sensing to estimate erosion” Description of the research activities: At the University of Hokkaido, I participated in the KAKENHI (22H02372) <i>Legacy project</i> led by Professor Junko Morimoto, focusing on soil and vegetation dynamics after landslides. This natural disturbance in mountainous areas may increase in frequency in the future, due to climate-change related heavy rain events. After a landslide, forests gradually recover from bare soil to a closed tree canopy, but the main limiting factors in the initial stage are deer browsing and soil erosion. Remaining patches of vegetation, a legacy from the initial ecosystem pre-perturbation, can mitigate these limiting factors and promote a faster forest succession. In 2018, there was a major earthquake (Iburi-Tobu) resulting in as much as 7,000 landslides (44 km ² !) in Atsuma, southern Hokkaido. During my stay, I partook in fieldwork on the studied sites to monitor soil erosion on collapsed slopes (Figure 1), using a novel remote sensing technology: iPhone LiDAR.	
<div style="display: flex; justify-content: space-around;">   </div>	
Figure 1: iPhone LiDAR acquisitions at landslides areas in Atsuma. Photos by Professor Junko Morimoto.	

After data acquisition, orthomosaics and point clouds are processed in Pix4Dmatic, then CloudCompare (Figure 2) and ArcGIS Pro. The idea is to compare the surface level through time, to evaluate the respective volumes of soil erosion and deposition.

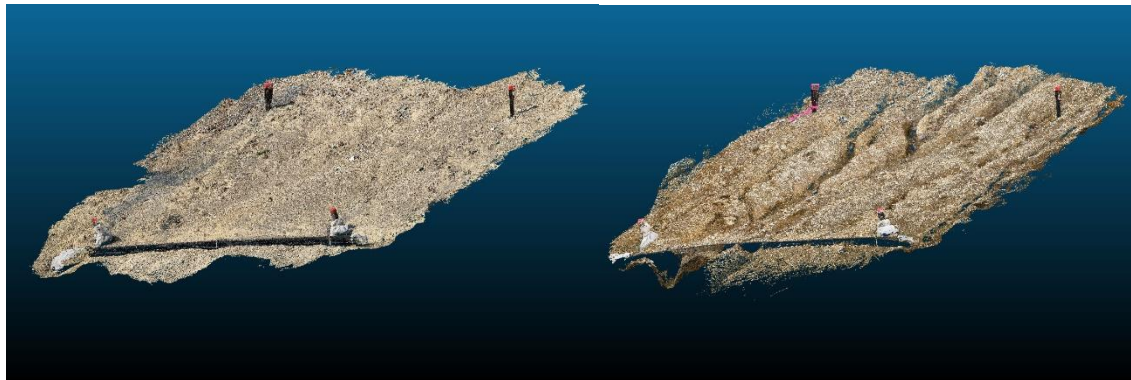


Figure 2: Erosion gullies formed between August (left) and September (right) 2023, clearly visible from iPhone LiDAR point clouds, in a 3x3 m² plot with no legacy.

During my JSPS summer fellowship, I participated in fieldwork from other research projects at the Ecosystem Management lab (deer herbivory at Hayakita, retention forestry and impacts on biodiversity at Ashibetsu, ecosystem services at Abira...), and I visited the forest research center in Nayoro. I gave three seminars on forest microclimate, the focus of my PhD, and discussed ongoing and future research projects involving microclimate. I also gave an Inkscape training to lab members (a design software). My host was very caring and welcoming, and I am really grateful to her, and to her whole lab!

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I was extremely lucky to spend two and a half months in the magnificent Hokkaido island, and would recommend for everyone as it is definitely the best summer destination in Japan (much cooler!). With another JSPS fellow, we visited Noboribetsu, with the Hell valley and its famous onsen. I enjoyed walking around Sapporo by myself, hiking to Maruyama for instance. With the super nice and friendly lab members, we ate at delicious restaurants, visited parks, went hiking and to a wonderful onsen near lake Shikotsu, enjoyed a barbecue, temaki suchis and such delicious Japanese food. During my homestay weekend, I met a wonderful family of three. We went cherry-picking (Mmmmm), made onigiri, went to a squirrel zoo on top of Mont Tenguyama, customized music boxes in Otaru, enjoyed hand-held hanabi... We got along so well that we met on four more weekends, eating kaisendon, having seaside barbecue, going to a local matsuri for the Obon festival, fishing crabs... I am staying 2.5 weeks after the fellowship ends, to further explore Hokkaido, as well as Iriomote island (Okinawa prefecture, far South!).

9. Adviser's remarks (if any):

Eva has not only worked energetically on the tasks given to her, but has also given us new perspectives on our research work. I look forward to continuing our cooperation.

JSPS Summer Program 2024 Research Report

1. Name: Thomas PAUVRET	ID No. SP24205
2. Current affiliation: Nord University (Norway)	
3. Research fields and specialties: Social Sciences	
4. Host institution: Sophia University	
5. Host researcher: Prof. Anne McDonald	

6. Description of your current research

My field is Political Ecology, with an interest in the structural issues that contribute to an uneven distribution of resources in the countryside, leading to ecological and social impoverishment. My research aims to provide data for policies that would contribute to mitigating climate change and biodiversity loss, while improving the welfare and autonomy of marginalized rural population.

Environmental movement, and ecological restoration, can serve the interests of various groups. Marginalized rural populations have a specific take on restoration, that ideally optimizes biodiversity, ecosystem services, cultural services and economic interest. Marginalized populations are the most affected by ecological degradation, since they live in and around the degraded sites. The movements that I research are addressing the root cause of the degradation, which is improper and exploitative land use from generally outside actors (large companies or land owners, state supported colonial practices). For this reason, environmental movements led by marginalized populations increasingly intersect with pre-existing calls for land reform/agrarian reform.

I am conducting research on the cultural and political aspects of ecological restoration, increasingly focusing on the intersection between environmental and agrarian reform movements. I published an article on the practice of “rewilding” in Scandinavia, its diversity and challenges, and the potential of “rewilding” to empower marginalized rural communities through increasing their political agency over the land they inhabit. I then conducted fieldwork in Brazil (Bahia) with the Landless Workers Movement, where the agrarian reform movement was directly involved with agroforestry and ecological restoration, in addition to feeding marginalized population, safeguarding local culture, spreading democracy and education in rural areas. As of late August 2024, I am building a partnership with the Humboldt University of Berlin, and after the fantastic opportunity provided by the JSPS, I have integrated Okinawa as my third case study in my comparative PhD thesis.

I initially wanted to include Japan as an additional insight for an article comparing the role of culture for the restoration of abandoned land in Norway, but after a thorough literature review and meeting with several Japanese researchers, I altered this plan. I will instead integrate Japan (Okinawa) fully into a revised PhD project, and conduct additional fieldwork to compare the structural issues surrounding competing land use and ecological degradation in Okinawa with similar issues in my previous case studies.

7. Research implementation and results under the program

Title of your research plan: People's heritage and earth's future: the role of local communities in reforesting abandoned landscape, perspective from Norway and Japan

Description of the research activities: Two months is a relatively limited time to conduct research activities, my goals were to: 1. Meet Japanese researchers in my field and 2. Assess if a comparative study with Japan is relevant for my thesis. These were both successful, so successful that Japan is now an integral part of my thesis.

I participated in a symposium at Sophia University with my host researcher and her colleagues. She gave me a lot of references to read, and we discussed on multiple occasion various issues of land use conflicts, environmentalism, heritage and land abandonment in Japan. This helped me narrow down my comparative cases to either Hokkaido or Okinawa. I was also invited to a research event at the University of Tokyo, followed by a meeting with Pr. Ryo Kohsaka to discuss research collaboration and help me to design a relevant research program in Japan. I also visited rural areas, and now have an increased understanding of the Japanese countryside and its challenges. While I aimed to research the heritage-related challenges of land abandonment and restoration, I found that a comparison with my other cases was challenging due to different approaches to environmental management and restoration. On the other hand, I realized that Okinawa was a perfect case study to complement my previous work on agrarian reforms and environmentalism.

I spent a week in Okinawa, visited the University of the Ryukyus (Faculty of Agriculture) and had a lengthy meeting with Pr. Chen Bixia. We discussed the relevance of Okinawa for my research, especially the intersection between land use conflicts and environmentalism, and the importance of the cultural aspect of forests for designing conservation policies (she is leading a project on Sacred Forests). Various stakeholders with opposing land uses coexist on Okinawa. Protests surrounding the controversial extension of the US base in Henoko Bay/Oura started shortly after I arrived. I could see locals (and international) inhabitants opposing it, and the impact structural land ownership issues on their welfare.

8. Please add your comments, including any cultural experience during your stay in Japan (if any): The summer months, despite the overwhelming heat, lend itself well to cultural activities. In and around Tokyo, I have been to plenty of festivals and taken part in beautiful synchronized dances, watched fireworks and floating lights from the riverbank, and hiked through the mountains around Tokyo and in Okinawa.

There is much to explore, and I found the inhabitants of Tokyo (especially in Nakano, where I lived) to be very curious and friendly, motivating me to learn the language and engage in "broken Japanese" conversations whenever I had the occasion. It is difficult for me to express how wonderful this immersion in the Japanese culture was and how grateful I am for this experience. I did not expect to be so happy in Tokyo, and I am looking forward to more cultural experiences in Japan when I come back for fieldwork.

JSPS Summer Program 2024 Research Report

1. Name: Isabelle Meskerem Elshadaye Augusta HANTONNE (ID No. SP24206)
2. Current affiliation: Sorbonne Paris Nord University
3. Research fields and specialties: Mathematical and Physical Sciences
4. Host institution: Kyushu University, Center for Organic Photonics and Electronics Research (OPERA)
5. Host researcher: Pr. Chihaya ADACHI
6. Description of your current research <p>One of the most difficult challenges in organic optoelectronics is to build a laser diode based on organic semiconductor materials. After organic light-emitting diodes have become ubiquitous in our everyday lives through our smartphone displays, the perspective of making laser diodes out of these materials is both an exciting scientific challenge and the promise for numerous practical applications ranging from advanced displays to chemical sensing. My PhD work focuses on two related topics: 1) enhancing our understanding and mastery of a widespread technique (Amplified Spontaneous Emission assessment) that is currently used for quantifying the laser capabilities of a new material; and 2) looking for exotic short-pulse regimes in organic semiconductor solid-state lasers.</p> <p>During my first year as a PhD student, I worked on Amplified Spontaneous Emission (ASE) assessment to characterize the lasing capabilities of organic materials using ASE (Amplified Spontaneous Emission) threshold measurements. This is a very common method, routinely used at OPERA (Kyushu University), which enables simple and fast quantitative evaluation without the need to build a complete laser device. Despite the widespread use of this method, very few studies have been conducted on the influence of experimental parameters on ASE thresholds and even on the ASE phenomenon itself. My work demonstrated that pumping conditions (such as geometrical parameters) and signal collection are critical for reliable and repeatable threshold values. I also developed two new functional experimental methods that provide complementary information to spectral methods regarding the spatial and temporal evolution of organic materials' emission using spatial distribution of the emission beam and fluorescence lifetime measurement.</p> <p>I am also interested in the temporal aspect of laser emission and I aim to explore new temporal regimes for organic solid-state lasers. Indeed, the final goal of my thesis is to develop the first short pulse organic laser and to this end, I first want to observe the onset of lasing of Vertical Cavity Surface-Emitting Lasers (VCSELs) to prove experimentally the existence of relaxation oscillations – very fast oscillations of the laser intensity – predicted by theory in such cavities. In France, I was able to make preliminary experiments with a fast oscilloscope and an ultrafast photodiode. I now need to go further in time resolution together with spectral resolution, which can only be addressed with a very fast streak camera setup. The use of such a device, available at OPERA, would allow for obtaining more precise results through simultaneous monitoring of spectrum versus time, while enabling me to extend my study to new laser cavities and new semiconductor materials, and to move towards the first organic Q-switched solid-state laser – laser regime where cavity losses are modulated to obtain short pulses.</p>

7. Research implementation and results under the program

Title of your research plan: Organic short-pulse lasers: towards new temporal regimes

Description of the research activities:

Throughout my stay at OPERA, I was able to use state-of-the-art equipment and benefit from the internationally renowned expertise of Prof. Adachi's group in organic optoelectronics and specifically organic lasers to carry out my research activities.

First, I used promising organic materials, such as BSBCz, that have a very low ASE threshold to prepare VCSELs (vertical laser cavities) and characterize them with the Fourier plane spectroscopy setup available on site – these materials will also be used for my temporal study. Two different methods were chosen for the fabrication of thin films of the emitting materials on the mirrors: i) solution deposition via spin-coating for emitters with high molecular weights (polymers) and ii) by vacuum deposition via an evaporation chamber for small organic molecules in the OPERA clean room, which allows for the fine control of the thickness of the material layer. This work also allowed me to participate in the characterization of novel materials developed by chemists present at OPERA and more generally, these studies have enabled me to improve the fabrication process of VCSELs as well as the deposition of emitting materials.

As described in the current research section, I am interested in studying new exotic short-pulse regimes in organic semiconductor solid-state lasers, and more specifically, in the onset of lasing to experimentally demonstrate the existence of relaxation oscillations in organic VCSELs. To observe these very fast oscillations, I used a streak camera with picosecond temporal resolution connected to a spectrometer. To fully characterize my laser cavities, I coupled this study with the Fourier plane spectroscopy setup available at the OPERA lab. I was able to observe fast oscillations of my laser intensity and confirm the presence of relaxation oscillations. To further investigate these oscillations, I also varied the pump power and compared the evolution of both pump and laser with theory. This results enabled me to move towards a Q-switched short pulse laser by isolating a relaxation oscillation or forcing the laser to operate on a single short pulse, by adding a saturable absorber to the cavity (passive Q-switching).

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

My stay was very enriching from both a scientific and cultural point of view. Summer is the festival season in Japan, so I was able to attend traditional parades such as the Hakata Gion Yamakasa, as well as enjoy fireworks displays on the beach or near aisles full of multiple food stalls (yatai) that the Japanese love so much. I particularly enjoyed taking part in the traditional events organized by my host institution, such as Tanabata, where I hung a wish on a bamboo tree, or one of the most popular summertime food rites, Nagashi somen, where we tried - with my colleagues - to catch white wheat noodles in a water stream flowing down a bamboo chute. I would like to thank my host institution and all the people I met during my stay for helping me create unforgettable memories of Japan.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: SINGAPPULI Diluka	(ID No. SP24207)
2. Current affiliation: CELIA, University of Bordeaux, France	
3. Research fields and specialties: Mathematical and Physical Sciences	
4. Host institution: Institute of Laser Engineering, Osaka University	
5. Host researcher: SHIGEMORI Keisuke	
6. Description of your current research <p>My Ph.D studies are within the context of Fusion Energy research, in particular the Inertial Confinement Fusion (ICF) approach. Very recently (2022), fusion ignition was demonstrated at the Lawrence Livermore National Laboratory (LLNL), with a total gain (ratio between the fusion energy and the total laser energy) of 3.1, using a Deuterium-Tritium capsule coated with a so-called “ablator layer” made of diamond. This result represents a key milestone in Fusion Energy research, paving the way for the development of future Fusion power plants for energy production.</p> <p>One of the key aspects to be addressed is the improvement in the efficiency of capsule compression. Unfortunately, diamond due to its high properties, requires very high initial pressure (12 Mbar) which only allows for limited compression.</p> <p>Boron Nitride (BN) is a very promising alternative candidate for ablation layer. Its crystalline structure and density share close similarities to both diamond and graphite but its melting temperature is lower than for diamond, potentially allowing for implosions with a higher fraction of fusion fuel burnt and higher fusion energy yields. My studies focus on BN properties (equation of state) under extreme conditions of pressure and temperature probed by laser-driven shock waves. Its experimental study will verify the theoretical models, and ultimately assess the fitness of BN as candidate ablator material for high-gain ICF.</p>	

7. Research implementation and results under the program

Title of your research plan:

Study of Boron Nitride Equation of State in Extreme Conditions : The Quest to Fusion Energy

Description of the research activities:

During these 2 months in Japan, I participated to experimental campaigns at the laser facility of Osaka University, the Institute of Laser Engineering. One of them tested a new approach for Fusion Energy, the so-called "Proton Fast Ignition". By focusing the very high intense laser LFEX (4 beams) on a hemispherical plastic shell inside a gold cone, protons and ions were directionally accelerated to heat a copper/plastic ball placed at the tip of the cone. After ~1 ns, the 6 GEKKO beams (cylindrical irradiation) compressed the ball to reach high densities.

The second experiment aimed to characterize boron nitride (BN) behavior in extreme condition. Using 12 GEKKO beams focused into a step target made of plastic/aluminum/quartz and cubic boron, a strong shock is generated and propagate at the rear side of the target. With optical diagnostics, we could track its propagation into the different layers and estimate its average velocity. This experiment should ultimately give BN properties with a more in-depth data analysis and assess BN fitness for ICF target design.

In addition, I learnt how the facility runs and improved my experimental skills thanks to the team there.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

Amazing experience in Japan, I really loved my stay here. The homestay program was an excellent way to see and live Japanese lifestyle. The family welcomed me with such warmth and made me feel like a true member of their family. We stayed in touch and met before my departure. At the laboratory, everybody was nice with me and especially my two supervisors Alessio Morace and Arikawa Yasonobu. I learnt a lot by working with them and included me as a team member. Japan offers very good working and living conditions, I would absolutely consider pursuing my research there.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Mathieu ROGET	(ID No. SP24208)
2. Current affiliation: Aix-Marseille University	
3. Research fields and specialties: Mathematical and Physical Sciences	
4. Host institution: Nagoya University	
5. Host researcher: Prof. François LE GALL	
<p>6. Description of your current research</p> <p>My current research involves quantum computing and quantum walks. Specifically, I'm investigating quantum walk based algorithms in both local and distributed settings.</p> <p>I have already studied discrete time quantum walks in the context of searching for a long time with several published papers. The last one, in particular, introduces a new model of quantum walk that is well defined on any graph. The model works in both centralized and distributed setting. We also provide a possible distributed protocol to execute this quantum walk. We have also shown that this model is particularly suitable for searching.</p> <p>On the other hand, the host researcher, François Le Gall, is strongly implicated in distributed quantum computing with several of his works being applied to actual meaningful problems. Furthermore, the distributed computational scheme introduced in his works is actually based on a searching algorithm (the Grover search).</p> <p>The purpose of this project was to explore possible useful applications for this new quantum walk model.</p>	

7. Research implementation and results under the program

Title of your research plan:

Distributed Quantum Computing with Quantum Walks

Description of the research activities:

The goal of this project was to investigate several algorithmic problems, and figure out if they are suitable to be solved with the quantum walk model I have recently published. Both local and distributed settings were considered.

After considering several possibilities, we found one algorithmic problem (namely “glued trees problem”) for which exponential advantage is likely. This problem was considered in a local setting.

Extended mathematical analysis allowed us to greatly simplify the expression of the quantum walk. Unfortunately, this wasn’t enough to obtain analytical results. However, it still allowed us to perform numerical simulations which provided strong numerical evidences of exponential advantage.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

9. Adviser’s remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Sarah MARCHAND	(ID No. SP24209)
2. Current affiliation: Centre de Recherche Cerveau et Cognition (Centre National de la Recherche Scientifique/Université Toulouse III – Paul Sabatier)	
3. Research fields and specialties: Biological Sciences	
4. Host institution: National Institute of Advanced Industrial Science and Technology (AIST)	
5. Host researcher: Tomokazu TSURUGIZAWA	
<p>6. Description of your current research</p> <p>Currently, at the Centre de Recherche Cerveau et Cognition (CerCo) in Toulouse, France, I am studying the visuo-vestibular integration of self-motion signals at the cortical level using brain imaging techniques. Using magnetic resonance imaging (MRI), I present primates (both human and non-human) with visual stimulation (videos of moving clouds of dots on a screen) and galvanic vestibular stimulation (electrical stimulation of the inner ears using surface electrodes placed behind the ears). These stimulations generate a sensation of self-motion. With the video generation parameters on the one hand and the galvanic stimulation parameters on the other, we can induce a sensation of self-motion in a preferred direction, such as to the left, right, forward, or backward. It is also possible to create situations of visuo-vestibular conflict by making the signals incongruent between the two modalities (<i>e.g.</i>, the visual indicating forward direction and the vestibular indicating backward direction). As part of my PhD, my research objective is to identify the regions involved in the visuo-vestibular integration of self-motion information, and to define the specificities of these regions, such as their preference for a given direction or their potential preference for a situation of congruence or incongruence between the signals. Since this study is being carried out on two models, the human and the rhesus macaque, it is also intended to highlight any similarities or differences between these two species, which are genetically close but have different modes of locomotion, the human being a terrestrial biped and the rhesus macaque an arboreal quadruped. To date, studies on humans have identified a fairly dispersed network and revealed an initial level of specificity in certain regions, such as V6 and VIP, which are only activated during galvanic vestibular stimulation in the anteroposterior axis, but not in the lateral axis (Aedo-Jury <i>et al.</i>, 2020). A subsequent study (Marchand <i>et al.</i>, <i>subm.</i>) then looked at direction specificity within this axis, highlighting that V6 presented a second level of specialization, being significantly more activated during stimulation inducing a sensation of forward self-motion. As for the question of signal congruence, it is once again the V6 region that shows itself to be specialized by showing greater activation in response to the detection of congruence between visual and vestibular signals. V6 therefore appears to be a key region in this integration, which is crucial for locomotion. In the rhesus macaque, which has already shown functional activity networks and connectivity very similar to those of humans (Cottureau <i>et al.</i>, 2017; DeCastro <i>et al.</i>, 2021), we are currently carrying out analyses to check whether this specialization of the V6 region is persistent between the two species and to further explore the specialization of other regions involved.</p>	

7. Research implementation and results under the program

Title of your research plan:

Activation of cortical regions in response to natural and artificial optic flow related to self-motion perception

Description of the research activities:

During my time at AIST, my main objectives were to assist in preparing and conducting MRI sessions with awake monkeys, preprocess and analyze the imaging data, and learn from the host team's expertise, particularly in connectivity analysis. We successfully developed visual stimuli in the form of videos representing both artificial (moving cloud of points) and natural (3D forest landscape) optic flow to study cortical activations related to self-motion perception. Our collaboration led to the successful training of a Japanese macaque for a complex fixation task and to the refinement of the MRI acquisition protocol, essential for accurate MRI data collection. We conducted around fifteen MRI sessions, processed the images, and performed statistical analyses to address our research question. Preliminary analyses have shown that some cortical regions involved in the processing of self-motion are more activated in the case of natural stimuli and/or stimuli indicating forward movement. Therefore, it seems that the “ecological” character of the stimulation has a reinforcing effect on the activation of certain cortical regions involved in the processing of visual stimuli compatible with self-motion. These initial conclusions now need to be reinforced by a more specific analysis by region of interest (ROI), as well as by the analysis of connectivity data, a skill that I have been able to develop with the expertise of AIST. This collaboration has the potential to result in the publication of a research paper, as soon as the complementary analyses are completed.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

During my stay in Japan, I was able to visit many places throughout the southern half of the island and discover the Japanese landscapes and culture. My host family, supervisors and colleagues also accompanied me in this cultural discovery, showing me places of cultural interest and introducing me to local activities, customs and food. My cultural experiences have included: visiting temples, tasting local dishes and culinary specialties, visiting historical, artistic and scientific museums, hiking through Japanese landscapes, staying in traditional hotels, visiting major Japanese cities, discovering how to wear traditional clothes, participating in a tea ceremony and attending a traditional festival.

9. Adviser's remarks (if any):

It was an extremely valuable opportunity for us to conduct research with Sarah-san through the JSPS Summer program 2024. I would like to express my sincere gratitude for Sarah-san and her Ph.D supervisor Dr. Durand for their contributions, and JSPS, so that we were able to run fMRI sessions smoothly using awake monkeys and analyze the data here at AIST. She is very skilled and excellent in all process of experiments, including preparing visual stimuli, performing both experiments and analysis, and is truly helpful to share her expertise. Her talk at a seminar was also excellent, providing interesting discussions with lab members. She attended Japanese Neuroscience meeting at Fukuoka and exchanged ideas with many researchers in Japan.

JSPS Summer Program 2024 Research Report

1. Name: Jeremie Raymond Josse	(ID No. SP24210)
2. Current affiliation: Université Grenoble Alpes	
3. Research fields and specialties: Humanities	
4. Host institution: Masami K. Yamaguchi Lab, Chuo University	
5. Host researcher: Prof. Masami K. Yamaguchi	
6. Description of your current research	
<p>In the past decades, the need for comparative cross-cultural study of language development in children has become increasingly clear. Most data gathered for developmental studies originate from American-English speakers (Henrich et al. 2010). This has created an alarming bias in this field. The study we have completed with this grant aims to compare two relatively understudied populations (Japanese and French), in order to reveal new insights into the wide array of strategies used by children of various linguistic backgrounds to acquire language.</p> <p>Our study focuses on lip-reading: an aspect of language-learning which is understood as the ability for listeners to bolster their live language comprehension under challenging auditory circumstances. Lip-reading ability has been shown to result in better language development in later life (Bastianello et al., 2022; Imafuku & Myowa, 2016; Tenenbaum et al., 2015; Tsang et al., 2018; Young et al., 2009; Birulés et al., 2023), which makes its study central to understanding healthy language development. Previous studies have suggested that, like Japanese adults, Japanese children do not rely on lip-reading as much as Western children (Sekiyama & Burnham, 2008). We expect these differences in lip-reading behaviour during childhood to be even more enhanced by a Japanese-French comparison, as opposed to an English-Japanese one, considering that visible lip protrusions accompanying speech are even more common and marked in French than they are in English.</p> <p>By using a combination of lip-reading tests, we have explored our hypothesis that Japanese children actually do use lip-reading to bolster language-learning, but in different ways and situations than Western children would. We also tested the hypothesis that the prolonged and ongoing usage of covid-mask in Japanese youth might have had an effect on their tendency to rely on lip-reading, and on their ensuing language-learning strategies.</p> <p>As a general rule, developmental science is often cited by various other domains of research seeking to model or to dwell into the origins of human behaviour and language. Helping this field becoming more reflective of the wide array of cross-cultural developmental strategies rather than merely centered on Western realities is therefore beneficial for our institution as well as for the global scientific community as whole.</p>	

7. Research implementation and results under the program

Title of your research plan:

Audio-visual integration during language-learning in Japanese and French children.

Description of the research activities:

During my time at Chuo university, I have finished coding a computer program aimed at presenting 2 distinct audio-visual integration tests in a way that would be comfortable and intuitive for children aged 6 to 11 as well as for adults. This program used audio-visual stimuli that I had created in home university in France before my departure. Once that goal achieved, my host researcher gave me access to a room in Miraikan (The National Museum of Emerging Science and Innovation) where, with the precious assistance of undergraduate student volunteers as well as other PhD students and researchers, data from 411 Japanese children and adults was gathered for this audio-visual integration study. My next step will be to gather the same amount of data from French children and adults upon my return in France.

My supervisor also arranged for me to meet other researchers in my domain from various universities and cities in Japan, which has led to rich and fascinating conversations about research and potential future collaborations.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

My cultural experiences in Japan might too various and varied to be commented on in such limited format. My supervisor gave me time to go and visit several regions of Japan which I have found interesting, beautiful, and that have made me wish to return in the future to learn more about this country and its culture and language. I have especially enjoyed spending a week with a child development research team in Hokkaido, which not only allowed me to discover a new Japanese lab and university, but also to explore the beautiful nature, mountains and hotspots of Hokkaido. I thoroughly enjoyed my stay here.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Muller Guillaume	(ID No. SP24211)
2. Current affiliation: Université Bordeaux Montaigne	
3. Research fields and specialties: <div style="display: flex; flex-wrap: wrap; padding: 5px;"> <div style="width: 33%; text-align: center;"><u>Humanities</u></div> <div style="width: 33%; text-align: center;">Social Sciences</div> <div style="width: 33%; text-align: center;">Mathematical and Physical Sciences</div> <div style="width: 33%; text-align: center;">Chemistry</div> <div style="width: 33%; text-align: center;">Engineering Sciences</div> <div style="width: 33%; text-align: center;">Biological Sciences</div> <div style="width: 33%; text-align: center;">Agricultural Sciences</div> <div style="width: 33%; text-align: center;">Medical, Dental and Pharmaceutical Sciences</div> <div style="width: 33%; text-align: center;">Interdisciplinary and Frontier Sciences</div> </div>	
4. Host institution: Meiji Daigaku	
5. Host researcher: Nemoto Misako	
6. Description of your current research <p>My research examines the interplay between Japanese proletarian literature and <i>Nihongo bungaku</i> (Japanese-language literature) from the empire's outer territories, including Taiwan, Korea, and Manchuria, during the 1920s-1930s. Although previous studies (by Bowen-Struyk, Field, Kamiya, and Kimura) have addressed these fields separately, few have explored their connections within the context of the Japanese empire. My aim is, through the analysis of a range of Japanese proletarian journals, to focus on critical reviews to identify significant authors from the outer territories. This project seeks to establish a corpus that reflects the literary contributions of these regions and to examine how the authors positioned themselves within the proletarian movement, often negotiating their peripheral status through distinct narrative strategies.</p>	

7. Research implementation and results under the program

Title of your research plan:

Proletarian literature and the Empire

Description of the research activities:

Most of my research time was spent working in libraries, focusing on accessing proletarian magazines from the 1920s-1930s. I successfully located a comprehensive range of magazines relevant to my research by alternating between three university libraries at my host institution, Meiji University (primarily at Izumi Library in July, and at Ikuta Library and Central Library in August), as well as the National Diet Library, where I was able to find some of the rarest issues. From the early publications of Japanese proletarian magazines, starting with *Tanemaku Hito* in 1921, to the final moments of the movement with *Bungaku Annai* and *Nippon Hyōron*, I traced reviews of proletarian literature from the colonies as they appeared in mainland Japan.

During my stay, I also attended several conferences and symposiums, including the Asian Studies Conference Japan, held in July at Sophia University, as well as various events at the Maison Franco-Japonaise in Tokyo.

With the support of my host at Meiji University, Professor NEMOTO Misako, I had multiple opportunities to present my research: first to students during a graduate seminar, and subsequently to researchers from my host institution. One of the most significant interactions was with TAKEUCHI Masaya, a distinguished expert in Japanese proletarian literature, whose valuable feedback and insights greatly enriched my research.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Matisse T. CHAMBRY	(ID No. SP24212)
2. Current affiliation: University of Montpellier	
3. Research fields and specialties: Biological Sciences	
4. Host institution: Kyoto University	
5. Host researcher: Prof. Miyuki MATSUO-UEDA	
6. Description of your current research I'm a master student in Wood Sciences. Therefore, I study chemistry, mechanics, biology and others wood-related sciences. This research in Japan was carried out as part of my end-of-study internship.	

7. Research implementation and results under the program

Title of your research plan:

Biomechanics and detection of tension wood in keyaki (*Zelkova serrata*) trees.

Description of the research activities:

The goal of this study was to better understand the biomechanics of the keyaki (*Zelkova serrata*) and to maximize the use of this precious forest resource. To do so, I had to find easy ways to detect tension wood in keyaki trees, to better prevent the usual problems encountered in sawmills due to the distribution of tension wood. I've tested several methods of detection and have tried to compare them, to know which one was the more reliable, easier-to-use and cheapest. For now, no one method stood out more than the others, but the project will continue at Kyoto University.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

This experience was very nice, discovering life in Japan and how research is conducted was very rewarding.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Raoul HALLOPEAU	(ID No. SP24 213)
2. Current affiliation: Strasbourg University, France	
3. Research fields and specialties: Mathematics and arithmetic geometry	
4. Host institution: Tokyo university, Kavli IPMU	
5. Host researcher: Professor Tomoyuki ABE	
6. Description of your current research <p>The theory of D-modules originates from differential equations. Indeed, one can associate a D-module to a differential equation $P(u) = 0$, containing the equation data's. Studying such a module algebraically yields valuable insights into the corresponding differential equation. Ultimately, we shift focus from the initial differential equation to investigate D-modules in their own right.</p> <p>The D-modules we are interested in are the holonomic D-modules: a D-module is said to be holonomic if its characteristic variety has minimal dimension. These modules generalize the concept of differential equations and integrable connections.</p> <p>My current work involves defining the notion of holonomicity for coadmissible D-modules on smooth rigid analytic curves. I succeed during my PhD to introduce a characteristic variety for coadmissible D-modules over a smooth formal curve. I am actually trying to define notion of holonomic modules at the level of the Zariski Riemann space associated to a smooth formal curve. I have made good progress towards this goal, thanks to Tomoyuki Abe, and I should also obtain a characteristic cycle for these holonomic modules. I hope to be able to write an article about it before the end of the year.</p>	

7. Research implementation and results under the program

Title of your research plan: Holonomic D-modules on a smooth rigid analytic curve.

Description of the research activities:

I worked every week with Tomoyuki Abe at Kavli IPMU (Kashiwanoha) through discussion on blackboards. Otherwise, the rest of my time was spent working in my office. Tomoyuki Abe was a great help, enabling me to resolve a number of points missing from my work.

I also met a mathematician in my field, Professor Nobuo Tsuzuki, in Sendai for two days.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I really enjoyed Japan and life there. I was also a pleasure to spend a week-end with my homestay family.

9. Adviser's remarks (if any):

JSPS Summer Program 2024

Research Report

1. Name: Pierre MACKOWIAK (ID No. SP24214)
2. Current affiliation: CMAP, École polytechnique, Institut Polytechnique de Paris
3. Research fields and specialties: Mathematical and Physical Sciences
4. Host institution: Waseda University
5. Host researcher: Professor Reika FUKUIZUMI
6. Description of your current research <p>In my PhD thesis I study a mathematical model of Bose-Einstein condensation in random medium. I focus on the study of a Schrödinger operator with both a confining potential and a white noise potential, and associated nonlinear Schrödinger equation. It is well-known that such an operator is ill-defined in dimension 2 or more, as the white noise is too rough. In order to define the operator in dimension 2, a renormalization procedure is needed.</p> <p>I constructed the operator in dimension 1 and 2 for general confining potentials. I then proved existence and uniqueness of solutions of the associated nonlinear Schrödinger equation. It then becomes a natural question to study stationary solutions of this nonlinear evolution equation. This was the aim of my research in Waseda university.</p>

7. Research implementation and results under the program

Title of your research plan:

Stationary solutions of the Gross-Pitaevskii equation with white noise potential in dimension 1 and 2.

Description of the research activities:

I proved that one can construct stationary solutions in dimension 1 and 2 using variational methods, mainly energy minimization under mass constraint and action minimization on the Nehari manifold. I also proved that defocusing positive energy ground-states are unique and form a continuous branch of solution bifurcating from the first eigenvalue. This branch covers all possible frequencies for defocusing standing waves. Moreover, in dimension 1, it is orbitally stable. In the focusing case, action minimization allows to construct standing waves for any possible frequency. I then obtained the optimal Hölder regularity of stationary solutions in dimension 1 and 2. In the focusing case, I showed that any stationary solution is exponentially localized.

In order to obtain stationary solutions without confining potential, I started to study the zero-confinement limit with Professor Fukuizumi. This will require to pursue our collaboration in order to get results.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I presented my work on renormalization and stationary solutions in several seminars in Tokyo, Sapporo, Kyoto and Osaka. Thanks to this I was able to meet many other Japanese mathematicians with whom I had interesting exchanges. I also participated in the workshop on the theory of Homogenization at U. of Tokyo.

I gave a help to the Open campus event of the host university (Waseda), it was a good experience to collaborate with some students, and know other research activities (out of my field).

9. Adviser's remarks (if any):

Sometimes Pierre kindly assisted at seminars with my bachelor students, discussed with them, and had a lunch/dinner with them. My students were all very glad to have those experience, and Pierre's presence surely stimulated my students both in term of mathematical studies and different cultures.

JSPS Summer Program 2024 Research Report

1. Name: LEROY Clément	(ID No. SP24215)
2. Current affiliation: Laboratory of Climate Science and Environnement, Paris	
3. Research fields and specialties: <div style="display: flex; flex-wrap: wrap; justify-content: space-between; padding: 10px 0;"><div style="width: 30%;">Humanities</div><div style="width: 30%;">Social Sciences</div><div style="width: 30%;">Mathematical and Physical Sciences</div><div style="width: 30%;">Chemistry</div><div style="width: 30%;">Engineering Sciences</div><div style="width: 30%;">Biological Sciences</div><div style="width: 30%; border: 2px solid blue; border-radius: 15px; padding: 2px;">Agricultural Sciences</div><div style="width: 30%;">Medical, Dental and Pharmaceutical Sciences</div><div style="width: 30%;">Interdisciplinary and Frontier Sciences</div></div>	
4. Host institution: Fukushima University	
5. Host researcher: Dr. WAKIYAMA Yoshifumi	
6. Description of your current research <p>The 2011 Fukushima Daiichi nuclear disaster released significant amounts of radionuclides, particularly cesium-137 (^{137}Cs), into the environment, leading to long-term contamination. In this context, understanding sediment transfers is crucial because of the persistence of ^{137}Cs in the environment and its affinity with clay particles.</p> <p>This research focuses on the development of non-destructive and cost-effective methods to identify sediment sources in Fukushima rivers, utilizing near-infrared (NIR) and mid-infrared (MIR) reflectance techniques. These methods can distinguish sediment from various sources, including forests, croplands and landslides, in target sediment material, which play a crucial role in the downstream spread of radioactive contamination. Traditional sediment source tracing involves expensive and often destructive analyses. Our approach allows to assess sediment properties by analyzing reflected radiation. This provides a rapid and efficient way to determine sediment origins without altering the samples.</p> <p>Our findings demonstrate the potential of NIR and MIR reflectance in effectively differentiating sediment sources. This will support evaluating the effectiveness of decontamination efforts and contribute to design a more sustainable approach to environmental monitoring and management in contaminated regions. The study has broader implications for dealing with industrial pollution in other regions and it emphasizes the importance of developing innovative approaches to environmental restoration.</p>	

7. Research implementation and results under the program

Title of your research plan:

Developing Novel Low-cost Methods for Sediment Source Tracing in Fukushima Rivers

Description of the research activities:

During my two-month stay at Fukushima University, I had the invaluable opportunity to collaborate with leading experts in the field of radioactivity across various disciplines. This experience allowed me to deepen my understanding of the subject while also engaging in hands-on fieldwork, where I conducted important measurements. In addition to these activities, I successfully completed my master's thesis, integrating the insights and data gathered during this period. This experience has been instrumental in advancing my research, particularly in the development of new methods for sediment tracing, which combines extensive modeling, data analysis, and fieldwork.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I was able to visit another fellow in Hokkaido for a few days as well as visit some parts of northern Japan especially the Fukushima Prefecture.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name:	(ID No. SP24 216)
2. Current affiliation : Université Paul-Valéry Montpellier 3 / IRP Mitate-Lab Post-Fukushima Studies	
3. Research fields and specialties: Social Sciences	
4. Host institution: Tohoku University, Department of Architecture, Laboratory of Urban Design.	
5. Host researcher: 窪田 亜矢 (Kubota Aya)	
6. Description of your current research <p>The aim of current research is to identify and characterize situations of social vulnerability in a post-nuclear accident context in Fukushima prefecture.</p> <p>The area studied is the town of Namie, and more specifically the Tsushima district. Since 2017, Namie has been selected to become a model of post-nuclear disaster resilience and is concerned by many local redevelopment projects. Among the 21,000 inhabitants before the disaster, only 1,900 remain in 2020. Most of them men with an average age of 55. Moreover, the evolution pace of urban fabric tends to be very fast after the reopening. For example, more than 80% of the former buildings in the central zone of Tsushima disappeared in less than a year after the reopening. The reasons given for this are varied, but radioactivity and damages to buildings caused by prolonged evacuation of the area are just two examples. Previous research has demonstrated the psychological effects of this policy on evacuees (stress related to compensation, loss of furusato). However, not that many studies which address the social issues in Namie analyze theses phenomenon as a potential systemic problem rooted by societal context. In that way, we sought to explore the theory of the production of space by Henry Lefebvre, and determine if those can be relevant to assess the daily vulnerabilities of inhabitant who decided to come in Namie.</p> <p>The research problem is summarized by the following question: <i>How can we identify the effect of the post-disaster reconstruction policy on the daily vulnerability of the inhabitants?</i> To answer this, we firstly synthetized of the current situation in Fukushima. Secondly, we explored whether the theory of space by Lefebvre have already been implemented in Japanese urban context, and if it can be used for our studies. Lastly, we used these tools to analyze the daily life of some residents in Namie.</p> <p>The purpose of this research is to provide a better understanding of the social phenomenon that emerge in the wake of industrial disasters, and whether it is possible to improve people's daily lives by understanding the space in which they live, and the deep consequences of political decisions.</p>	

7. Research implementation and results under the program

Title of your research plan:

Post-disaster reconstruction and its vulnerabilities, an analysis of everyday space.

Description of the research activities:

Our first activity was to obtain as much topographical data as possible on the current state of the area to characterize changes since the disaster. Data relating to changes in the built environment, precise demographic statistics and changes in surface area since 2011 are still difficult to access. Several official sources exist, such as the national database, those of Fukushima Prefecture, and those of the Ministry of Regional Planning, Infrastructure, Transport and Tourism. But apart from the latter, geolocated data in vector format can be difficult to find.

The Fukushima disaster sparked, and is still sparking, an international interest for research in all disciplines. For example, the Scopus database lists nearly 5455 peer-reviewed articles between 2011 and 2017 alone (Kaur et al., 2019), which is probably only the tip of the iceberg if we count grey literature. We have therefore compiled a brief review of the state of the art on the subject of reconstruction in Fukushima, in order to meet our purpose.

Another part of the bibliographical work will be to determine whether and how Henri Lefebvre's theory of the production of space can be assimilated to the concept of vulnerability as theorized in disaster science. The aim here is to find out what relevance this theoretical framework can bring to the analysis of personal and territorial vulnerability, and whether it can open up new and relatively unexplored fields of methodological approach (especially with regard to the study of everyday spaces in a post-disaster context).

In this first attempt, my participation to this program considerably fastened my research as my colleagues in the laboratory could provide me many references and documents from symposiums made in the field.

The second activity was to go out into the field to interview Namie residents. Visiting the village of Tsushima and getting a feel for the situation. I was also able to take part in a field trip to the Sanriku and Fukushima region to visit the main disaster sites and the decontamination waste storage area.

Results:

By analyzing the situation in Namie, the rural way of life, as described in our interviews, is based on a high degree of social coherence between individuals though mutual help. The disintegration of the community, the impossibility of full decontamination, the reconstruction project according to urban standards, the evacuation and the loss of activities, have locally shattered this coherence. Interestingly, sociologists such as Seiki. R in '*Accident of the Fukushima nuclear power plant and deprivation of one's hometown*' (Seiki, 2020), mention that the problems of community disintegration did not begin with the evacuation, but rather when the area reopened, with disagreements between those who could afford to return and those who could not.

The territory of Fukushima, as a product of the disaster, finds itself caught between the three dimensions of space that have become irreconcilable: a designed space (development) that applies the standards of the city as an object of consumption (by building houses specific to suburban living style). Spatial practices with highly heterogeneous motivations (keeping one's house to pass on the memory / to oppose the reconstruction policy, etc.) and considerably restricted by the contamination. And an lived space, which was also radically changed by the surrounding contamination, the loss of confidence in the authorities in charge of reconstruction, and socio-demographic evolution.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

The JSPS programme has been an immeasurable opportunity for my research project, as well as for forging links with students and researchers in Japan. I hope to be able to return.

9. Adviser's remarks (if any):

JSPS Summer Program 2024

Research Report

1. Name: Clément GIBEAUX	(ID No. SP24217)
2. Current affiliation: EDYTEM, Savoie Mont Blanc University, France	
3. Research fields and specialties: Chemistry and Biological Sciences	
4. Host institution: Okayama University	
5. Host researcher: Prof. Yuta NISHINA	
6. Description of your current research <p>Enteric viruses can be transmitted by various means, including drinking water, and have the potential to cause illness and death. Among these viruses, human noroviruses are the primary culprits responsible for gastroenteritis. However, their cultivation in the lab is complex, which highlights the importance of developing an extraction method for these autochthonous viruses. Such a method is crucial for effectively cleaning water, investigating their characteristics, and monitoring their evolution. At present, the methods used for their analysis in wastewater require large quantities of water laden with pollutants (metals, organic matter, sediments), which can inhibit techniques for analyzing the genome of these viruses.</p> <p>This is why my thesis project (Virocaptur) aims to develop materials with controlled porosity for the concentration and analysis of human noroviruses (virus of gastroenteritis) in wastewater and drinking water.</p> <p>Materials with controlled porosity were prepared and specifically shaped from chitosan (biopolymer non-toxic and biocompatible) and mesoporous templated carbon for subsequent use in virus capture in aquatic medium. Chitosan-based materials, such as millimetric hydrogel beads and thick films as well as chitosan/porous carbon composites to obtain a bigger specific surface area and with controlled pore diameters were synthesized using a gelation method.</p> <p>The scanning electron microscopy observations of the surface of the freeze-dried hydrogels, demonstrates the presence of a multiscale porosity including macropores (pore size > 50 nm) and mesopores (2 nm < pore size < 50 nm) able to host the viruses studied.</p> <p>The prepared materials were applied for murine norovirus (MNVs) (diameter ~ 35 nm) sampling studies in various conditions targeting both virus adsorption and release in saline water, tap water and wastewater. The non-pathogenic grown MNVs suspension is used as a model for human noroviruses medium. Over ~90% of MNVs are found to be adsorbed by chitosan hydrogels beads after 2 hours in ultrapure water and tap water.</p> <p>A desorption method based on the control of physico-chemical conditions has been developed allowing the release of ~80% of the MNVs initially adsorbed in saline water on the chitosan hydrogels by favoring the electrostatic repulsion of the viruses by the material. The efficiency of virus adsorption /desorption in wastewater by the prepared materials is currently being studied. The prepared materials will be tested for sampling the gastroenteritis viruses in the outflow of Chambéry wastewater treatment plant.</p>	

7. Research implementation and results under the program

Title of your research plan:

Innovative porous material for norovirus detection in water (**IPON-ORO project**)

Description of the research activities:

New **chitosan/graphene oxide (CS/GO)** materials were successfully synthesized under **hydrogel** form (beads and film) and **dry membrane** with varying ratio CS:GO to investigate the influence of GO on chitosan materials. Chitosan with different molecular mass and two GO suspension with different particles size. Different method of stirring was tested to improve the homogeneity of the viscous CS/GO acid solution, the best being with a hand blender. Hydrogels were synthesized via a **gelation process** in basic medium of the acid solution CS/GO poured in a petri dish for the film. Beads were produced by dropping CS/GO solution directly in basic bath. Thin membrane (thickness ~ 0.027-0.084 mm) was obtained by drying CS/GO solution poured in petri dish then adding NaOH for rehydration and neutralized the acidity of the membrane. Membrane has flat surface without porosity in comparison to freeze-dried hydrogel as observed under a scanning electron microscope. No significant difference was observed between CS/GO hydrogel and pure CS hydrogel matrix. Thermal decomposition of the materials was studied by thermogravimetric analysis. CS/GO membranes have higher thermal stability in comparison to GO, but inferior in comparison to pure CS. These materials were used for the adsorption and the desorption of non-enveloped **virus Q-beta** and enveloped **virus phi6**. Improvements to the double agar plaque assay method and virus culture have been implemented in the laboratory for the virus quantification. Materials were put in contact to a saline viral suspension for the **adsorption** step then transferred in **desorption** solution to recover adsorbed viruses. In the case of Q-beta virus, ~80% was adsorbed in 2 h with pure CS beads, ~25% for some CS/GO beads and ~ 54-100% with CS/GO film. The application of the similar desorption solution like the one use in France did not yield positive results due to an incompatibility with plaque assay method. The use of another desorption solution with beef extract is currently being tested, as it has already given good results with functionalized GOs. The same experience is underway with phi6 viruses.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I visited several shrines and temples in Okayama and of course the famous Okayama Castle and the magnificent Korakuen Garden. During a few days of the Obon period, I took the opportunity to visit new places in Tokyo that I hadn't visited on a previous tourist trip. I really enjoyed my homestay family experience, with whom I visited the Kurashiki Bikan historical quarter. It is a very interesting experience to compare working methods and models between France and Japan. It was a very enriching experience to work in Prof. Nishina's laboratory and benefit from his expertise. I'm sincerely happy to be able to stay a little longer thanks to the JSPS to accumulate more results relevant to a future publication.

9. Adviser's remarks (if any):

Clément Gibeaux has demonstrated exceptional research skills during his stay at Okayama University. His innovative work on developing chitosan/graphene oxide materials for virus detection in water has shown promising results, particularly in virus adsorption and desorption studies. His adaptability in optimizing experimental methods and dedication to advancing his research objectives are commendable. His cultural immersion in Japan, including engagement with local customs, has enriched his experience and broadened his perspectives. His contributions will undoubtedly impact our future publications.

JSPS Summer Program 2024 Research Report

1. Name: Dorothea Mladenova	(ID No. SP24301)
2. Current affiliation: University of Leipzig, Germany	
3. Research fields and specialties: Humanities/Social Sciences	
4. Host institution: Chiba University	
5. Host researcher: Juljan Biontino	
6. Description of your current research My current field of research focuses on global and transnational memory culture with a focus on the transnational “comfort women” movement. The “comfort women” movement originated in South Korea and Japan around the year 1990 through transnational cooperation, and has spread to other Asian countries as well as to the US and Germany. After having studied the movement in Germany extensively, I wanted to learn more about the Japanese network: its historic development, its current members, activities and goals. I wanted to visit established “comfort women” memorials and museums, but also find protagonists who have been involved in (failed) attempts at memorializing the “comfort women” history. I planned to discuss with scholars, curators and activists what difficulties exist when it comes to the establishment of a memory culture for the “comfort women” in Japan, and how they are trying to overcome them. I was also interested to know how they perceive the installation of memorials to the “comfort women” outside of Japan, and specifically in Berlin.	

7. Research implementation and results under the program

Title of your research plan:

The transnational “comfort women” movement in Japan – its history, goals, and activities

Description of the research activities:

During my fieldwork in Japan, I managed to visit museums and memorials as well as interview several activists and discuss the “comfort women” activism and memory culture with scholars. I was introduced to more activists and involved persons than I could possibly interview within the short time-span. I collected a considerable number of pamphlets, brochures, books and journal articles, which I plan to analyze thoroughly after going back to Germany.

I visited the “Women’s Active Museum” (WAM) in Tokyo, a documentation center on the history of “comfort women” with a focus on the Women’s International War Crimes Tribunal (2000). I also visited two “comfort women” memorials – one in Tateyama and one in Kamogawa. I interviewed activists and scholars in Hiroshima, Kansai and Tokyo. Furthermore, I was invited to give a presentation on my research at Kyūshū University in Fukuoka and at Hitotsubashi University in Tokyo.

A highlight of my research stay were the commemorative days on August 14 and August 15. August 14 marks the International “Comfort Women” Day commemorating former “comfort woman” Kim Hak-sun’s coming-out in front of the media in 1991, which is considered the starting point of the transnational movement. At the commemorative event held in Tokyo, I got to meet some of the activists at the forefront of the movement. August 15 marks the Memorial Day for the End of the War. On this day, I visited the “comfort women” memorial in Tateyama and participated in the mourning ceremony.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I really enjoyed the fireworks festivals, but I recommend avoiding the ones in Tokyo since they tend to get overcrowded. Try to find a fireworks festival in a rural area. I also enjoyed Bon-odori and o-matsuri.

With climate change, I do not think that summer is the best time to conduct research in Japan. Due to the high humidity, any temperature beyond 30°C is unbearably hot, leading to extreme fatigue. On several days, the (actual) temperatures were over 35° and the felt air temperatures were beyond 40°. I might have been able to meet more activists and scholars had the temperatures been lower, but my body was struggling hard to cope with the weather. This summer was probably one of the hottest ever recorded in Japanese history and if you listen to climate scientists, the future is bleak.

9. Adviser’s remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Mei-Chin Pang	(ID No. SP24302)
2. Current affiliation: BASF SE, Ludwigshafen.	
3. Research fields and specialties: Mathematical and Physical Sciences (Data Science)	
4. Host institution: Tohoku University	
5. Host researcher: Prof. Saneyuki Ohno	
6. Description of your current research With increasing adoption of batteries for various applications spanning from consumer electronics to electric vehicles and aircraft, large amount of battery datasets is being curated and collected for battery performance monitoring. During battery cycling across hundreds of cycles, anomalies could happen inevitably due to reasons such as equipment breakdown, batteries manufacturing flaw, measurement errors or even cell failure. As a result, the collected dataset is often contaminated with different outliers, which could cause performance deterioration over an extended cycling period. While detecting a few anomalous data points manually by visual inspection during one cycle is trivial, handling outliers across multiple cycles for hundreds of cells is often time-consuming and cumbersome. In this study, we present combined statistical methods with machine learning for high-throughout outliers detection across thousands of cycles for different cell chemistry, including solid-state cell chemistry. We create a labeled dataset for algorithms benchmarking purposes and make the dataset publicly available using the state-of-the-art database. Here, we show that statistical methods combined with machine learning could shorten the time required to detect outliers in battery cycling protocols. By tracking outliers during battery cycling processes systemically, possible reasons causing outliers can be identified to improve the long-term battery performance and reliability.	
7. Research implementation and results under the program Title of your research plan: Towards Responsible AI for Battery Applications	

Description of the research activities:

- We identify useful statistical methods to detect anomalies in battery cycling protocols across thousands of cycles;
- We also include negative results for methods from the literature that do not show good performance in the appendix and offer possible explanations on why these methods are not suitable for battery applications;
- Together with Prof. Ohno and the researchers at Tohoku University, we will be contributing a new dataset to the public data repository using the state-of-the-art database solution for solid-state battery chemistry;
- We introduce new techniques to help to detect anomalies in battery cycling processes and will be releasing an open-source python package, where the readers could download our models and dataset for further analysis, in addition to reading our paper (paper in preparation and will be submitted to machine-learning relevant journal after the JSPS summer program);
- We have submitted an abstract about our findings to be presented in an upcoming battery conference in Germany.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I personally value the cultural experience during the JSPS summer program. I have the opportunity to stay with a Japanese family organized by the JSPS homestay program. From making sushi and origami to doing household chores together, it was a fantastic opportunity to learn Japanese living in real-life. Well, we also visited Matsushima and experienced summer activities together. My homestay family and I continue to remain in contact even after the homestay, and I also invited them to visit me next time in Germany.

Apart from the homestay, I also have the opportunity to get to know many Japanese friends and researchers in the laboratory of Prof Ohno and Prof Honma personally. They helped me to learn some technical phrases relevant for my research in the Japanese language. We also went to the Tanabata festival together to see fireworks in Sendai and it was a great experience to see many Japanese wearing colorful Yukata watching fireworks.

My understanding of the Japanese culture has certainly improved significantly after this summer program, and I am looking forward to collaborating more with Japanese researchers in the future after the JSPS summer program 2024.

9. Adviser's remarks (if any):

During her two-month of the JSPS internship in our laboratory, Dr. Pang made significant contributions not only to her own research activities but also to the cultivation of an international perspective within our research group and the enhancement of our programming skills. Through her proactive engagement with laboratory members, she immersed herself in Japanese culture while simultaneously educating our team on global perspectives and cross-cultural balance. Dr. Pang's initiative in conducting Python tutorials was particularly noteworthy. She provided comprehensive instruction on numerical analysis and data visualization techniques, skills that are crucial in battery research. Her efforts in this area have substantially improved the technical capabilities of our team. I am confident that the benefits our team received from Dr. Pang's presence over these two months were as substantial as the experiences she gained during her time in Japan.

Summer Program 2024 Research Report

1. Name: Jennifer K.S. FRISKE	(ID No. SP24303)
2. Current affiliation: Mullard Space Science Laboratory, University College London, UK	
3. Research fields and specialties: Mathematical and Physical Sciences	
4. Host institution: Department of Astronomy, University of Tokyo	
5. Host researcher: Dr. Michiko FUJII	
6. Description of your current research <p>In recent years, groundbreaking missions like Gaia and JWST have significantly advanced our understanding of the Milky Way's origin and evolution.</p> <p>In the second data release of the Gaia satellite mission, together with collaborators, I found a pattern in the motion of stars (Friske&Schönrich 2019) that indicated a resonance. Resonances happen around large galactic features, like spiral arms or the Galactic Bar, which dominates the centre of the Milky Way. The further stars are from the Galactic centre, the longer they take for a revolution. If that time span coincides with the revolution time of the Galactic bar, they are at resonance, feeling the gravitational effect of the bar the strongest.</p> <p>We found that we could only reproduce the observed pattern in stellar motions if the Galactic bar slowed down since its creation, roughly 8 Gyr ago (Chiba et al. 2020, Chiba&Schönrich2021).</p> <p>Such a deceleration has been observed in cosmological simulations if the bar exchanges angular momentum with the interstellar gas and especially the Dark Matter Halo surrounding the Milky Way.</p> <p>This large, spherical halo surrounds the Milky Way and is about 10 times as heavy as all Milky Way stars together. Through measurements of stellar rotation curves, we now have an idea about the distribution and mass of dark matter of the Milky Way, but do not know about its kinematic structure. If we know how much angular momentum is exchanged and the rate of slowdown, we can infer back on the velocity distribution of the dark matter halo.</p> <p>However, for this we also first need to better understand the way angular momentum is exchanged in a realistic scenario. This was at the core of my research project here, where I studied the N-body simulations from Fujii et al. (2019) and Asano et al. (2023).</p>	

7. Research implementation and results under the program

Title of your research plan:

Mapping the interaction between the Galactic bar and the dark matter halo with N-body simulations

Description of the research activities:

I started by getting acquainted with the simulation suite. Due to the large number of particles in an N-body simulation, first some computational problems had to be solved. As I was using some other parameters than those previously analysed by members of the research group, I needed to first set up some computational routines to automate some calculations and avoid mistakes down the line. I also needed to familiarise myself with the package pynbody that helped to handle the large amount of data points.

Finally, as I was specifically interested in resonances, it proved helpful to switch from Euclidian coordinates to so-called action-angle coordinates.

With the set-up done, I was able to locate the resonances and trace them in the galactic disc. Chiba et al. (2020) had only looked at particles in a fixed potential. However, particles in N-body simulations move under their own gravity. This makes N-bodies more realistic, but also more prone to scatter and harder to analyse, as they exhibit more features coming e.g. from spiral arms. This is particularly true for the halo, where drawing definite conclusions is generally difficult due to our limited understanding and the resulting lack of accurate models.

In the end, I was able to trace the resonances in the disc and show both the redistribution of angular momentum in their vicinity as well as the global loss of angular momentum over time, as expected.

However, I was not yet able to find the corresponding resonant wake in the DM halo. This was somewhat surprising to me and the research group and will require some more careful analysis in the future.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

My first time in Japan was an incredible experience. Some highlights included attending a trip to Kyoto for Gion Matsuri meeting a local friend, local fireworks festivals, and exploring various sites with my colleagues and other JSPS fellows. I was also lucky enough to take part in a small conference at the National Astronomical Observatory of Japan.

In general, being part of the summer project allowed me to explore a completely different culture not only as a tourist but also in a work and living environment which really enhanced my understanding and appreciation of this country.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Christoph ROHMANN	(ID No. SP24304)
2. Current affiliation: Ostfalia University of Applied Sciences	
3. Research fields and specialties: Engineering Sciences	
4. Host institution: Toyohashi University of Technology	
5. Host researcher: Prof. Jun MIURA	
6. Description of your current research <p>My current work primarily focuses on developing a safety-optimized strategy for global path planning for autonomous vehicles. In automotive terms, global path planning refers to what is generally known as navigation. Current navigation systems usually calculate either the shortest, the fastest or the most efficient route to their goal destination. By using databases of geotagged accidents that contain information about the cause of the individual accident, the environmental conditions and other safety-relevant aspects, I am working on finding patterns that can specifically be used to derive safe navigation strategies for autonomous vehicles. This is done by clustering the accidents using their geo-coordinates and calculating a safety metric based on weighted accident parameters taken from the database, which then results in a global safety score for each cluster. This score is considered during the global path planning phase to identify a safety-optimized route. In addition to the information contained in the database, environmental conditions throughout the vehicles estimated path are considered for the safety score calculation. Autonomous vehicles rely on perception sensors like cameras and LiDAR for perceiving their environment. These sensors are affected by environmental conditions such as weather phenomena (e.g. rain and fog), which increases the safety-criticality when the autonomous vehicle is exposed to these conditions. Based on the quantification of the sensor performance reduction under such conditions, I am working on adjusting the safety score on a local cluster basis through the integration of weather forecasts. This allows to continuously update the score based on the current situation and to derive safe driving behaviors for the autonomous vehicle during operation.</p> <p>To quantify the impact of rain on LiDAR sensors specifically, the research goal for my stay in Japan was to find the correlation between varying rain intensities and the resulting performance reduction of LiDAR-based 3D pedestrian detection models. Interactions with pedestrians pose a major challenge for autonomous machines (including vehicles and other mobile robots), since collisions can lead to severe injuries. Detecting people is a challenging task for 3D-based object detectors in general, as their dimensions are small compared to cars and other objects and they lack distinct features and characteristics. Exposing the sensor to adverse environmental conditions is expected to decrease the detector performance, which is why this scenario incorporates a particularly high level of safety-criticality. Since fully autonomous vehicles per definition need to be capable of operating during any given environmental condition, giving the system sophisticated metrics to quantify the current situational safety-criticality is vital for making judgements that lead to the execution of appropriate driving maneuvers (e.g. for collision avoidance).</p>	

7. Research implementation and results under the program

Title of your research plan: An Analysis of Adverse Weather Effects on Safe Robot-to-Pedestrian Interaction

Description of the research activities:

As a first step of my research stay at the Active Intelligent Systems Laboratory (AISL), I performed an in-depth literature review on the influence of rain with varying intensity on the general data quality of LiDAR sensors. Based on the paper "Predicting the Influence of Rain on LIDAR in ADAS" (Goodin et al., 2019), we implemented an algorithm that builds upon on a simplified version of the general LiDAR equation to apply artificial rain noise to LiDAR-based point clouds. It is applied both during runtime (by using the Robot Operating System) and as a means of post-processing to augment existing datasets. We opted to use LiDAR data captured by real sensors instead of simulated ones, because the noise algorithm heavily relies on accurate reflectance values of objects, which current simulation frameworks don't (or only in a limited way) provide. We specifically chose the KITTI 3D object detection dataset, as it one of the most frequently used datasets for benchmarking detection models. For the 3D object detector, we chose the PartA2-net model included in the OpenPCDet framework, as it showed the best results for pedestrian detection on the KITTI validation split (Average Precision (AP) of 66.40%@R40). By altering the raw dataset with varying noise levels ranging from 1mm/h to 50mm/h of rain intensity, the results showed that the AP of the pedestrian detection model already reaches 0.001% at rain intensities of 5mm/h, which makes it virtually unusable for heavy rain scenarios. By retraining the model with a dataset that we augmented with noise representing rain intensities of 5mm/h, the pedestrian detection results became significantly better, maintaining an AP of 48.6% and 42.7% under 5mm/h and 50mm/h rain intensities respectively. False-positive detections occurred when using the retrained model on the raw dataset with no noise applied, which we corrected by performing a second training iteration, this time using a combination of both raw and noise-introduced data as input for the training process.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

My host established contact with fellow researchers from Nagoya University, where I was invited for a research discussion session. It was a great opportunity to discuss mutual research topics with researchers from Japan and to gain insights into their research system and infrastructure.

During my spare time, I traveled to various places in Japan and experienced many facets of its beautiful culture and traditions. I visited several summer festivals, which I believe truly capture the essence of a Japanese summer. I also took part in the homestay program, which I highly recommend. Even after the program ended, I met my host family several more times and we already made plans to meet up again in Germany.

I want to express my sincere gratitude towards the JSPS, SOKENDAI, DAAD, my host Prof. Miura and everyone else involved for making this research stay possible.

9. Adviser's remarks (if any):

During his stay at our university, Mr. Rohmann worked on evaluating a performance degradation model of LiDAR under adverse weather conditions. The results obtained are valuable and will contribute to vehicle safety technology. This visit also allowed us to engage in a deeper exchange of expertise, laying the foundation for future collaborations.

JSPS Summer Program 2024 Research Report

1. Name: Christopher Klapproth	(ID No. SP24305)
2. Current affiliation: University Leipzig	
3. Research fields and specialties: Biological Sciences	
4. Host institution: Tokyo Institute of Technology, Earth Life Science Institute	
5. Host researcher: Liam M. Longo, PhD	
6. Description of your current research <p>Protein domains are conserved units of protein evolution, often able to fold independently and frequently repeating across the protein universe. Several thousand protein domain families and their associated topologies and biological functions have been described to date in databases like the PDB, ECOD and others, offering a rich basis of knowledge of these fundamental building blocks of life. However, in many cases, proteins do not carry out their function alone, but act in conjunction with cofactors to facilitate enzymatic function.</p> <p>There is a lack of investigation into the interplay of cofactor binding and the evolutionary development of the protein architecture configurations that carry out this interaction. This, however, may have deep implications for our understanding of early development of life. Since both cofactors and proteins are modular, understanding this connection could reveal the extent to which these systems have been influencing each other during evolution.</p> <p>Goals of the research conducted in Japan were as follows:</p> <ol style="list-style-type: none">1. Analyze and describe different organizational modes of protein-cofactor binding sites.2. Investigate if, and to what extent, these interaction modes are typically carried by a primary domain (“anchor domain”) or are evenly distributed across multiple domains working in conjunction.3. Understand the relationship between common chemical groups present in many cofactors (Adenine, Ribose, etc.) and the emergence of the protein domains that primarily interact with them. Another point of interest was how adaptable this relationship is. <p>Based on this, we wanted to further understand the rules which govern the way cofactors are interacted with by proteins, to then formulate a more general hypothesis on how protein active site emergence is evolutionarily driven.</p>	

7. Research implementation and results under the program

Title of your research plan:

Protein cofactor binding – Modularity across scales in Biology

Description of the research activities:

We constructed an analytic pipeline for the investigation of protein-cofactor interaction patterns on the level of binding modes. In a first step, crystal structures of proteins were obtained from the Protein Data Bank and screened for atom-atom interactions between amino acid residues and cofactor molecules. Based on our findings, we mapped discovered interaction patterns to evolutionary data from the ECOD data base. We furthermore established a simple notation for the description of cofactor binding patterns and domain organization, classifying different binding modes by statistical and topological parameters.

Key findings of my research period include:

- Creation of an atlas of cofactor binding modes and analysis of common binding features.
- Although the interface between domains is a common site of protein interaction, it seems that many or most of these actually evolved from a single domain. In other words, interfaces are often a derived feature, not the point of origin of a binding mode.
- Adding to this, cofactor binding sites seem fundamentally modular in nature, with certain 'key' anchor protein domains often being reused in different binding contexts and purposes.
- Binding site architectures are often highly adaptive, with even highly similar architectures showing evolutionary specializations allowing for vastly different purposes (i.e. the ATPgrasp domain being adapted for binding NAD).

We are currently in the process of drafting a manuscript for publication. For this purpose, we plan to further collaborate with other research groups known by Prof. M. Longo. In this sense, the JSPS summer program will have an impact on our work that will extend well beyond its initial scope, both in terms of duration as well as individuals involved.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

Aside from my research, I participated in many extracurricular activities and events, both officially organized (Homestay) as well as self-organized (climbing Mt. Fuji with other research fellows, visiting many historical sites and vistas).

I feel like the experience given here was a very well-rounded one that not only advanced my professional, but also my personal development.

9. Adviser's remarks (if any):

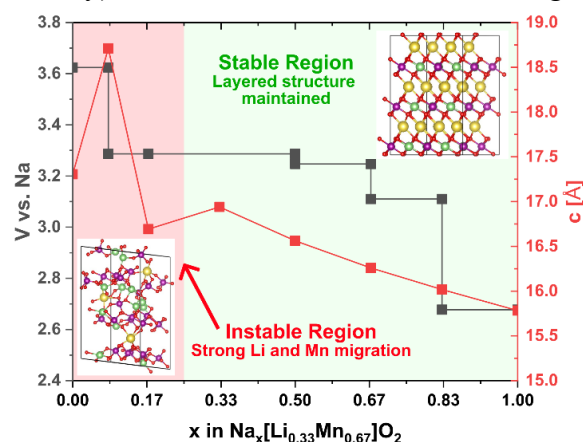
JSPS Summer Program 2024 Research Report

1. Name: Konstantin Köster	(ID No. SP24306)
2. Current affiliation: IMD-2, Forschungszentrum Jülich GmbH, Germany MESA+, University of Twente, The Netherlands	
3. Research fields and specialties: Mathematical and Physical Sciences	
4. Host institution: Kyoto University	
5. Host researcher: Prof. Takeshi Abe	
6. Description of your current research <p>Batteries have been already applied in many devices of modern life and even more high-performance batteries are required in the near future to match the expected demand of electric vehicles and to store energy from renewable sources. While today's industry standard are lithium-ion batteries (LIBs), recently sodium-ion batteries (SIBs) gained significant interest as they bear the opportunity to decrease battery costs and increase the sustainability compared to LIBs due to the high abundance of sodium compared to lithium. Among the classes of cathode materials discussed for SIBs, layered oxides (LO) of the composition NaTMO_2 are the most appealing because of their high energy density. However, the performance of SIBs still needs to be improved and other challenges such as the lower phase-stability (micro-cracking, degradation) of cathode materials because of the increased ionic radius of sodium compared to lithium need to be tackled. To increase the stability of these materials, a joint approach of experimental work and theoretical studies is necessary to obtain an in-depth understanding of the materials. My current research focuses on density functional theory (DFT) calculations of LO as cathode materials for SIBs in cooperation with experimental partners. Published works focused for example on stability investigations of a $\text{P2-Na}[\text{Ru}_{0.78}\text{Co}_{0.22}]\text{O}_2$ cathode material as well as the comparison of the redox mechanism to the Ru-free material [Adv. Energy Mater.; 10.1002/aenm.202302017]. Stability predictions of different phases to verify experimentally observed phase transitions were provided by my DFT calculations. In accordance with the experimental results, I found redox activity of $\text{Ru}^{4+}/\text{Ru}^{5+}$ as well as activation of anionic redox (oxygen redox) in my simulations. We were able to attribute the massively improved capacity (energy density) with the help of our calculations to the activation of these additional redox activities. In another study, we focused on the sustainability aspects of SIBs by investigating a layered oxide cathode material for SIBs based on NaMnO_2 where Mn is partially substituted by copper and lithium [Energy Storage Mater.; https://doi.org/10.1016/j.ensm.2024.103224]. I studied this cathode material with similar computational methods and found, in discussion with our experimental partners, that lithium is able to activate oxygen redox in the material (increase capacity at high voltages) and that the cheap and abundant copper is both, redox active ($\text{Cu}^{2+}/\text{Cu}^{3+}$) as well as a structural stabilizer. Besides collaboration studies I also work on pure theory projects to improve the accuracy of our computational methods to design novel battery materials. Recently, I published a systematic benchmark of various parameter sets of hybrid functionals for DFT calculations of battery materials versus highly-accurate, but very expensive, <i>GW</i> calculations [Phys. Rev. B; 10.1103/PhysRevB.109.155134]. Results gave implications on how hybrid functionals can be effectively tuned for battery materials to improve agreement to experiments.</p>	

7. Research implementation and results under the program

***Ab Initio* Studies of Sodium-Ion Battery Cathodes and their Interaction with Solid Electrolyte**

$\text{Na}_x[\text{Li}_{0.33}\text{Mn}_{0.67}]\text{O}_2$ was identified as an interesting cathode material as it was reported to be stable in the sodium-rich (high capacity) O3-phase. DFT-PBE geometry optimizations were performed at several charge states to investigate the lattice-parameter changes (mechanical stability) and to obtain the theoretical voltage curve. For sodium concentrations below 0.33, the calculations suggested structural and mechanical instability of the cathode as indicated by a strong change in the *c*-lattice-parameter and migration of Li and Mn ions from the transition metal layers towards the sodium-ion layers (cf. Figure). The migration of Mn at less than 17% Na indicates that the anionic redox cannot further maintain charge balance, and hence,



Mn is migrating to tetrahedral environments to become oxidized to 5+. However, for voltages below ca. 3.3 V (Na concentration greater 0.17) a stable layered structure was observed in the calculations. To understand how the cathode material could behave in interaction with a $\beta\text{-Al}_2\text{O}_3$ solid electrolyte, more than 10 reaction energies involving various impurities as possible products were explicitly calculated by DFT-PBE calculations. For both, the cathode and the electrolyte, it was found that it is thermodynamically favorable to form sodium-deficient (e.g., $\text{Na}_1\text{Al}_{11}\text{O}_{17}$) structures together with Na_2O or Na_2CO_3 if some excess oxygen or CO_2 is present, which is hard to eliminate in experiment. The calculations also suggested that formation of the Li analogs (e.g., Li_2O , Li_2CO_3) is likely if the cathode is operated in the instable voltage region (cf. Figure) as even in the stable region the corresponding reaction energies are only slightly positive. However, reactions involving mixed products of the cathode and electrolyte such as $\text{Li}_2\text{Al}_{11}\text{O}_{17}$ and $\text{Na}_1[\text{Li}_{0.17}\text{Mn}_{0.67}]\text{O}_2$ were all found to be unfavorable, indicating that the discussed cathode-electrolyte pair is stable, at least as long as the cathode is operated in the stable voltage region. Finally, *NpT ab initio* molecular dynamics (AIMD) simulations at 300K and 1 atm (lab conditions) were performed for the cathode material and the electrolyte. With help of the *ab initio* data a machine learned force field (MLFF) that can describe both materials was trained and optimized. After further training on *ab initio* data of the contact region, this MLFF could potentially help to massively speed up AIMD simulations of the composite material, thus allowing to study the cathode-electrolyte interaction at the *ab initio* level at long time scales.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I had the chance to explore several of the temples and shrines in the Kyoto area. Moreover, I joined the Japanese Culture Festival at Kyoto University. Lastly, I visited Prof. Tateyama at Tokyo Institute of Technology.

9. Adviser's remarks (if any):

JSPS Summer Program 2024

Research Report

1. Name: Edda S. F. MATTHEES	(ID No. SP24307)
2. Current affiliation: Institute for Molecular Cell Biology, University Hospital Jena	
3. Research fields and specialties: Biological Sciences	
4. Host institution: Graduate School of Pharmacological Sciences, Tohoku University	
5. Host researcher: Prof. Asuka INOUE	
6. Description of your current research <p>My current research focusses on how specificity is achieved in the regulation of one major receptor class, transmitting extracellular signals into intracellular responses. With over 800 members in humans, G protein-coupled receptors (GPCRs) represent the largest receptor family, crucial for cellular responses to stimuli like light, ions, or neurotransmitters. Due to their physiological significance, over a third of FDA-approved drugs target GPCRs for disease intervention.</p> <p>Upon activation, GPCRs initiate signal transduction by interacting with G proteins, consisting of $G\alpha$, $G\beta$, and $G\gamma$ subunits. Humans feature 16 $G\alpha$, 5 $G\beta$, and 12 $G\gamma$ isoforms, forming various trimers. Specific $G\beta\gamma$ combinations have been shown for instance to shape the kinetics of receptor signaling. The regulation of these diverse GPCR signaling responses involves a surprisingly small number of ubiquitously expressed proteins, only six in total: two cytosolic GPCR kinases (GRK2/3), two membrane-tethered GRKs (GRK5/6) and two scaffolding proteins, known as β-arrestins (β-arrestin1/2). Previous studies showed that the cytosolic isoforms GRK2/3 interact with membrane-bound $G\beta\gamma$ dimers to facilitate their translocation to the membrane, where the activated receptors reside. GRKs phosphorylate intracellular receptor domains, leading to β-arrestin recruitment, GPCR desensitization and internalization. Pathologically dysfunctional receptor regulation disrupts its spatial and temporal balance. There has been a long-standing effort to develop compounds that preferentially trigger either G protein- or β-arrestin-mediated pathways, termed biased agonists, with the aim of reducing adverse drug effects due to specific activation of the cellular response favorable in certain diseased conditions. Despite progress in understanding $G\beta\gamma$-specific signaling pathways, the effects of their direct interaction on GRK2/3 localization and activation in living cells remain unknown, as G protein signaling and receptor regulation are often viewed as independent cellular processes.</p> <p>Based on our previous finding that GPCRs can be divided into different groups according to the GRK isoforms that facilitate their regulation, we continued to investigate the consequences of GRK-specificity in receptor regulation. In our most recent publication (Matthees <i>et al.</i> 2024), we emphasized the important role of the GRK2/3–$G\beta\gamma$ interactions in the mediation of GPCR–β-arrestin complex formation. By utilizing our GRK2/3/5/6 knockout cells and GRK2/3 mutants, unable to associate with the $G\beta\gamma$ dimer, we were able to show that GRK2/3-mediated β-arrestin recruitment to different GPCRs and subsequent receptor internalization is clearly dependent on the availability of activated $G\beta\gamma$ dimers. Hence, β-arrestin-mediated receptor regulation is inseparably intertwined with G protein activation for GRK2/3. Especially for receptors that specifically rely on GRK2/3-mediated phosphorylation, our research strongly indicates that developing a purely G protein- or β-arrestin-biased agonist presents significant challenges as the signaling pathways are strongly interlaced for GRK2/3. Based on these findings, we advise scientists in search for β-arrestin-biased agonists to first investigate the GRK specificity of their receptor of interest, as this represents the key characteristic to enable the creation of such GPCR activators.</p>	

7. Research implementation and results under the program

Title of your research plan:

Decoding receptor regulation: the role of G $\beta\gamma$ interactions with G protein-coupled receptor kinases (GRKs) 2 and 3

Description of the research activities:

Our latest work emphasized the important role of activated G $\beta\gamma$ for subsequent GPCR regulation, especially for receptors which solely depend on phosphorylation via the cytosolic GRK2/3 isoforms. In my time in Japan, we systematically investigated the influence of the compositional diversity in potential G $\beta\gamma$ dimer formation on the direct interaction with GRK2/3. To this end, we set up a high-throughput protein-protein interaction assay, enabling us to specifically assess all 60 possible G $\beta\gamma$ combinations individually with both GRK2 and 3 upon stimulation of the muscarinic acetylcholine 5 receptor (M5R) as a representative GPCR specifically regulated by GRK2/3 only. Indeed, we found shared and distinct profiles for GPCR-stimulated G $\beta\gamma$ -GRK interactions depending on the specific G $\beta\gamma$ families. The observed differences between GRK2 and 3 are especially noteworthy as they are often considered interchangeable. The completion and analysis of this ambitious data set enabled us to select two distinct G $\beta\gamma$ combinations for further in-depth analysis employing single-molecule tracking analysis in internal reflection fluorescence (TIRF) microscopy. Collectively, our results demonstrate that G $\beta\gamma$ combinations strongly influence GRK2/3 recruitment to the membrane, thereby affecting GRK2/3-specific receptor regulation. Furthermore, our findings highlight distinct, non-redundant roles for GRK2 and 3, which may aid in the development of GRK2- or GRK3-biased drugs to potentially mitigate unwanted side effects in therapeutic applications.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I had a wonderful time in Japan, immersing myself in its rich culture. Prof. Inoue and his team warmly welcomed me into their lab, where we had frequent discussions and celebrated together, in addition to exploring Sendai and its surroundings, enjoying fantastic food and breathtaking views of mountains, waterfalls and a visit to the baseball stadium. The Summer Program was a great way to connect with other participants and discover Japan together. I also loved the homestay experience, where a kind Japanese family hosted me for a weekend, took me to a bustling fish market and the Pacific Ocean, and showed me how to make delicious gyoza. This time is very special to me and I will always cherish this experience.

9. Adviser's remarks (if any):

During the JSPS program, Edda-san put in significant effort on the G $\beta\gamma$ -GRK project and made impressive progress. With the results achieved, we plan to co-author a research article with her supervisor in Germany. Edda-san brought a fresh perspective to our lab. She took the time to have a discussion individually with each member and provided valuable insights from a broader viewpoint. Edda-san also led regular group meetings for our junior students, which they found stimulating. Thanks to her interactions, our students now feel more confident showing their experiments and engaging in scientific discussions in English. Overall, I am proud to say that Edda-san's visit was an excellent success; it truly demonstrated the value of cross-cultural and interdisciplinary collaboration in science.

JSPS Summer Program 2024 Research Report

1. Name: Gerrit Rehs	(ID No. SP24308)
2. Current affiliation: University of the Bundeswehr Munich, Germany	
3. Research fields and specialties: Engineering Sciences	
4. Host institution: The University of Tokyo	
5. Host researcher: Prof. Tomohiro Yokozeki	
<div>6. Description of your current research</div> <p>Sustainable and emission-free mobility is a crucial part in achieving the goals set for carbon emission reduction by several countries to reduce the effects of the transportation sector, such as automotive or aerospace sector, on the climate change. One promising approach is the use of hydrogen as an energy supply for fuel cells. In order to store hydrogen, light pressure vessels using composite materials are of high interest, especially for the aerospace sector.</p> <p>As a PhD student at University of the Bundeswehr Munich my research focuses on detailed numerical models for predicting the structural behavior of composite pressure vessels (CPV) as well as their experimental validation. For accurate modelling of the structural behavior of the CPV, several aspects such as geometry representation and material models are of importance.</p> <p>Composites are composed of different layers, which show orthotropic behavior. Based on the different ply angle fiber direction, the composite shows a complex mechanical behavior. Considering more aspects, such as ply fiber volume fraction, accurate modelling of the structural behavior is challenging. One important aspect beside the above mentioned is the consideration of damage evolution processes resulting in nonlinear material definitions.</p> <p>By implementing these aspects into numerical analysis models, the design of CPVs should be improved.</p>	

7. Research implementation and results under the program

Title of your research plan:

Structural Design of Composite Pressure Vessels considering Damage Evolution Processes

Description of the research activities:

At the University of Tokyo, different studies on continuum damage mechanics (CDM) for composite materials have been investigated following the build block approach. Therefore, the developed models were validated using coupon and element level, showing accurate capturing of damage evolution processes which can be applied to fatigue simulations as well.

Within the JSPS summer program, these models were expanded to component and tank level. A reference CPV design was defined using the winding software *μChain* and the FE-solver *Abaqus*. This CPV design was used as validation case for the following simulations. As the CDM models for capturing the nonlinear damage evolution processes are implemented within the subroutine module of the FE-solver *Marc*, all models had to be implemented accordingly.

First, following the build block approach, the CPV was abstracted as a tube under inner pressure loading. A parametric FE-model was implemented within the *Marc/Mentat* software in order to be able to analyse different CPV designs. A comparison between the CPV model and the tube model showed accurate results.

Second, a methodology was developed to import the winding results of *μChain* into the *Marc/Mentat* software. This was done using a Python API to access the winding results and create an input file for *Mentat* which then could be run in *Marc*.

A comparison of the CPV model derived in *Abaqus* as well as *Marc* resulted in very good agreement of the mechanical behavior of both models. This was also the case for the tube models under inner pressure loading.

As a result, these models were used to run the first nonlinear analyses using the CDM subroutine.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

The JSPS summer program was an incredible experience for which I am very grateful. I was able to perform research with very experienced lab members at the University of Tokyo in my field of research, which will result in collaborative research activities in future. Furthermore, I had the opportunity to explore the beautiful nature and culture of Japan on many different hiking and sightseeing trips. I would highly recommend this program to others.

9. Adviser's remarks (if any):

JSPS Summer Program 2024

Research Report

1. Name: Tobias Wand	(ID No. SP24 309)
2. Current affiliation: University of Münster	
3. Research fields and specialties: Mathematical and Physical Sciences	
4. Host institution: Rissho University, Faculty of Data Science, Kumagaya Campus	
5. Host researcher: Hiroshi Iyetomi	
6. Description of your current research <p>At my home institution, the research of my PhD is in the field of complexity science and dynamical systems. I use data-driven methods inspired from physics to analyze time series data from socio-economic systems. In particular, financial time series offer a rich number of interesting phenomena which can be understood with modern quantitative methods, while also being available at high resolutions and with a good degree of data quality. Stochastic differential equations can be used to both model many systems in physics and to capture the behavior of financial data. Moreover, the increasing availability of data allows quantitative researchers to use modern tools from machine learning and artificial intelligence to better understand the behavior of socio-economic systems.</p>	

7. Research implementation and results under the program

Title of your research plan:

Causal Hierarchy in the Financial Market Network – Uncovered by the Helmholtz-Hodge-Kodaira Decomposition

Description of the research activities:

We use Kenneth French's database of financial returns for different business sectors to estimate a network of how much each business sector is causally influenced by the other sectors. This network of the flow of causality is then analyzed with the Helmholtz-Hodge-Kodaira Decomposition (HHKD): The estimated network can be convoluted and difficult to interpret, but the HHKD extracts the underlying hierarchy of upstream and downstream from the flow network. This allows us to rank the sectors according to their position in the causality hierarchy.

First, we had to implement the estimation and HHKD in Python code which we needed to test with artificial data to see if the algorithm replicated the true structure of the data. Then, we had to find out which time intervals are best to investigate with our method and tested several time periods and durations. We finally focused our research on the period of the financial crisis during the Covid pandemic. Our results indicate that for this period, the sectors Precious Metals and Pharmaceuticals have the highest positions in the causal hierarchy and drive the other sectors of the economy. Our goal is to summarize these results in a manuscript to submit it to the special issue on Complexity in Financial Networks in the journal *Entropy*.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

Together with my host, I visited the Shodenzan Kangiin temple in Kumagaya and also had the chance to visit several temples and the traditional town Kawagoe during the JSPS homestay event. Also, the Uchiwa Matsuri festival and the O-Bon firework in Kumagaya were great opportunities to experience Japanese traditions as well as the "modern tradition" of karaoke together with some other young researchers from Risscho. Moreover, I presented my research at the universities of Kobe and Kyoto and at student association in Tokyo.

9. Adviser's remarks (if any):

First of all, I am proud to have hosted Tobias in Japan. This program has worked so well for us. As he described above, we were able to achieve fruitful results in econophysics. In addition, his visit to our institution greatly promoted our international activities. For example, we held a seminar around him, which was a good opportunity for the young members of our institution to have an academic and cultural exchange with him.

JSPS Summer Program 2024 Research Report

1. Name: Kevin Wang	(ID No. SP24310)
2. Current affiliation: Eberhard Karls University of Tuebingen	
3. Research fields and specialties: Biological Sciences, Interdisciplinary and Frontier Sciences	
4. Host institution: Osaka University	
5. Host researcher: Dr. Masaru Ishii, Dr. Erika Yamashita	
6. Description of your current research My current research is mainly based on tumour immunology, more specifically the molecular mechanisms of host-tumour interactions and the development of novel cancer immunotherapeutic strategies. At the University Hospital and Faculty of Medicine in Tuebingen, in Germany, I investigated the application of anti-cancer antibodies on ovarian and pancreatic cancers. Upon my return to my home institution, I will focus on the investigation of a novel bispecific antibody as treatment option for multiple myelomas, a type of blood cancer.	

7. Research implementation and results under the program Title of your research plan: Importance of bone composition in osteoclast-bone interaction analysed via intravital 2-photon microscopy Description of the research activities: Bone metabolism is regulated by multiple environmental signals. Our bones respond to these signals by modulating the balance between new bone formation and resorption of older bone. This process is also called bone remodeling and is tightly controlled by three types of cells: osteoclasts, osteoblasts and osteocytes. Osteoclasts are bone resorbing cells, whereas osteoblasts specialize in forming new bone. However, it is still unknown how osteoclasts recognize where to resorb bone. To investigate the osteoclast-bone interaction, mouse experiments in combination with intravital multiphoton microscopy were performed. During my summer internship, two main projects were designed. First, bone marrow cells were isolated from the tibia and femur of the mice. These cells were then cultured to differentiate into osteoclasts, which were subsequently transferred onto two different discs, each made of a distinct primary component of human bone: Octacalcium Phosphate (OCP) and Hydroxyapatite (HAp). While

newly formed bone has a higher content of OCP, mature bone consists mainly of HAp. The second project was more complex and involved mouse surgery. Adult mice were anesthetized and the top of the skull was surgically opened to expose the calvaria bone. Two holes were then drilled into the calvaria bone to remove the bone at those sites. The holes were then filled with similarly sized discs made of either OCP or HAp, just like in the first project. Afterwards, the head was sutured and the mice were kept for another 3 weeks before the visualization of the results using intravital multiphoton microscopy.

The preliminary results seemed to show more Osteoclasts at the OCP discs and more Osteoblasts at the HAp discs which was slightly surprising. Due to the bone-resorbing characteristic of osteoclasts and the bone-forming characteristic of osteoblasts, results were inversed from what was expected and are still being evaluated.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I deeply enjoyed the research at Dr. Masaru Ishii's research group at Osaka University. Not only was the research cutting-edge in the field of science, particularly in immunology, but it was also supported by state-of-the-art equipment. The availability of multiple multiphoton and confocal microscopes, an advanced imaging center and a large mouse facility, along with numerous collaborators, experimental designs were possible that would be challenging at many other institutions.

Experiencing the culture in Japan was also very impressive. To me, seeing the inclusion and the depth of traditions in modern life was really unique. I believe that this is also reflected in the working culture, which seems both fascinating and intense. A strong commitment to work and success can lead to long working hours and challenges for work-life balance. I was also surprised to learn about the age hierarchy in Japan, where respect towards elders, even if it is only a few years of age difference, is deeply rooted into the society.

All this made my experience during my JSPS stay truly unique and incredible.

**JSPS Summer Program 2024
Research Report**

1. Name: Nadine Mathé	(ID No. SP24311)
2. Current affiliation: Master's Student at the University of Hamburg (Faculty of Humanities)	
3. Research fields and specialties: Humanities	
4. Host institution: Osaka University	
5. Host researcher: Prof. Dr. Matthew Burdelski	
6. Description of your current research <p>The aim of this study is to analyse information structures in order to compare what and how information is provided in Germany and Japan to (international) students. My research stay in Japan was in order to gather the data at Osaka University and to start analysing it. This research is part of my Master Thesis that I am in the process of writing.</p> <p>This study uses a framework developed by Androutsopoulos and Kuhlee (2019) as basis to describe Linguistic Landscapes in Schools or "Schoolcapes" as an educational setting. Though I adapted and expanded the framework to include categories or "taxonomies" used by LingScape, an application for annotating Linguistic Landscapes, a project conducted by Université du Luxembourg.</p> <p>The primarily focus lies on the kind of information visible in Linguistic Landscapes in Universities or "Uniscapes in areas used by students. What kind of information is present? Is it for example infrastructural, meaning information concerning the navigation at universities or regulative? What languages are present in German and Japanese Universities, Universities in rather monolingual countries. What is the ratio between the national and other languages?</p> <p>In order to create a comparable basis, I chose my home faculty of Humanities at the University of Hamburg, focusing on the language departments in the so called "Philosophenturm" [Tower of Philosophy] and the Minoh Campus of foreign languages at Osaka University. Both places are similar in structures, as they are both large buildings with multiple floors used by various language departments. Both buildings include a cafeteria, places to study and other facilities for students and staff as well as libraries.</p> <p>The portion of my research, that I conducted in Osaka during JSPS fellowship, had three goals. My first goal was finding a suitable place for comparison (Minoh Campus). The second goal was collecting data in form of pictures and annotate them. The third goal is I am using a framework in MAXQDA in order to conduct a qualitative analysis. And my last goal was to start the qualitative analysis, for which I transferred my framework to MAXQDA.</p>	

7. Research implementation and results under the program

Title of your research plan:

Assessing International Student Facilities at German and Japanese Universities through Linguistic Landscapes

Description of the research activities:

My research activity can be split into three phases:

1. Scouting and Data Collection
Mapping out the area and taking pictures on several days,
Transferring the data to MAXQDA
2. Organizing Data and Annotation
Data collected at Minoh Campus consists of 918 pictures.

Annotation categories focus on discourse type, linguality (no. of languages), language, script and placement

3. Qualitative Analyses

Example provided: First Floor Minoh Campus, relation between number of language and kind of language

Code system	ENG	GER	JPN	KOR	ZHO	None	Σ
no l.	0	0	0	0	0	5	5
translingual	0	0	0	0	0	0	0
multilingual	1	1	1	1	1	0	5
quadrilingual	1	0	0	1	1	0	3
trilingual	0	0	0	0	0	0	0
bilingual	27	0	25	1	0	0	53
monolingual	9	0	18	0	0	0	27
	38	1	44	3	2	5	93

Encountered challenges:

- not every area I planned to do research in was accessible to me, which was probably worsened by a language barrier
- libraries do not allow pictures taken in Osaka University
- dormitories are only accessible to residents (safety concerns)
- encountered amount of data was more than anticipated because I did not exclude temporary signs and posters as they are a vital part of the linguistic landscape as it is viewed by students. Therefore, the annotation phase, which was supposed to be around 3 weeks, ended up taking around 5 weeks. This pushed my whole process two weeks back. Currently, I am still analyzing the data.

8. Please add your comments, including any cultural experience during your stay in Japan (if any): ‘

During my stay in Japan, I attended 竹の子にほんご交流会 Takenoko Nihongo Table at Osaka University. It's a program offered by Japanese volunteers to talk to international students, researchers or family members. They help with Japanese learning and offer cultural experiences, for example Japanese Games. Even after the program ended, I am still in contact with the volunteer who talked to me every week for a month. It really helped my Japanese speaking ability and I received some great recommendations. I highly recommend other researchers to try and find programs like this at their Host University. I also do recommend the Homestay Program for similar reasons.

9. Adviser's remarks (if any):

JSPS Summer Program 2024

Research Report

1. Name: Laura Elisabeth Tuturea	(ID No. SP24312)
2. Current affiliation: Department of Psychiatry and Neurosciences, Charité-Universitätsmedizin Berlin, Campus Benjamin Franklin, Hindenburgdamm 30, 12203, Berlin, Germany	
3. Research fields and specialties: Medical, Dental and Pharmaceutical Sciences	
4. Host institution: Department of Behavioral Medicine, National Institute of Mental Health, National Center of Neurology and Psychiatry, Kodaira Tokyo 187-8551, Japan	
5. Host researcher: Prof. Yoshiharu Kim	
6. Description of your current research My doctoral thesis investigates the impact of cultural, migration, and gender-related factors on the mental health of Vietnamese migrants in Germany. As a licensed psychotherapist, I draw from this research and over a decade of clinical experience in national and international trauma and migration projects.	
7. Research implementation and results under the program Title of your research plan: Long term mental health trajectories after Great East Japan Earthquake: A systematic review Review question How do the symptoms of psychological distress, post-traumatic stress disorder and depression develop in populations affected by the GEJE from 12 months post-exposure onwards? Background The Great East Japan Earthquake of 2011 was a catastrophic event with widespread impact on the affected population's mental health (Kunii et al., 2022; Reconstruction Agency Japan, 2023; Shigemura et al., 2021). Numerous studies have investigated the short-term mental health effects of the disaster; however, the long-term mental health trajectories remain less well understood (Kunii et al., 2022; Newnham et al., 2022; Shigemura et al., 2021). Understanding these trajectories is crucial for informing public health strategies and interventions aimed at supporting disaster-affected populations over time (Kunii et al., 2022; Newnham et al., 2022; Shigemura et al., 2021). This systematic review aims to synthesize all available studies that investigate long-term mental health outcomes following the Great East Japan Earthquake, providing a comprehensive overview of the mental health trajectories of affected individuals.	
Description of the research activities: Method Systematic Literature Review Procedure Using PRISMA guidelines	
1. Research Question Formulation <ul style="list-style-type: none"> • Development of a focused research question using the PICO framework. 	
2. Protocol Development <ul style="list-style-type: none"> • Creation and registration of a detailed protocol on PROSPERO, outlining objectives, criteria, and methods. 	
3. Comprehensive Literature Search	

- Design of a search strategy for databases, including grey literature.

4. Study Selection Process

- Application of predefined inclusion and exclusion criteria. Conducting a two-stage screening process (title/abstract and full-text).

5. Data Extraction and Management

- Development of a standardized extraction form.

6. Quality Assessment

- Assessment of risk of bias using tools like the Cochrane Risk of Bias tool.

7. Data Synthesis

- Execution of a qualitative synthesis and, if feasible, a meta-analysis to combine results from similar studies.

8. Reporting and Dissemination

- Reporting of findings using the PRISMA checklist and flow diagram, including sections on background, methods, results, and conclusions.

During the two months JSPS research stay steps 1-5 will be successfully completed. The databases PubMed, Web of Science, and APA PsycINFO were searched for studies published between January 1, 2011, and July 31, 2024, focusing on psychological distress, PTSD, and depression. The inclusion criteria were longitudinal studies with at least two waves of data collection, one year post-exposure. A total of 1,183 studies were screened, and 24 studies were included in the final analysis. The finalization of the scientific article is envisioned for the remaining stay and will be completed either during the research stay in Japan or after return to Germany. JSPS funding will be stated in the article. Afterwards the article will be submitted to a target journal of the field. JSPS will be informed upon successful publication.

Additionally, I joined a pilot project launched by the NCNP for mental health support for refugees in Japan, where I gave a presentation and shared experiences from my related projects in Germany.

8. Please add your comments, including any cultural experience during your stay in Japan:

During my time at the Department of Behavioral Medicine at the National Institute of Mental Health, National Center of Neurology and Psychiatry in Japan, I was deeply impressed by the department's exceptional commitment to research in disaster mental health and trauma. It was an honor to work alongside Japan's foremost authority in this field, Professor Kim, who, with his many decades of experience, has significantly shaped disaster response strategies. Under the guidance of Dr. Zui Narrita, a international renowned expert in systematic reviews, the department provided invaluable support, enhancing our collective understanding of psychological outcomes following disasters.

The supportive environment fostered by the team greatly contributed to my professional growth and the success of my research. I am particularly grateful to the JSPS Summer Program for the scholarship that enabled me to engage in such a transformative experience. The connections I developed during my stay are invaluable, and I am eager to continue collaborating with the department to further our shared goals in disaster mental health research. My experience in Japan has deepened my appreciation and respect for its rich culture and the collaborative spirit that drives innovation and excellence.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Altan Akar	(ID No. SP24313)
2. Current affiliation: Technische Universität Braunschweig	
3. Research fields and specialties: Engineering Sciences	
4. Host institution: Electronic Navigation Research Institute	
5. Host researcher: Dr. Naruto YONEMOTO	
6. Description of your current research Signal integrity is one of the major research areas within the field of EMC. By understanding and characterizing the dynamic behavior of a transmission channel, it is possible to implement additional measures to ensure reliable and error-free operation in critical applications, such as flight navigation systems. This understanding also helps to establish reasonable restricted areas, thereby reducing costs. Today, advanced computers allow for the simulation of various complex propagation scenarios and the investigation of interactions among different systems. However, the analysis of dynamic effects remains beyond what can be numerically achieved. Moreover, at least one metrological assessment of the impact of interferences on transmission channels is essential for validation purposes. My research work focuses on a practical approach to characterize such dynamic effects upon transmission channels of flight navigation systems such as VHF-Omnidirectional Radar (VOR) or Instrument Landing System. Since real-world environments are often inaccessible or prohibitively expensive to investigate, the focus lies in scaled environments. These allow for greater flexibility in availability, designing the measurement environment and controlling involved parameters. My current research work builds up on investigations initiated at the Institute of Electromagnetic Compatibility of TU Braunschweig. The primary focus is to determine whether a group of realistically scaled wind turbines can influence a transmission channel in such a way that it leads to disturbances in the navigation information of e.g. a VOR system. This work in the field of fundamental research can form the basis for future technologies while also addressing ongoing challenges, such as finding reasonable restricted areas around the base stations and the expansion of wind energy systems in Germany.	

7. Research implementation and results under the program

Title of your research plan:

Investigating the Impact of Dynamic Scatterers on Transmission Channels in an Anechoic Chamber

Description of the research activities:

I was able to continue our previous work in the field of characterizing the impact of moving, mechanical scatterers upon transmission channels. The planned measurements with realistically scaled models involving multiple wind turbines, in a low-reflection measurement environment could be carried out successfully. The goal was to investigate the impact of different motion patterns on channel properties at the example of the frequency range of the navigation systems VOR and ILS (localizer) completely isolated from environmental influences. Therefore, a lot of measurement data has been recorded and evaluated. As a result, a significant amount of measurement data has been gathered and evaluated across various scenarios, which facilitates understanding and enables effective management of such situations.

Additionally, it was possible to perform radar cross section (RCS) measurements of all scaled models, which allow further simulations of static scenarios in future.

However, the time was mainly used to record and generate a wide database. The postprocessing couldn't be finished within time.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

The working culture and also the dedication of the researchers at the Electronic Navigation Research Institute has helped me comparing and reflecting our institutional situation in Germany. It is amazing how much can be achieved here with so few employees. I was introduced into many of the actual research topics.

Besides the research activities, I was allowed to attend at an international conference about flight inspection in Nagoya. It allowed me to get a deeper insight into this field and the conference was rounded up with a nice japanese social program: Kabuki, Shodō, Taiko and more.

All in all the JSPS summer program was a very valuable experience to me, regarding both life inside and outside academia.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Jeongin Moon	(ID No. SP24314)
2. Current affiliation: Max-Planck Institute for Astrophysics	
3. Research fields and specialties: Mathematical and Physical Sciences	
4. Host institution: Kavli IPMU(University of Tokyo)	
5. Host researcher: Masahiro Takada	
6. Description of your current research I'm working on a galaxy survey, namely, HETDEX(The Hobby-Eberly Telescope Dark Energy Experiment) with my supervisors Professor Komatsu and Professor Ariel Sanchez. I'm measuring the power spectra (Fourier transformed 2PCFs) of the Lyman-Alpha Emitting galaxies(LAEs) to constrain the cosmological parameters. Through the analysis of these statistical properties, we can understand the expansion history of the Universe and the physical properties of the large-scale structures. I have experienced and actively participated in galaxy survey collaborations, including SDSS eBOSS, DESI and HETDEX. I'm currently a member of the PFS collaboration and started to work in the PFS cosmology group with Professor Takada in this summer program.	

7. Research implementation and results under the program

Title of your research plan:

Measuring power spectra of PFS mocks to implement the cosmological analysis

Description of the research activities:

I have worked on PFS survey, or the Subaru Prime Focus Spectrograph survey, which is aiming at answering the questions about dark matter and dark energy, and figuring out the history of galaxies. Notably, this survey distinguishes itself from other surveys in terms of its wide redshift range with a single tracer. This unique feature enables the measurement of the time-evolution of dark energy across the range that no other observational surveys could have covered.

Furthermore, the PFS survey can make a big synergy with the HSC survey, a photometric galaxy survey conducted with the same Subaru telescope. Scientific data for the PFS cosmology group will be available within the upcoming year, so I have contributed to validate and build analysis pipelines using simulated mock data and I'm going to continue this work after I leave Japan to finally implement the cosmological analysis using actual PFS data.

In IMPU I could have met main researchers associated with the PFS survey, including Professor Takada. Thus, it was helpful for me to join this JSPS summer program and could get the privilege of working in-person with these great researchers.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Lucas STAMPE	(ID No. SP24316)
2. Current affiliation: University of Münster	
3. Research fields and specialties: Engineering Sciences	
4. Host institution: Shinshu University	
5. Host researcher: Prof. Hernán AGUIRRE	
6. Description of your current research Social media platforms produce great volumes of data which are multimodal in nature (textual, visual, ...). Disinformation, in particular coordinated efforts to shift narratives, present a great threat to both the continued operation of online media of all types, and ultimately to the functioning of democratic societies at large. There are several challenges when trying to identify such efforts, like dealing with high data velocity, multimodality, and changes across time, creating highly varying data instances, which may further be polluted with outliers, impeding clustering algorithms used for campaign detection. In my research, I have analyzed ways to detect coordinated behavior, particularly given semantic heterogeneity and different modes of data. Specifically, I have analyzed e.g. the potential of LLMs to describe images textually and use it alongside posts for campaign detection. In another study, we analyzed the potential to use sentence embeddings to capture semantic differences. Another stream of work is concerned with detecting LLM-generated fake content. Given how in a data stream, data can be represented as points, one of the potential ways to facilitate campaign detection is data augmentation through outlier detection. By reducing the volume of data, and keeping relevant information only, the formation of meaningful clusters could be enhanced. The research conducted at Shinshu presents a first step towards that goal.	

7. Research implementation and results under the program

Title of your research plan: Evolving Instances to Understand Outlier Detection Algorithms

Description of the research activities:

In the beginning of the research stay, I was able to participate in the CIMO 2024 Workshop on Evolutionary Computing together with other researchers from Japan, France, and Spain, and gathered valuable feedback on my research approach.

Initially, current methods and existing benchmarks of outlier detection methods were surveyed and used to select methods for the study at hand. Commonly used textual streaming datasets were employed to create initial data instances. To be usable by outlier detection methods, the textual data needed conversion into numeric values. This was achieved using modern, light-weight versions of LLM-based sentence embeddings. To describe these data instances, a variety of descriptors were considered, ranging from distance-based or angle-based to more advanced ones that utilize, for instance, convex hulls or apply statistical tests for data distributions. The selected outlier detection methods were initially applied on the created instances.

A set of operators that create small changes to the data instances were designed. These were used to evolutionarily change the initial set of instances with the goal of maximizing or minimizing the performance of the outlier detection methods.

Finally, dimensionality reduction techniques as well as the previously used descriptors were used to generate statistics and further understanding in which case each method performed well, or badly, which could serve as a basis for a classifier to select adequate outlier detection methods for different real-life instances.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

In addition to the research itself, together with the team I was able to go to a conference that was relevant to our research area. For feeling like part of the research team from the very beginning, spending time together with my host family in their hometown and even beyond the homestay itself, and finally meeting friends and their families in their homeland after knowing and working with them for German Japanese cultural exchange for several years, I feel truly grateful. Apart from visiting several culturally significant places together with my colleagues, many of the things I've had the privilege of learning in Japan I hope to take home and implement in my life and community.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Tereza Lausová	(ID No. SP24317)
2. Current affiliation: German Cancer Research Center, Heidelberg, Germany and University Clinic Heidelberg, Germany	
3. Research fields and specialties: Biological Sciences	
4. Host institution: National Cancer Center Japan, Tokyo, Japan	
5. Host researcher: Dr. Yuichi Shiraishi	
6. Description of your current research <p>Sarcomas are rare tumors arising from mesenchymal tissue. They are known for their complex, rearranged karyotypes as well as varied histology. There are currently over 60 distinct classes of sarcoma, affecting both pediatric and adult patients. Some sarcoma subtypes can be distinguished based on specific mutations and chromosome fusions, as well as based on their DNA methylation signature.</p> <p>Dedifferentiated liposarcoma (DDLs), which is the entity that I focused on in this research project, most commonly affects patients in their 40s and 50s. It has known structural rearrangements, but less is known about its DNA methylation pattern.</p> <p>This work utilizes long read sequencing technology to combine structural and DNA methylation information layers. For the purpose of this analysis, tumor samples from 10 patients were collected prior to the start of the project. From each patient, paired tumor and whole blood samples were made available. DNA from these samples was sequenced using Oxford NanoPore PromethION technology.</p> <p>The NanoPore instruments allow for simultaneous acquisition of the DNA sequence as well as any modifications, including methylation. The “third generation sequencing” has revolutionized analysis of many complex parts of the genome, including repetitive sequences as well as structural rearrangements in cancer.</p> <p>The goal of this project was to investigate the DNA methylation status around chromosomal fusions in ten dedifferentiated liposarcoma samples.</p>	

7. Research implementation and results under the program

Title of your research plan:

Mapping large structural variation and methylation in long-read sequencing data of sarcoma tumors

Description of the research activities:

The first goal in the project was to prepare data for analysis. I have performed sequencing quality control using MinionQC and removed two runs with insufficient quality. This did not influence the number of patient samples included in the analysis. Following this, I have mapped the remaining reads to human genome using minimap2 software.

The next goal was to identify structural variants in DDLS using nanomonsv (Shiraishi et al., 2023). I have found frequent rearrangements on chromosome 12, especially the amplification of region involving the MDM2 gene, which was in accordance with previously published research.

During my stay I was kindly introduced to Dr. Hirata, who published molecular analysis of DDLS (Hirata et al., 2019), which found chromosomal fusions involving non-coding RNA DNM3OS gene. I was not able to validate these results, which was likely caused by the limited scope of this project, as opposed to Hirata et al. – 10 in contrast to 101 samples.

The third goal of the project was to investigate the DNA methylation in DDLS. For this, the sequencing signal had to be re-interpreted (re-basecalled) using dorado, specialized software. This has taken up to three weeks.

In the meantime, I have added context to structural variants in DDLS identified earlier. I have mapped CpG islands, which are important in DNA methylation-mediated gene regulation, affected by structural variants. In many samples, structural variants have affected CpG islands associated with promoters in known cancer-related genes, including TERT. I have also gathered information about DNA methylation status of adipose tissue, the tissue of origin of DDLS, from publicly available data, in the regions of interest.

Due to insufficient time, it was not possible to perform correlation analysis between structural variants and methylation. The continuation of the project is currently in negotiation and is of high interest.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I have appreciated the care that the host lab has taken to create opportunities for networking with colleagues and other members of the institute. I had a chance to present my research in Germany and gained valuable connections. I have also enjoyed participating in outings with my colleagues, notably to local restaurants.

9. Adviser's remarks (if any):

JSPS Summer Program 2024

Research Report

1. Name: Jakob Christoph EHRING	(ID No. SP24318)
2. Current affiliation: Max-Planck-Institute for Physics, Garching, Germany	
3. Research fields and specialties: Mathematical and Physical Sciences	
4. Host institution: Fukuoka University	
5. Host researcher: Prof. Kei KOTAKE	
6. Description of your current research <p>I currently work in the field of numerical astro-particle physics. Specifically, I work on understanding the first second of core-collapse supernovae. These are stellar explosions powered by the gravitational collapse of massive stars that leave neutron stars as compact remnants. Stars can be described as a fluid of extremely high density and temperature. During the final stage, electrically neutral elementary particles, play a pivotal role. They are interacting only weakly and propagate across comparatively long distances without interaction. This constitutes the dominant form of energy transport from the emerging neutron star to the surrounding regions, which is necessary to power the explosion. The number of neutrinos becomes so high that due to certain inherently quantum mechanical effects the propagation of neutrinos is modified, called neutrino flavor conversions.</p> <p>I do self-consistent first-principle computer simulations. In these simulations the star is put on a spherical grid and the evolution of the content of small numerical cells is calculated using equations of fluid dynamics and radiation. Important ingredients in these simulations are the interactions between neutrinos and ordinary matter, the effects of non-radial flows (multi-dimensional effects) and the behavior of matter at high densities and temperatures.</p> <p>My research focusses on the implications that flavor conversions have on the heating and cooling of the stellar fluid on a within the innermost 10,000km during the first second after collapse. I did the first self-consistent simulations including flavor conversions. This enabled me to study the feedback of flavor conversions on the dynamical evolution of the stellar fluid, which in turn leads to a modified evolution of the neutrinos. I found that both, the regions where flavor conversions occur, and the point in time at which they occur have an influence on the heating and cooling of stellar matter. Flavor conversions at later stages and flavor conversions inside or close to the neutron star tend to hinder the explosion while flavor conversions at early times in the so-called heating region, well outside of the neutron star, seem to be supportive for the development of the explosion.</p>	
7. Research implementation and results under the program <div style="margin-left: 20px;"> Title of your research plan: The Impact of Neutrino Flavor Conversions on the Emission of Gravitational Waves in Core-Collapse Supernovae </div>	

Description of the research activities:

During my stay in Fukuoka I learned new methods about the post-processing of data gathered in numerical simulations. Specifically I was introduced to a program that calculates the signal of gravitational waves from the output of the radiation-hydrodynamical codes – that is, from the time-dependent distribution of matter, the velocity and momentum of the matter, and the strength of the gravitational potential.

My primary task was to understand the program and to write an additional interface. This interface is necessary because different numerical simulation codes have different conventions for the exact way the data is stored. During this process I was also able to make some changes to the program to be able to take advantage of some specific properties of the output data of my simulations. I was able to speed up the calculation of the gravitational wave signal by a factor of a few hundred.

During the last week of my stay the calculation of the gravitational wave signal was accomplished. We started to analyze the data and immediately found very interesting features in the gravitational wave signal. If these features can be found in the data of a future observation of a gravitational wave signal they might be clear evidence for the existence of neutrino flavor conversion inside the central regions of the neutron star. We started to work on a draft version for a publication of the data. The project will be continued despite the difficulties of remote collaboration.

During my stay I was also given the chance to promote the research results that I obtained before coming to Japan. With the help of the research support allowance I could visit other groups in Tokyo and in total give three presentations. These presentations were very well perceived and I had quite a few discussions afterwards. I also learned about the current projects of other groups and could in some cases give advice on specific problems.

I also learned about the Japanese education and research system and potential working opportunities. I could get hands on information about the daily life of students, researchers, and lecturers in Japan.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I really enjoyed my stay in Japan. My understanding about the Japanese culture, history and especially language increased a lot. Thanks to the orientation week in Hayama, my research stay in Tokyo and my stay in Fukuoka, I could experience the diversity of the different Japanese regions. I will remember the dedication Japanese people put into things they are passionate about. Starting with the hospitality and the commitment to make good experiences for guests (restaurant, public, public transport, hotel, ...) and continuing to big events (the Hakata Gion Yamakasa festival), Japanese people strive for perfection.

9. Adviser's remarks (if any):

In my view, Dr. Ehring's stay at Fukuoka supported by this JSPS Summer program is by far more valuable than I anticipated before his arrival to Fukuoka. As soon as he started his program, he gave a presentation in our group meeting, by which we made it to clarify the scientific research that we can synergetically work together. I believe that this program will surely provide a worldly-unique opportunity that is indispensable for elucidating the multi-messenger observables from core-collapse supernovae, which can be only doable by this program.

JSPS Summer Program 2024
Research Report

1. Name: Lukas KETTER	(ID No. SP24319)
2. Current affiliation: University of Münster	
3. Research fields and specialties: Chemistry	
4. Host institution: Tokyo Institute of Technology	
5. Host researcher: Prof. Yoshitaka TATEYAMA	
6. Description of your current research Lithium-ion batteries are an integral part of energy storage in our modern society. To push this technology beyond its current performance limits, shifting to solid-state batteries is a promising approach to enhance safety and energy density. To tailor the performance of solid-state batteries, a profound understanding of charge and heat transport within all components is key. In my previous work at the University of Münster I investigated heat, electron and ion transport in solid-state battery cathodes experimentally using Laser-flash analysis, impedance spectroscopy and direct current polarization. As solid-state battery cathodes typically consist of two main components, namely the cathode active material and a solid-state ion conductor, I varied the volumetric ratio of these components to understand its influence on the effective transport. While ionic and electronic conductivities changed over orders of magnitude when varying composition, heat transport in these composite cathodes is low, showing thermal conductivities below $1 \text{ W m}^{-1} \text{ K}^{-1}$ irrespective of composition. To further understand these findings, a resistor network model has been developed suggesting that interfacial thermal resistances between the solid-state ion conductor and the cathode active material are at play, impeding heat transport in solid-state battery cathodes.	

7. Research implementation and results under the program

Title of your research plan:

Investigating thermal interfacial resistance in solid-state battery cathodes computationally.

Description of the research activities:

Inspired to understand heat transport in solid-state battery cathodes on a more fundamental level, the set goal was to model heat flow through an interface structure of a typical solid-state battery cathode. To tackle this task, we started with establishing a workflow to calculate thermal conductivities of the solid-state ion conductor that can then also be used to investigate transport through an interface structure. The main method to investigate thermal transport in the solid-state ion conductor was reverse non-equilibrium dynamics (RNEMD). Thereby the modelled crystal under investigation is virtually heated to the desired temperature and a constant energy flux is generated. Over time, then a constant temperature gradient along the direction of energy flux establishes, whereas the thermal conductivity is obtained, by dividing the energy flux with the negative temperature gradient. By finetuning a neural network potential, we were able to perform RNEMD simulations and to calculate the thermal conductivity of the solid-state ion conductor. The obtained thermal conductivities lie in the range of experimentally assessed values that I have measured in my previous work! First exciting results have been made under the JSPS summer program, as a general workflow to calculate thermal conductivities has been established and the thermal conductivities of the solid electrolyte have been calculated.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

- I really enjoyed the beautiful nature of Japan and had the chance to visit many places around Tokyo during the weekends.
- The program has a good length to gain an insight into Japanese scientific culture and make international connections with Japanese scientists. I also visited a Japanese research group working on solid-state batteries in Sendai, which was a great experience for me.
- The homestay program was wonderful.

9. Adviser's remarks (if any):

Mr. Lukas Ketter, originally an experimentalist, has worked very hard to acquire the cutting-edge computational expertise such as NNP and RNEMD. He is careful, frank and flexible so that we have had many substantial discussions about the calculations and their implications, toward the goal of this research. To reach a certain research stage for future publication, we have set a few weeks extension of his stay in my group. In addition to such scientific activities, he is quite friendly so that we have had lots of cultural exchange between Germany and Japan, which has been so enjoyable for all members in my group.

JSPS Summer Program 2024

Research Report

1. Name: Julia de Freitas Sampaio	(ID No. SP24320)
2. Current affiliation: Humboldt University of Berlin	
3. Research fields and specialties: Humanities x Social Sciences Mathematical and Physical Sciences Chemistry Engineering Sciences Biological Sciences Agricultural Sciences Medical, Dental and Pharmaceutical Sciences Interdisciplinary and Frontier Sciences	
4. Host institution: Tokyo University of Foreign Studies	
5. Host researcher: Ariane Macalinga Borlongan	
6. Description of your current research My current research investigates the influence of the host society's reception on immigrants' motivation to learn the local language. I pay particular attention to the role of "integrative" and "instrumental" motivations. My general hypothesis is that if the host society is receptive, the immigrant might develop a stronger integrative motivation. Meanwhile, if the host society is not receptive and is hostile, immigrants might lose (or never develop) their integrative motivation. In my current research, I am comparing the experiences immigrants had in Tokyo and in Berlin. For that, I conducted 12 semi-structured interviews in each city. The results were then summarized, coded and are currently being analyzed and triangulated with the literature review for increased validity.	

7. Research implementation and results under the program

Title of your research plan:

Comparative Study of Migrant Experiences in Berlin and Tokyo: Language Acquisition and Cultural Adaptation

Description of the research activities:

During my stay in Japan, I conducted 12 interviews with immigrants learning Japanese and compared these findings with 12 interviews I had previously conducted in Berlin. This comparative analysis, along with a literature review examining the sociocultural contexts of both countries and summarizing key theories on second language acquisition, is being developed into an article co-authored with my host researcher in Japan. Additionally, I submitted an article about this research to the journal "Linguistic Diversity and Human Mobility: Explorations in Migration Linguistics," which was accepted for publication.

Through networking events organized by JSPS, I connected with other researchers in my field, leading to a collaborative project on linguistic landscapes at universities in Naha. I also drafted a potential research project for a future postdoc in Japan.

Furthermore, I taught two classes at Tokyo University of Foreign Studies and attended several lectures there.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

The homestay experience was lovely, however it was a bit too long. I think one day only would have been better, as the family seemed very busy.

9. Adviser's remarks (if any):

I would have appreciated more tips on how to behave in case of natural disasters. I have no training when it comes to earthquakes and I felt rather lost when the Japanese government released the advisory regarding the mega thrust.

JSPS Summer Program 2024
Research Report

1. Name: Sarah Kate GOSTLIN	(ID No. SP24401)
2. Current affiliation: University of Ottawa	
3. Research fields and specialties: Biological Sciences	
4. Host institution: University of Tokyo	
5. Host researcher: Professor Robert E. Campbell	
6. Description of your current research	
<p>I research infection-induced metabolic disruptions in the brain during periods of acute stress, such as systemic infection. I use CD-1 mice to measure glucose and lactate metabolism in the brain following an intraperitoneal injection of the bacterial endotoxin lipolysaccharide. I also research the potential protective effects of probiotic bacteria, specifically probiotic solutions consisting of a mixture of lactate-producing bacterial species. Currently, my research is revealing that systemic infection has harmful sex- and age-dependent effects on brain metabolism, serving as a potential explanation for the chronic fatigue and brain fog often associated with viral infection. My research also reveals that probiotic supplementation, especially throughout the pubertal period, may exert protective properties that mitigate the disruptions in glucose and lactate levels in the brain following infection.</p>	

7. Research implementation and results under the program

Title of your research plan:

Towards developing an effective fluorescent protein-based extracellular glucose biosensor

Description of the research activities:

Optogenetics is the use of light-activated protein tools to meticulously measure and manipulate biological processes. The use of optogenetics in the neurosciences, through the use of fluorescent protein-based biosensors, is an exciting research avenue. However, few effective fluorescent protein-based biosensors for metabolic substrates such as glucose and lactate exist. The current project is looking to optimize an red fluorescent protein-based extracellular glucose binding protein biosensor. We are using directed evolution, linker optimization, fluorescent assays, structure-guided engineering and sequencing techniques to achieve this goal.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I had a fantastic time in Japan! I found the orientation week at SOKENDAI very enriching and the homestay a great experience to network with other Japanese residents.

9. Adviser's remarks (if any):

I am very happy to have had the opportunity to host Ms. Gostlin in our lab at The University of Tokyo. She enriched the laboratory environment by introducing us to her unique expertise in the areas of neuroscience and brain metabolism. We wish her the best of success in her future endeavors.

JSPS Summer Program 2024 Research Report

1. Name: Joseph Kim	(ID No. SP24402)
2. Current affiliation: University of Ottawa, Canada and TU Braunschweig, Germany	
3. Research fields and specialties: Engineering Sciences	
4. Host institution: Waseda University, Japan	
5. Host researcher: Prof. Takahito Mikami	
6. Description of your current research This project focuses measuring and analyzing tsunami evacuation behavior during a planned tsunami evacuation drill in Zushi City, Kanagawa Prefecture, Japan. Zushi, a coastal community vulnerable to near-field tsunamis due to its proximity to tectonic plate boundaries, held a tsunami evacuation drill to improve community preparedness and response strategies. The study's primary objective is to observe and evaluate the evacuation routes, speeds, and behavior of participants during the drill. The findings aim to contribute to the development of more effective evacuation strategies and inform future tsunami risk reduction efforts.	
7. Research implementation and results under the program <u>Title of your research plan:</u> <i>Field Measurements of Tsunami Evacuation Behaviour in Japan</i>	

Description of the research activities:

The research activities were performed during Zushi City's tsunami evacuation drill, which took place on July 4th, 2024. The drill was primarily aimed at workers of beach houses along Zushi Beach, who are expected to act as evacuation leaders in a real tsunami event. The beach was divided into west and east sections, each with specified evacuation locations.

Data collection involved tracking the evacuation routes and speeds of participants using GPS devices, video recordings, and aerial imagery captured by drone. Volunteers were assigned to a section of the beach to observe and follow the largest group of participants in their area. The GPS devices recorded longitude, latitude, elevation, and time at one-second intervals, providing high-resolution data on participant movements. Additionally, video footage and aerial imagery were used to complement the GPS data and provide a visual record of the evacuation process.

The analysis of the evacuation drill revealed several key findings:

1. The average evacuation speeds ranged from 0.88 m/s to 1.02 m/s, which is slower than the typical walking speeds reported in the literature. The slower speeds observed during the drill are hypothesized to be influenced by the high temperatures and humidity on the day of the drill.
2. The routes chosen by participants were not always the shortest in terms of distance or duration but were often the least physically strenuous. For example, some groups opted for routes that avoided stairs, even though this meant a longer travel distance.
3. Larger groups exhibited lower standard deviations in evacuation speed, indicating more consistent movement within these groups. No significant correlation was found between average evacuation speed and group size.
4. The recorded evacuation durations suggest that in the event of a real tsunami, which could arrive in less than 10 minutes, there is a significant risk of loss of life due to the slow evacuation speeds observed during the drill.

JSPS Summer Program 2024 Research Report

1. Name: SeoHong (Brett) Min	(ID No. SP24403)
2. Current affiliation: University of Toronto	
3. Research fields and specialties: Mathematical and Physical Sciences	
4. Host institution: University of Tokyo	
5. Host researcher: Prof. Yuto Ashida	
6. Description of your current research <p>All quantum systems are inherently open because physical systems can never be entirely isolated from their environment. Given the often intractable nature of the many environmental degrees of freedom and their interactions with the system of interest, it is crucial to develop sophisticated approximation schemes to accurately describe the dynamics and steady states of open quantum systems. This is particularly important for quantum systems that are strongly coupled to their environment. My recent work has focused on utilizing a newly developed theoretical tool that transforms a quantum system strongly coupled to its environment into a modified system that is weakly coupled. Through this approach, I demonstrated that by adjusting the locality of the environment, intriguing magnetic orders can emerge in quantum spin systems under strong system-bath coupling. Furthermore, when applied to a one-dimensional electronic system with a topologically non-trivial phase, I was able to identify the primary mechanism behind the expansion of the topological phase.</p>	

7. Research implementation and results under the program

Title of your research plan:

Quantum control of exotic phases using strong light-matter coupling in cavity

Description of the research activities:

At the Ashida Lab, I examined the two-dimensional (2D) cluster state under local decoherence. This state exists on a 2D lattice of quantum bits (qubits) that are entangled in a specific way, forming a 'breadboard' for a type of quantum computing known as measurement-based quantum computing (MBQC). Local measurements on the 2D cluster state provide a flexible and versatile platform for creating and performing various quantum operations, making it a promising quantum computing approach. By 'local decoherence,' we refer to potential errors that could alter individual qubits, such as bit-flip or phase errors. We modeled this decoherence by coupling each qubit to its own environment, represented by a single quantum harmonic oscillator, which corresponds to a realistic scenario of the cluster state subject to environmental noise.

Over the past two months, I raised a fundamental concern regarding the typical approach researchers employ to characterize different phases of a system strongly coupled to its environment. Using the 2D cluster state under local decoherence as a specific model, I studied two different frameworks for characterizing the phases of the 2D cluster state. With the coupling strength between the system and its environment as a tuning parameter, we discovered a discrepancy between the two frameworks as the coupling strength exceeds a critical value.

In the first approach, the 'pure-state' picture, one performs a unitary transformation on the total system, consisting of both the system and the environment, then projects the environment into its low-energy manifold. This results in a system-only Hamiltonian with potentially renormalized parameters. The ground state of this Hamiltonian is pure, and its phase can be characterized by examining the pure state. In the second approach, the environment's degrees of freedom are projected out from the beginning, yielding what is known as a mixed state—a probabilistic ensemble of pure states described by a density matrix. By applying quantum information measures to the density matrix, we demonstrated that there is a critical coupling strength beyond which the 2D cluster state loses its computational power. This suggests that when characterizing different phases of matter, it may be more effective to use quantum information measures on mixed states rather than relying solely on the traditional pure state approach.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

This was one of the most inspiring experiences I have had. The Japanese graduate students are very bright and extremely hardworking. It was an awakening moment for me, and I would like to adopt their work style to improve as a researcher back home.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Cyler W. VOS	(ID No. SP24404)
2. Current affiliation: Memorial University of Newfoundland	
3. Research fields and specialties: Chemistry	
4. Host institution: Kyoto University	
5. Host researcher: Prof. Masaharu NAKAMURA	
<p>6. Description of your current research</p> <p>In Canada my research involves forming polymers that have a higher chance for biodegradability using compounds that can be derived from renewable resources. I form these polymers by using a variety of metal catalysts that contain chromium, zinc, and magnesium metal centers. The idea behind my research is to make polymers using a circular economy, by using renewable materials as the building blocks with a low amount of energy and time required for their formation. Hopefully these efforts assist in finding an alternative for many non-degradable plastics that are used today which are either made from harmful petroleum-derived chemicals or require a large amount of energy in their formation. Currently, the polymers I form use compounds derived from renewable feedstocks such as <i>rac</i>-lactide that can be derived from sugars in crops such as corn, cyclic anhydrides and epoxides which can be formed from sources such as pine needles and sugars in plants, and using carbon dioxide as the hope is to one day have the carbon dioxide that is carbon-captured from the atmosphere to be used for alternative useful materials such as polycarbonates. Throughout my PhD work I have had the opportunity to be trained on a variety of scientific equipment for analysis of my formed materials, as well as had experience doing work in air and under inert gas environments due to the use of air and moisture sensitive metal compounds.</p> <p>My research at Kyoto University looks to build upon my previous knowledge and background in polymer chemistry using metal catalysts but applying it to a relevant polymer film, urushi (lacquer), that has been important in Japanese culture. Urushi has been used for Japanese lacquerware due to its resistance to weathering and ageing, as well as its attractive appearance. Currently urushi is formed by extracting sap from the Japanese lacquer tree (<i>Toxicodendron vernicifluum</i>), going through a variety of processing, and then developing the films from the processed lacquer. However, since natural urushi is currently costly and scarce, a more economically and environmentally sustainable alternative is sought. Therefore, my project envisioned using iron catalysts for cross-coupling reactions to form urushiol (and eventually urushi films) from abundant and renewable components such as aromatic compounds derived from woody biomass and long carbon chains from naturally sourced fatty acids. This project allowed me to take advantage of my catalysis and polymer chemistry background, but also taught me new techniques in organic chemistry I have not used previously in Canada, and combine both my group in Newfoundland's and the Nakamura group's mutual interest in sustainable chemistry.</p>	

7. Research implementation and results under the program

Title of your research plan:

Synthesis of Urushiol Analogues based on Iron Catalyzed Cross Couplings

Description of the research activities:

During my fellowship in the Nakamura group I attempted the formation of urushiol analogues, precursor of urushi films, by first forming the starting material Grignard component that is very air and moisture sensitive and the slightly less sensitive fatty acid chain which form the urushiol analogue when coupled together. The research was a valuable learning experience as my area of chemistry does not involve these Grignard compounds so learning about them and how to handle/form them was a steep learning curve. After many attempts, I was unable to form the compound by myself but with the assistance of a PhD student in the Nakamura group, Wu Beiling, the very sensitive Grignard was formed. I also was able to synthesize 3 fatty acid side chains to be used for the total synthesis of the main components of Asian lacquer by the researchers in the Nakamura group. Due to the short length of the program on top of the many new techniques that I learned with varying learning curves and mistakes during the reactions, I was not able to complete my original goal of forming urushiol analogues using iron catalysts or the urushi films that were to be tested. However, I hope the fatty acid chains I have made will be of use to the group's further research in these urushiol analogue formation reactions, as well as the techniques I have learned will be of much benefit to me in my future career as a chemist.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

During my stay in Japan I had the opportunity to participate in the Homestay program where I lived with a host family for a weekend. The mother of the host family was a calligraphy teacher so I participated in a calligraphy class with local residents taught by her. Furthermore, upon arriving in Obaku I got to attend a classical music concert by professional musicians at the university followed by an evening at a local izakaya. I had the opportunity to see many areas of the Kansai region during weekends in my stay in Japan as well as some other regions such as Miyazaki and Hayama, taking in the local culture, shrines, temples, and activities in each new area I visited. My lab members also took me to Arashiyama which was an unforgettable experience.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Ashley Gedge	(ID No. SP24405)
2. Current affiliation: Ontario Tech University	
3. Research fields and specialties: Biological Sciences	
4. Host institution: Kyushu Institute of Technology	
5. Host researcher: Dr. Toshinari Maeda	
6. Description of your current research: My current research is in the field of Wastewater-based epidemiology (WBE), which is a field that involves analyzing wastewater to monitor the presence of chemicals, discover the overall health of the environment, and detect pathogens in a population. This method can provide valuable insights into public health by detecting substances like drugs, pharmaceuticals, viruses such as SARS-CoV-2, and antibacterial resistance. Moreover, WBE can determine the burden of undiagnosed or asymptomatic infections at the population level. Currently, I am developing a novel protocol utilizing quantitative polymerase chain reaction (qPCR) to detect a group of pathogens referred to as sexually transmitted infections (STIs) in community wastewater. This group of pathogens causes an array of health burdens including reproductive, congenital complications, and even cancer. Additionally, my research utilizes sequencing methods to determine whether antibiotic resistant hotspots exist within Canadian and Japanese communities. Implementing a new type of STI surveillance provides a more comprehensive understanding of STI infection rates in both Canada and Japan and empowers public health to implement effective interventions. Such interventions could play a crucial role in curtailing the spread of infections and bolster the overall health of the communities involved.	

7. Research implementation and results under the program

Title of your research plan:

A Comparative Analysis of Sexually Transmitted Infections and Antibiotic Resistance Genes in Wastewater: A Transcontinental Study of Canadian and Japanese Communities

Description of the research activities:

At the Kyushu Institute of Technology (Kyutech) I had the opportunity to learn the benchwork and analysis for 16s rRNA metagenomics, and extraction protocols for wastewater sludge samples. 32 Canadian samples and 8 Japanese samples will be included in the sequencing sample set. The sequencing run to include such samples will be completed soon and the data will be sent to me for future analysis.

Additionally, an extraction protocol for testing wastewater sludge solids was preformed from two different stages in the sludge treatment process, and from two different locations in Kitakyushu, Japan. These extractions will be taken back to Canada to determine if the STI related genes can be detected in the Kitakyushu community, and to run future investigations regarding antimicrobial resistant genes. During my exchange, I was also given the opportunity to participate in research as a visiting student at the University of Tokyo in the International Wastewater-based Epidemiology lab under the supervision of Dr. Masaaki Kitajima. There, I learned new pathogen concentrating protocols, compared (PCR) quantification methods, and tested Japanese samples for my targets of interest. A total of 8 wastewater samples were sampled and extracted from the Shinkawa area in Sapporo, Hokkaido, utilizing this newly learned protocol. The Japanese samples, along with 32 Canadian samples were tested and compared between digital droplet PCR and pre-amplification/qPCR. Positive detections for 2 targets of interest were seen, and the quantification comparisons displayed a general agreeance between them.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I have really enjoyed my time during this exchange in Japan. I was able to learn a lot about the honorable culture, tried many new foods like baby sardines and beef tongue, and was able to travel throughout Japan discovering the natural beauty. I attended the Tobata Gion festival in July, watched Hanabi fireworks in Kitakyushu, and saw the streets lined with traditional tea houses in Kyoto. I will incorporate the environmental consciousness that is so engrained in all Japanese into my own life in Canada, and their strong work ethics into my future research.

9. Adviser's remarks (if any):

JSPS Summer Program 2024

Research Report

1. Name: Etienne GERMAIN	(ID No. SP24406)
2. Current affiliation: Université du Québec à Rimouski	
3. Research fields and specialties: Biological Sciences	
4. Host institution: The University of Tokyo	
5. Host researcher: Prof. Akinori TAKASUKA	
6. Description of your current research	
<p>In 2023, the commercial fishery for spring-spawning Atlantic herring (<i>Clupea harengus</i>) was closed in the southern Gulf of St. Lawrence, Canada (sGSL). The main reason explaining the stock collapse is the continuous recruitment failure over the past two decades. Even though factors involved in sGSL herring recruitment regulation remain unknown, a positive link between fast growth during early life and recruitment has been reported for numerous small pelagic fish species, including herring. In my master's project, we aim to test the relationship among growth achieved during larval life, and year-class strength.</p> <p>To do so, we are relying on a powerful tool in fisheries science, the otolith, which consist of small concretions found in the inner ear of fish that are characterized by the daily deposition of a growth increment. The number of increments can thus be used to estimate age in days, and the width of each daily increment is proportional to the somatic growth of fish.</p> <p>We are currently using possibly the longest otolith time series in Canada for herring, provided by the governmental department of Fisheries and Oceans Canada, which comprises annual otolith samples from one-year-old juvenile herring from 1979 onward. Individual larval growth trajectories (daily increment widths from core), as well as growth integrated over the first year of life (radius at first annuli) are being derived from otoliths of juveniles either belonging to cohorts characterized by strong or weak recruitment over the full time series. We are testing the hypothesis that individuals associated to strong recruitment events are characterized by faster larval growth and an overall larger size at the age of one year compared to individuals from weakly-recruiting cohorts. A better understanding of the links between growth and survival potential will help further identify the determinants of herring dynamics in the sGSL, and more broadly across Atlantic Canada.</p>	

7. Research implementation and results under the program

Title of your research plan:

Understanding fish growth using otoliths, also known as ear stones

Description of the research activities:

The objective of this project in Japan was to compare the growth dynamics of fish around the world and to compare different methods of analysis that can be used in order to achieve this.

In order to do that, we used the Japanese anchovy (*Engraulis japonicus*) as a model to compare growth patterns among small pelagic Japanese species and compare their early-life survival mechanisms. This choice of species is all the more interesting because anchovy belongs to the same group as herring, both clupeoid species. Anchovy is also a good choice of model because it is subject to important fishing activities in Japan, notably with the *shirasu* industry, and has a strong cultural importance.

During my stay, I worked in close collaboration with Mr. Shota Tanaka, a PhD student in Dr. Akinori Takasuka's laboratory. Thanks to them, I acquired some valuable competences in otolith analyses that will then be applied directly into my project in Canada during the next months. In total, I dissected a number of 304 fish larvae to extract their otoliths during my stay. The otoliths were then mounted, fixed on microscope slides and analyzed under a microscope to count and measure the daily rings. These results are expected to contribute and be included in a publication in the next months and more globally, to provide key information to help improve management strategies for fishery resources in Japan.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I had the pleasure to visit some supermarkets and museum and was able to observe the cultural importance of the *shirasu* industry in Japan, which does not exist in Canada. I feel like this really complemented the research that I have been doing here and made me realise the cultural context of the project as well. In general, I have been really surprised of how seafood products are so well valorized here compared to Canada.

I also participated to a HomeStay program, which was really interesting and so appreciated to really learn a lot on Japanese lifestyle and culture, I really enjoyed it. At last, this program has really been a fantastic experience and I certainly recommend it to young researchers to develop great connections that truly will last in time. Thank you so much.

9. Adviser's remarks (if any):

The project promoted the collaboration between the two laboratories. Mr. Etienne Germain worked on the otolith analysis very well, obtaining results from new samples of anchovy larvae. The data would immediately contribute to the analysis on growth and feeding mechanisms of anchovy larvae. His adviser and me established the collaborative relationship based on the JSPS Summer program in 2006. Now, I'm so happy to see that the present program connected Mr. Germain and my student, Mr. Tanaka, in the next generation. We also appreciate his communication with the lab members.

(SP24407) Research Report

1. Name: Nathaniel J Andrews	(ID No. SP24407)
2. Current affiliation: School of Kinesiology & Health Science, Muscle Health Research Centre, York University, Toronto, ON, Canada	
3. Research fields and specialties: Other	
4. Host institution: Graduate School of Sport and Exercise Sciences, Osaka University of Health and Sport Sciences, Osaka, Japan	
5. Host researcher: Dr. Daiki Watanabe	
6. Description of your current research: <p>Skeletal muscle accounts for roughly 40 % of total body weight. These muscles allow us to interact with our environment through different types of contractions. For example, we can open a door or use stairs with shortening contractions (in which the muscle shortens while developing force) or we can hold on to a railing during our daily subway commute (in which muscle develops force but does not undergo length changes). While our muscles let us interact with our environment, skeletal muscles are subjected to muscle fatigue. Skeletal muscle fatigue can be observed with repeated contractions that result in a decrease in force, velocity or power generation that is reversed with rest. Additionally, free cytosolic calcium $[Ca^{2+}]_i$ plays an important role in skeletal muscle force generation and when $[Ca^{2+}]_i$ levels are decreased, force production is subsequently blunted. Current literature suggests that muscles undergoing shortening contractions experience greater fatigue when compared to isometric contractions in both humans, and isolated rodent models. My research focuses on comparing fatigue between two types of contractions, isometric and shortening contractions. Given the current literature, we suspect that shortening contractions would elicit greater fatigue when compared to isometric contractions due to a decrease in $[Ca^{2+}]_i$ over a series of repeated contractions which would result in blunted force production. Additionally, we also anticipate that shortening contractions require greater energy consumption and we may further explore the potential effects of reactive oxygen species on skeletal muscles undergoing shortening contractions.</p>	

7. Research implementation and results under the program

Title of your research plan: Comparing Fatigue Induced by Repeated Isometric Versus Dynamic Contractions in Skeletal Muscle

Description of the research activities:

My research activities in Japan focused on the core concept of my research in Canada, being comparing contraction types and calcium handling. However, during my stay, my main object was to learn a new method that would allow me to look at a variety of steps along a muscle contraction cascade, which could include any location related to the activation of a muscle to the relaxation phase. The initial portion of the fellowship involved me learning how to make new solutions to ensure they are physiologically relevant. Afterwards, I was then given time to practice the method to obtain consistent data. After ~2.5 weeks of practice, I was able to apply this new method to my research project in Canada to identify and observe if any changes in $[Ca^{2+}]_i$ handling were present when comparing the contraction types. Additionally, I learned how to use other types of analysis that allow me to observe glycogen utilization assay and the potential effects of reactive oxygen species on proteins related to the muscle contraction cascade. At the end of my fellowship, we are currently analyzing our data.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I have enjoyed my stay in Japan, and I have experienced a variety of festivals and tried different types of food throughout the Kansai region. I was based in Osaka which is an incredible, fun and friendly city. I met a variety of locals who were friendly and happy to talk and discuss the differences between Canada and Japan. With my host family, I was able to learn more about the “day to day” life of a Japanese family.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Nicolas PAGE	(ID No. SP24408)
2. Current affiliation: Queen's University	
3. Research fields and specialties: Engineering Sciences	
4. Host institution: University of Tokyo	
5. Host researcher: Prof. Shinsuke MURAKAMI	
6. Description of your current research <p>My research investigates a unique alternative to post-mining land-uses (PMLU's) in Ontario, Canada. In mining environments that result in pit lakes, aquaculture presents as an attractive repurposing alternative that may contribute to the social wellbeing, environmental sustainability and economic diversity for communities. However, pit lake aquaculture requires specific conditions to be viable. My research develops an integrated solution to identify and evaluate pit lakes in Ontario that have the necessary pre-conditions that could support an aquaculture operation.</p> <p>To identify these eligible pit lakes, we utilize geographic information system (GIS) technologies to gather data on mining environments. We conduct extensive research to understand the necessary criteria for pit lake aquaculture. Furthermore, we deploy a survey to gather the community perspectives about the most important community impacts and concerns related to mine aquaculture. By integrating the community perspectives into our rating scheme, we improve the social acceptance of our site selection model. Finally, we input all this data into a multi-criteria decision-model (MCDM) to rank various sites based on their suitability for pit lake aquaculture. Overall, we generate an integrated solution for finding pit lakes that are suitable for repurposing to aquaculture.</p> <p>This research presents a pivotal opportunity to empower stakeholders to make informed decisions, optimize land use, and drive sustainable initiatives in mining rehabilitation. Integrating this methodology into early mine planning can also enhance community acceptance by ensuring that benefits like sustainable land use and community benefits extend beyond a conventional mine's operational lifespan, fostering long-term trust and collaboration between mining companies and local communities.</p>	

7. Research implementation and results under the program

Title of your research plan: Investigating post-mining land uses in the Japanese context.

Description of the research activities:

During the JSPS program, I set out to understand mining environments in a global context to inform my mine repurposing research in Canada. I visited Mt. Buko limestone mine (active) and Ashio copper mine (closed). I also met with Japanese Organization for Mining and Energy Security (JOGMEC) representatives to learn about mine pollution control techniques in Japan. In doing so, I learned the importance of context in post-mining land-uses. Notably, Japanese mining largely involves aggregates and seldom takes place in open pit form. Without pit lake formation, aquaculture is not possible. Furthermore, Japan's comparatively smaller size and larger population means that optimized land uses, mine reclamation and safety is of high importance.

Building on these findings, I learned critical survey development skills by developing a pilot survey to inform the survey portion of my research. Using the survey feedback and results, I will develop a more effective survey that can reach a larger audience.

Finally, under the guidance of other research fellows in my lab, I made significant progress on my GIS skills, such as finding and curating critical databases for pit lakes and applying spatial analysis techniques.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

My experience in Japan was not only formative in my academic journey, but also a cherished life experience. In meeting many other researchers in my lab and through the JSPS program, I learned a lot about being a researcher and made many friends. I also got to visit and experience many great cities such as Kyoto, Nikko, Kamakura, Kobe, Tokyo, Nara, and more.

9. Adviser's remarks (if any):

His stay is just for two months, and he is still a first-year master's course student; I didn't expect huge progress in his research during this period alone. However, he utilized this period quite actively, visiting multiple places, meeting people, and working with my other students. Eventually, I saw he made significant progress in his research and was quite impressed. His stay also greatly benefited my other students.

JSPS Summer Program 2024 Research Report

1. Name: Julian S. STOKES	(ID No. SP24409)
2. Current affiliation: University of Northern British Columbia	
3. Research fields and specialties: Biological Sciences	
4. Host institution: Kobe University	
5. Host researcher: Prof. Roumiana TSENKOVA	
<p>6. Description of your current research</p> <p>Aquaphotomics is a novel, actively developing field of spectroscopy research that aims to understand the interactions between water's molecular structure and light, and to use these interactions to examine other environmental factors and complex water-based systems.</p> <p>Temperature influences water's molecular structure by strengthening or weakening hydrogen bonds, shifting the balance of high-energy free water molecules and more structured, heavily H-bonded molecule clusters. Heating makes water's structure more chaotic, and cooling makes water's structure more orderly; this makes water absorb less and more light, respectively, which we can see using spectroscopy. Temperature's relationship with water's structure is relatively well-understood, and aquaphotomics researchers frequently use temperature as a tool to examine other, less known factors influencing a given sample of water.</p> <p>My research during the JSPS Summer Program investigates the functional properties of a specially designed drinking water (based on deep sea water and mineral water) by examining this water's light absorption spectra at different temperatures and comparing its behaviour to that of pure, distilled water. This approach to investigating drinking water has additional real-world value, as people prefer to drink water at various temperatures; for my experiments, I chose temperatures that represent "chilled" water, room temperature water, human body temperature water, and "heated" water.</p> <p>My research has specific, practical applications in helping to understand the quality of the chosen drinking water formula, as well as foundational value to the broader aquaphotomics field; this novel research provides a template which may be used to compare other types of drinking water.</p>	

7. Research implementation and results under the program

Title of your research plan:

Investigating the Functional Properties of a Deep Sea Water-Based Drinking Water Using Near-Infrared Spectroscopy and Aquaphotomics

Description of the research activities: Throughout my time with the Aquaphotomics Research Field, I received mentorship from various lab members regarding aquaphotomics theory and methodology; I learned to collect data from water samples using specialized spectrophotometer equipment, and how to analyze spectral data using advanced multivariate analysis software. I also had an opportunity to provide feedback on a fellow lab-member's poster for an upcoming research conference.

I completed an experiment designed to examine how the molecular structure of a specially designed drinking water (based on deep sea water and mineral water) interacts with temperature compared to a pure water control. I examined how these waters absorbed key wavelengths of near-infrared light at four different temperatures, using this information to draw conclusions about molecular structure. I found that the designed water had more high-energy, free water molecules at low temperature, suggesting that—relative to pure water—it behaved as though it were a “warmer” water. The opposite was true at high temperature, with the designed water possessing more heavily structured groups of molecules and appearing “cooler” than pure water. At human body temperature, the designed water absorbed light in a pattern similar to the water contained in living human cells. Altogether, these results indicate that drinking the specially-designed water may help support homeostasis, or balance, within the human body. I presented my findings in a seminar to various researchers and interested stakeholders. Finally, I collected data for a follow-up experiment examining temperature, light, and water interactions more dynamically.

8. Please add your comments, including any cultural experience during your stay in Japan (if any): Working with the Aquaphotomics Research Field was an excellent learning experience and first exposure to working culture in Japan. Outside of work, I had many opportunities to travel to significant historical and cultural locations throughout the Kansai region. I also thoroughly enjoyed daily life here in Japan, while I consistently made efforts to learn Japanese language, communicate with the friendly locals, and try an impressive assortment of Japanese cuisine. Finally, my homestay experience was a fantastic introduction to Japanese culture; my host family went to great lengths to ensure that I felt like a part of their household. Along with several sightseeing trips, my hosts planned fun activities that educated me about Japanese traditions.

9. Adviser's remarks (if any): Julian Stokes has been very enthusiastic in learning Aquaphotomics. He succeeded for a very short time to learn a lot about Aquaphotomics and acquired spectral data in a series of experiments. He is a very fast learner and was able to even analyze his spectral data and discover new water properties. His friendliness and communication skills helped him to integrate immediately in the Lab. Thanks to the good time management and plenty of curiosity he was able to visit and enjoy many places in Japan and to meet many people. I hope that he can come again and continue his studies and my Lab and I are really looking forward to work together in the future.

JSPS Summer Program 2024

Research Report

1. Name: Mya S. SCHOUWENBURG	(ID No. SP24410)
2. Current affiliation: University of Northern British Columbia	
3. Research fields and specialties: Mathematical and Physical Sciences	
4. Host institution: Keio University	
5. Host researcher: Prof. Tomoaki OKUDA	
6. Description of your current research <p>My research focuses on air quality in Prince George, British Columbia, with a particular emphasis on PM₁₀ particles and chromium speciation, both of which have significant implications for public health. Prince George, with its industrial activities, faces considerable air pollution challenges, especially from sources like road dust and wildfires. PM₁₀ particles, small enough to penetrate deep into the lungs, are particularly concerning when they contain toxic metals such as chromium.</p> <p>At Northern Analytical Lab Services (NALS) at UNBC, I've been deeply involved in projects addressing these air quality issues. My research began with the development of analytical methods to detect and quantify polycyclic aromatic hydrocarbons (PAHs) and metals from single air samples. This work was essential for understanding the composition of PM₁₀ in the region and assessing its potential health impacts.</p> <p>My current research is focused on chromium speciation in workplace air. Chromium exists in different forms, with chromium(III) [Cr(III)] being less toxic and essential in trace amounts, while chromium(VI) [Cr(VI)] is a known carcinogen. A major challenge in studying chromium is accurately distinguishing between these two forms, as they can interconvert during sampling and analysis. To overcome this, I employ advanced techniques like EPA Method 6800, which minimizes interconversion and ensures more accurate results. This research is crucial for ensuring air quality assessments meet stringent exposure guidelines while also reducing costs and environmental impact.</p> <p>Overall, my work aims to provide more accurate and reliable data on air quality, particularly in areas like Prince George, which can serve as a representative for northern Canadian communities. By enhancing our ability to monitor and analyze pollutants like PM₁₀ and chromium, my research contributes to better health outcomes and environmental protection for the community.</p>	

7. Research implementation and results under the program

Title of your research plan:

The chemical composition of subway dust and its potential biological effects.

Description of the research activities:

As human activities continue to drive environmental changes and time spent in enclosed spaces increases, concerns about the health effects of particulate matter (PM) in subway environments are growing. Building upon Dr. Okuda's research on PM in a Tokyo subway station from 2018 to 2023, this study aims to evaluate the impact of various chemical species found in subway dust on respiratory cells.

The research involves a preliminary phase designed to assess the feasibility of using personal sampling pumps and vanishing filters for collecting total suspended particulate (TSP) from subway environments. These vanishing filters, developed by Dr. Okuda's lab at Keio University, offer significant advantages for cell viability studies. They are water-soluble, biocompatible, and have high tensile strength, which helps overcome the challenge of PM adhering to the filter material during exposure experiments.

Key objectives of this research include:

1. **Cell Culture and Exposure Methods:** Learning and performing cell culture techniques, cell viability assessments, and exposure methods to determine how subway dust affects respiratory cells.
2. **Particulate Collection:** Evaluating whether sufficient particulate matter can be collected from subway stations using sampling pumps operating at 4 L/min and vanishing filters. This involves determining the amount of TSP collected over a 6-hour period and comparing it with ambient air samples.
3. **Comparative Analysis:** Assessing cell viability and the elemental composition of subway dust compared to ambient air samples. This includes identifying any significant differences in metal concentrations and their effects on cell health.

During the study, sampling at 4 L/min for 6 hours (totaling 1.440 m³) at Nagatachō subway station successfully collected 50 µg of TSP. Analysis showed that subway dust had elevated levels of iron and copper compared to ambient air samples. Furthermore, cell viability assays indicated that the subway samples resulted in lower cell viability compared to those exposed to ambient particles.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I had a fantastic time in Japan, and there were so many highlights. The homestay program was amazing; visiting Sankein Garden and feeding koi fish and turtles was a lot of fun. The lab trip was another great experience. We stayed at an elementary school where we played sports, solved puzzles, cooked together, and even went to the beach. The Okuda lab was very welcoming, and I'm really grateful for the chance to join them, even if just for a short time. I also loved trying different foods like okonomiyaki. I got to explore cities like Osaka, Kyoto, Yokohama, and Tokyo, and seeing the deer in Nara was a special treat. The fireworks show was a perfect way to end the trip. I especially enjoyed the JSPS program because it gave me a great opportunity to experience Japanese culture while working on international collaborative research.

JSPS Summer Program 2024
Research Report

1. Name: Larry Dong	(ID No. SP24411)
2. Current affiliation: Dalla Lana School of Public Health, University of Toronto	
3. Research fields and specialties: Mathematical and Physical Sciences Medical, Dental and Pharmaceutical Sciences	
4. Host institution: Information Technology Center, University of Tokyo	
5. Host researcher: Dr. Zihui (Irene) Li	
6. Description of your current research <p>While randomized clinical trials (RCTs) are the gold standard for understanding treatment effects, they are often expensive and infeasible. In statistical terms, the treatment effects of interest are referred to as causal estimands and they can be estimated using observational data to emulate an RCT by accounting for the underlying biases, notably confounding bias. However, this approach assumes that all confounding variables are measured and readily available for analysis which, in practice, may be unrealistic. In many cases, such clinical confounders can instead be found in medical notes which, while rich in information, can be challenging to use in the context of statistical inference due to their unstructured nature.</p> <p>During my Mitacs-JSPS internship at the University of Tokyo, my research focused on exploring the use large language models (LLM) in the context of statistical inference. Given the high-dimensional and unstructured nature of outputs, we used structured generation, an approach that constrains LLM outputs to a specific desired output space. This approach enables iterative sampling from LLM-induced distributions of unmeasured confounders, which we can be estimated empirically using Monte Carlo approximation. An extended version of G-computation can be used to relate observational data to the desired RCT setting which we wish to emulate. We achieve this by substituting the data-generating distribution of the unmeasured confounder with its Monte Carlo estimate, akin to an informative prior under a Bayesian framework.</p> <p>We aim to apply our method to estimate the effect of corticosteroids use in increasing the risk of hospitalization due to opportunistic infections in patients with rheumatoid arthritis (RA). With corticosteroids considered as short-term rescue therapies, their use is often driven by RA severity—a clinically relevant factor that is rarely explicitly recorded in medical records but could be inferred from clinicians' notes.</p>	

7. Research implementation and results under the program

Title of your research plan: Estimating Average Treatment Effects via Unmeasured Confounding Adjustment through Large Language Models

Description of the research activities:

The initial steps in this research project were twofold: 1) to demonstrate the computational feasibility of our proposed method and 2) to obtain a dataset of adequate sample size addressing a real-world problem. Generating individualized outputs from a large language model (LLM) can be computationally intensive, particularly when multiple samples are required to estimate the distribution of the unmeasured variable using a Monte Carlo approach. During this process, I improved my ability to use GPUs and manage cloud computing resources, as their cumulative cost can add up quickly. We also compared various open-source LLMs of different sizes and ones fine-tuned to medical datasets.

A significant amount of time was spent retrieving data that is both clinically relevant and of sufficient sample size to carry out a meaningful analysis. We queried data from MIMIC IV, a publicly available electronic health record, using SQL via BigQuery. On the simulation side, we confirmed that the omission of the unmeasured confounder in estimating the causal effect can lead to biased estimates of the average treatment effect. Moreover, we decided to use a semi-synthetic experimental setting where sampled MIMIC medical notes within simulation iterations via bootstrap. Finally, we would love to continue this collaboration by extending our approach to longitudinal settings and precision medicine, both of which are already central to my PhD research at the University of Toronto.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

The cultural experience was vital component of my stay in Japan. I attended many cultural festivals, and I visited many parks and gardens around Tokyo. I traveled through different parts of Japan, notably Hokkaido, Tochigi and Mount Fuji. Lastly, I really appreciated my homestay. I would like to thank again my homestay family for welcoming me and I hope that we keep touch in the years to come.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Carina YAN	(ID No. SP24412)
2. Current affiliation: University of Toronto	
3. Research fields and specialties: Biological Sciences	
4. Host institution: Tokyo University of Agriculture and Technology	
5. Host researcher: Prof. Kazunori IKEBUKURO	
<p>6. Description of your current research</p> <p>Diagnostics are used in a vast variety of applications, including biomedical research, disease diagnosis, therapeutic treatment management, and food and environmental safety monitoring. With substantial impacts on patient care and public health policy, reliable diagnostic tools are vital to strengthening the global healthcare system. Unfortunately, there is a critical shortage of diagnostic infrastructure in many parts of the world. Due to financial and skilled labour barriers to conventional diagnostic tools, low-resource areas, including low- and middle-income countries and even northern regions of Canada, experience long wait times from sample to result and limited diagnostic access in general. Evidently, there is an unmet demand for point-of-care platforms that are reliable, portable, and easy-to-use.</p> <p>At the University of Toronto, my graduate research focuses on developing portable diagnostic tools using the principles of synthetic biology. Synthetic biology is a growing scientific discipline that can be divided into two subfields, first, the use of unnatural molecules to mimic the functions of natural biology, and second, the use of biological parts to assemble systems with unnatural functions. Synthetic biology approaches can support the rational design and validation of novel biosensors to, ultimately, shorten design-to-production cycles for rapid solutions to emerging demands. Specially, cell-free technology can enable protein production in hours without the use of living cells as opposed to the conventional cell-based methods that require multi-day procedures. From a research and development perspective, cell-free protein synthesis (CFPS) can enable rapid prototyping of proteins that can serve as molecular sensors. My current research aims to develop engineered protein-based biosensors for the detection of DNA and antigens to, ultimately, provide low-burden, isothermal diagnostics for point-of-need use.</p>	

7. Research implementation and results under the program

Title of your research plan: DNA Aptamer-Based Sensors for Protein Detection

While protein-based recognition elements can provide clinically relevant selectivity and sensitivity in diagnostics, their stability and function may be easily altered by external factors, such as temperature and storage duration. In contrast, single-stranded oligonucleotides, termed aptamers, are stable and low-cost recognition elements that demonstrate high affinity and specificity for target ligands. Furthermore, there is an established *in vitro* evolution method, called systematic evolution of ligands by exponential enrichment (SELEX), that can be implemented to discover DNA-based aptamers that specifically bind to any ligand of interest.

Description of the research activities:

Researchers at my host laboratory are highly experienced with SELEX and have successfully applied the method to develop aptamer-based sensors for a variety of biomolecules, including small molecules, viruses, and antigens. The process of SELEX can identify high affinity binders against any biomolecular target of interest through successive rounds of aptamer selection. During my fellowship, I had the opportunity to observe the experimental process of SELEX and conduct the method first-hand. Working with experienced students, I was able to implement SELEX to identify DNA aptamers targeting the major capsid protein L1 of human papilloma virus type 16 (HPV16). HPV16 infection is the cause of most cervical cancer cases, therefore the development of reliable sensors for the HPV16 L1 protein may be critical to improving patient care.

Over the course of my fellowship, I was able to conduct two rounds of SELEX. Overall, the results indicated that HPV16 L1 specific aptamers were successfully selected from the first round of SELEX. While the fellowship period is not long enough to complete the entire evolution method, we hope to continue this collaboration moving forward to develop novel molecular diagnostic tools.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

During my research fellowship, I travelled to multiple prefectures in Japan, including Nagano, Kobe, Osaka, Kyoto, Kanagawa, Yamanashi, and Okinawa. During my travels, I had the opportunity to try regional Japanese foods and visit local temples and shrines.

9. Adviser's remarks (if any):

JSPS Summer Program 2024

Research Report

1. Name: Jeremy R. Karam	(ID No. SP24413)
2. Current affiliation: McMaster University	
3. Research fields and specialties: Mathematical and Physical Sciences	
4. Host institution: The University of Tokyo	
5. Host researcher: Dr. Michiko Fujii	
6. Description of your current research <p>It is well known that stars are formed in clustered environments inside giant clouds of molecular gas throughout galaxies across the visible universe. Simulations show that as star clusters form inside giant molecular clouds, they grow by merging with one another and accreting the background gas present throughout the clouds which encourages the formation of new stars. However, our understanding of the dynamical effects of mergers and gas accretion on the clusters involved is not well understood because it is difficult for simulations to resolve the individual stars and gas that make up each cluster. These dynamical imprints are important as they can influence our interpretation of the observations of star clusters.</p> <p>Throughout my research, I model star cluster mergers and gas accretion inside giant molecular clouds while resolving individual stars and gas and analyze the dynamics of the resultant clusters. I have compared my results to observations and determined that anisotropic dynamics present in star cluster observations can be explained by the hierarchical nature of star cluster formation. Mergers can cause rotation and non-spherical expansion of stars around the centres of clusters. As well, accurate modelling of the background gas present in the giant molecular cloud is crucial as such gas can determine whether or not mergers take place at all. As clusters merge with one another, the gas present in each cluster is condensed and, in turn, new star formation is promoted. However, depending on the distribution of the background gas, and the geometry of the merger, up to 10% of the stellar mass of the cluster can be dynamically removed after the merger due to increases in kinetic energy. All of this contributes to the complex change in cluster membership throughout a clusters assembly inside molecular clouds.</p> <p>My current goal is to include more physics in my simulations to understand the merger process fully. I have worked in Japan to include feedback from stars and formation of new stars in my simulations. Feedback is responsible for changing the distribution of background gas present which can alter the merger. The formation of new stars can help us better understand the age gradients we observe in young clusters.</p>	

7. Research implementation and results under the program

Title of your research plan: Modelling the Evolution of Embedded Star Clusters

Description of the research activities:

Throughout my stay in Japan, I used the numerical simulation code ASURA-BRIDGE developed by Dr. Fujii and collaborators at Kobe University to analyze a star cluster merger with the inclusion of stellar feedback and star formation. I have begun running a merger simulation and have begun analysis of the simulation output. Other simulations of different mergers are currently running and will be analyzed when I return back to my home institution.

As well, I travelled to other universities across Japan to give seminars on my research project allowing me to get more accustomed with astronomy researchers and research practices in Japan. I took part in many meetings with Dr. Fujii's research group, updated the group on my week's work, and answered any questions the group would have. I also took part in group meetings with another group at Kobe University in which I listened to many talks by other researchers and gained a full appreciation for the science being conducted in Japan.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I made sure to take many trips throughout my short time in Japan. Each trip was full of new cultural experiences including shrines, new foods, and historical museums. As well, the most important cultural experience for me was the work culture in my research group. I have come to love the way academic research is conducted in Japan and the way members of a given research group communicate with each other and spend time together. I very much hope to come back to Japan and do research in the near future.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Hoi Leung Pun	(ID No. SP24414)
2. Current affiliation: University of Toronto	
3. Research fields and specialties: Mathematical and Physical Sciences	
4. Host institution: University of Tokyo	
5. Host researcher: Dr. Kato Aitaro	
6. Description of your current research <p>Large earthquakes are sometimes preceded by foreshocks, which are regarded as the precursory activity of the fault that can potentially inform us of the forthcoming mainshock. However, the physical mechanism behind the seismic triggering process remains elusive. Two end-member triggering mechanisms have been hypothesized, namely the cascade triggering and the aseismic slip triggering model. Earthquakes are the process of stress released from the fault after accumulation. The cascade model suggests that foreshocks are triggered through earthquake-to-earthquake interaction via stress transfer, i.e., seismic slip from a mother event loaded stress on surrounding areas causing daughter events and eventually the mainshock. On the other hand, the aseismic slip model suggests foreshocks are byproducts of the aseismic slip nucleation process, i.e., aseismic slip (slip on the fault that does not generate seismic wave) nucleates the mainshock through loading stress, and during the progress, stress loaded on localized fault patch and triggered foreshocks. The major difference between them is the aseismic and seismic contribution to stress accumulation. However, the triggering role of the cascade model and the aseismic slip model is controversial with studies showing contrasting results on the same event based on different evidence, and it is also possible a combination of both.</p> <p>My research focuses on the nucleation process of the foreshock sequence before the 2016 Mw 6.9 Fukushima earthquake to determine the possible underlying triggering mechanisms of the mainshock. By obtaining a completed earthquake catalog, I aim to characterize the spatiotemporal evolution of seismicity pattern and calculate the static Coulomb failure stress changes (ΔCFS) induced by the foreshock sequence to assess the significance of cascade triggering and aseismic slip. The studying of the properties of foreshock sequence and the indicators of triggering mechanism can improve the earthquake early warning system and mitigate seismic hazards.</p>	

7. Research implementation and results under the program

Title of your research plan:

The implications of foreshock sequences on mainshock triggering of the 2016 Mw 6.9 Fukushima Earthquake

Description of the research activities:

Under the supervision of Dr. Kato, I focused on three aspects: (1) utilizing the seafloor observation network for earthquakes and tsunamis along the Japan Trench (S-net), (2) earthquake relocation, and (3) analyzing earthquakes spatiotemporal pattern.

My targeted sequence is located offshore of Fukushima prefecture. The Hi-net stations are located in the inland area which is far away (> 50 km) from the source region and subjected to higher uncertainty. The S-net data is closer to the source (< 20 km) which can provide a more accurate and precise data record. Since the arrival time of P-wave and S-wave of S-net stations are not provided by the Japan Meteorological Agency (JMA), I use an automatic, deep-neural-network-based phase-picking tool, PhaseNet, to pick the arrival time on S-net data. Then, I used the combination of the Hi-net and S-net arrival time data and computer program, hypoinverse, to relocate earthquakes to obtain a more precise location and depth of earthquakes.

After relocating earthquakes, I use the S-wave data (1s before and 3s after S-wave arrival time) to perform Match & Locate (M&L) to recover hidden events due to waveform overlapping or buried by seismicity. M&L recovers events based on waveform correlation when the correlation threshold is equal to or larger than ten times the Median Absolute Deviation. The original catalog consists of 7 events between 2016/11/22 and the mainshock. After running M&L, the preliminary results show a total of 43 events within the same period, which is a 6-fold increase in earthquakes. However, we did not observe any repeating earthquakes as the correlation coefficient of new events is less than 0.95.

After obtaining a more completed catalog, I perform a spatiotemporal analysis of earthquake patterns. I analyze the location of earthquakes at different time stages, the degree of overlapping of earthquake rupture radius, and observe any migration pattern towards the mainshock hypocenter. Based on the preliminary results, the foreshock-mainshock sequence favors the cascade model but needs to be verified by the Coulomb Failure Stress transfer, which is the next step of my project.

I also visited the JMA office. The presenters introduce the career pathway and operation room, demonstrating how JMA is responsible for earthquake and volcano warnings (such as issuing the recent Nankai Trough earthquake warning), and weather forecasting.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

Japan has always been my favorite country. The two and half month's fellowship period allows me to participate in different festivals and visit interesting geological sites. I am very impressed with the number of details inside the museum. For example, the Fossa Manga Museum is in Itoigawa, which is a small city, but the museum consists of very detailed jadeite and geological information.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Maria Fahim	(ID No. SP24415)
2. Current affiliation: University of Toronto	
3. Research fields and specialties: Biological Sciences	
4. Host institution: National Cerebral and Cardiovascular Center	
5. Host researcher: Dr. Kazu Kikuchi	
6. Description of your current research <p>My current research in Toronto focuses on deciphering the earliest cell fate decisions involved in heart development, using the zebrafish as a model organism. Heart development is a tightly regulated process orchestrated by well-characterized transcription factors and signaling pathways. Major effort has been dedicated to characterizing the development of cardiac progenitor cells (CPCs). During gastrulation and mesoderm establishment, these cells are driven by unique transcriptional programs and signaling pathways to undergo a series of differentiation and migration events. While the regulatory networks governing later heart development are well understood, how CPC fate is initially established and later diversified is poorly characterized. There is evidence to suggest that cardiac fate specification in progenitor populations occurs earlier than previously thought, however identifying and describing these populations has been a challenge due to the lack of markers for progenitors early in development. As such, I will investigate the earliest signs of cell fate specification in CPC-enriched populations using the zebrafish model.</p>	
7. Research implementation and results under the program <p><u>Title of your research plan:</u> Comparative analysis of myocardial gene regulatory networks during development and regeneration</p> <p><u>Description of the research activities:</u> Heart disease bears a heavy burden on the health care system. Curative approaches are extremely limited and surgery is often the best course of treatment. Heart disease encompasses a variety of disorders, but among these, myocardial infarction (MI), or a heart attack, presents an especially difficult case for treatment. The extremely limited ability of the mammalian heart to regenerate contributes to the high mortality and morbidity associated with MI. Unlike mammals, other animals, such as the zebrafish, can regenerate their heart following damage. As such, dissecting the mechanisms involved in cardiac regeneration in the zebrafish can contribute to cell-based therapies for heart failure in human. I would like to combine our current understanding of the regulatory networks involved in development, which is the focus of my thesis project, to investigate the networks involved in regeneration.</p> <p>While there are various approaches that may be used to investigate cardiac regeneration, studying regeneration through the lens of cardiac development is of particular interest to me. Despite the simpler structure of the zebrafish heart, there is a high degree of conservation among vertebrates during development, such as at the level of gene regulation, progenitor migration and morphogenic mechanisms. It has recently been shown in the</p>	

zebrafish that unlike heart development, stem cells do not contribute to the regeneration of heart muscle, but rather pre-existing cardiomyocytes that undergo de-differentiation and subsequent proliferation to form mature cardiomyocytes. One of the most recent findings that contributed to this understanding is attributed to the Kikuchi Lab, who revealed the role of Krüppel-like factor 1 (Klf1) in these regenerative cardiomyocytes (Ogawa et al. 2021).

My research here focused mostly on exploring the transcriptional profile of cells isolated from zebrafish hearts, either in a wild-type or Klf1 over-expression (Klf1-OE) background. This transcription factor was known to play a role in red blood cell development prior to this finding, but is not involved in cardiac development, as has been established in literature and have also observed in my own data. To explore the zebrafish regenerative network, I relied on Cell Oracle, a relatively new tool which allows users to explore network connections in their single-cell data (Kamimoto et al. 2023). More precisely, Cell Oracle uses single-cell sequencing data along with transcription factor binding information, derived from either experimental or already available chromatin accessibility data, to identify connections and infer directionality between them, ultimately resulting in the construction of a gene regulatory network (GRN).

In the Klf1-OE context, GRN analysis revealed a large expansion of cells that was likely a collection of several different immune cells. Additionally, the cardiomyocyte cluster was much smaller in comparison to control and could be divided into “normal” cardiomyocytes and “de-differentiating” cardiomyocytes, as evidenced by the expression of a handful of dedifferentiation markers, including *klf1*. There were also many transcription factors, and even families of transcription factors (Sox, Klf), that played a greater role in the GRNs identified in Klf1-OE. Finally, there was an intriguing increase in ribosomal-related genes in the Klf1-OE dataset. Although this could be an indication of lower quality sample, this was unlikely because the percentage of mitochondrial genes was comparable to control and was within normal ranges. As such, this could instead be a potential sign of increased cellular translational activity in the regenerative context.

Overall, the zebrafish model of heart regeneration is an invaluable tool for deciphering the mechanisms involved in heart regeneration following injury. Not only is this one of the best models, if not the best model for near-complete regeneration of the heart, but zebrafish are extremely amenable to genetic manipulation and various imaging technologies. This model will undoubtedly strengthen our efforts for regenerative therapy in humans.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I had a wonderful stay in Japan. Osaka in particular is lovely, and I learned a lot from the other scientists and graduate students in the lab. I also joined a Crossfit gym in Osaka, which had amazing coaches and community. I made several friends there, which was a pleasant bonus on top of staying active and healthy!

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Dayag Sheykhkarimli	(ID No. SP24416)
2. Current affiliation: Osaka University, PRIME	
3. Research fields and specialties: Engineering Sciences Biological Sciences	
4. Host institution: Osaka University, PRIME	
5. Host researcher: Hideto Mori	
6. Description of your current research Understanding the brain's synaptic connectivity is one of the most formidable challenges in neuroscience, due to the vast and plastic nature of the synaptic network, which is constantly reshaped by development and experience. Traditional methods, which rely on destructive imaging, offer only static snapshots, erasing the dynamic history they seek to capture. Our research proposes a transformative approach that encodes the developmental trajectory and plasticity of synaptic connections directly into DNA, creating a living record of neuronal interactions. We achieve this through a "DNA tape" system, where CRISPR base editors induce mutations in synthetic DNA barcodes embedded in neurons. These mutations act as precise timestamps, while a monosynaptic tracing virus serves as a courier, transferring these mutated barcodes between synaptically connected neurons, effectively recording snapshots of the brain's connectivity network over time. Additionally, by harnessing trans-splicing ribozymes, we can covalently fuse barcodes from connected neurons into a single sequenceable unit, bypassing the need for single-cell isolation and enabling high-throughput mapping of synaptic connectivity on an unprecedented scale. This innovative approach will be validated using primary neuronal cultures from mice, and further developed with in vivo applications to create optimized mouse models for neural tracing. Leveraging the cutting-edge expertise and state-of-the-art facilities at Osaka University, we aim to generate these mouse lines, which will serve as a pivotal resource for the neuroscience community. Ultimately, this project will establish a foundation for producing comprehensive, open-access brain connectivity maps, significantly advancing the field and providing invaluable tools for future research.	

7. Research implementation and results under the program

Title of your research plan:

Towards recording the developmental plasticity of a mammalian brain in DNA tapes

Description of the research activities:

To lay the groundwork for this ambitious project I set out to establish two foundational components: 1) *in vitro* neuronal culture system for rapidly testing synaptic connectivity reporter constructs and 2) generation of optimized mouse lines for future *in vivo* plasticity recording. Towards the first goal, I established primary neuronal cell cultures isolated from P0-P2 pups, benchmarked electroporation and lipofection efficiencies of various constructs and finally, established patterned 2D culture system for rapid quantification of trans-synaptic flux efficiency (Fig. 1A). I am currently testing AAV1/AAV5 based pipeline for quantitatively evaluating trans-synaptic transmission efficiency in primary hippocampal neuron co-cultures. Towards the second goal, under the supervision of Dr. Yongang Lu, I performed *in-vitro* fertilization (IVF), pronuclear injections and embryo transplantation to generate transgenic mice. I achieved 90% IVF and 40% successful injection rates, paving the way for rapid generation of various trans-synaptic recorder mice in the future (Fig. 1B). Towards this I designed both AAV1 and glycoprotein deficient rabies virus based transgenic constructs for introduction into mice.

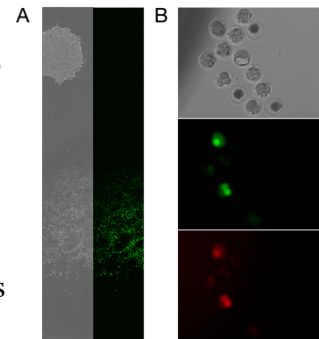


Figure 1. A) Spatially segregated source (*StayGold*) and target cells (no fluorescence). B) Transgene integration rates of *StayGold* and *mCherry* via pronuclear injections into 13 embryos.

Although I will bring the tools and expertise with me to continue the work at the University of British Columbia, given the great success and fast pace of animal experiments, as well as cutting-edge expertise of scientists, I will apply for the subsequent JSPS fellowships and am looking forward to come back again to continue my work towards recording the developmental plasticity of a mammalian brain in DNA tapes for the first time.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I am grateful to everyone making my stay in Japan deeply meaningful. I attended conferences in Kyoto and Fukuoka, met with collaborators in Kumamoto, stayed with Japanese host – Motomura family, experienced the onsen, enjoyed the peaceful early mornings and late nights of the Suita campus, made friends and learned a lot from my talented coworkers. I am looking forward to coming back soon both to enjoy the beautiful Japan and its elegant science.

9. Adviser's remarks (if any):

Despite spending a relatively short time of 2 months, Dr. Sheykhkarimli has quickly integrated into our team and successfully learned new techniques to push his exciting project forward. With the generous support of JSPS and MITACS, we are looking forward to more such productive collaborations in the near future.

JSPS Summer Program 2024 Research Report

1. Name: You Zhi HU	(ID No. SP24418)
2. Current affiliation: University of Toronto	
3. Research fields and specialties: Engineering Sciences	
4. Host institution: Tokyo Institute of Technology	
5. Host researcher: Prof. Hideki KOIKE	
<p>6. Description of your current research</p> <p>Research Overview:</p> <p>Individuals with social anxiety avoid public speaking due to a fear of negative evaluation. However, they are often misinterpreted as just being shy or introverted, creating difficulties for them. This misinterpretation creates additional challenges, particularly in Japan, where Taijin Kyofusho (TKS) – a culturally specific form of social anxiety – is prevalent. TKS sufferers fear being observed and avoid various social situations. Despite its prevalence, access to effective treatment remains limited, suggesting the need for innovative solutions.</p> <p>This research aims to develop and evaluate Virtual Reality (VR) applications to address the pervasive issues of social anxiety and TKS. The study has two primary objectives:</p> <ol style="list-style-type: none">1. Cultural Exploration and Usability Assessment: This component explores cultural differences in social anxiety, focusing on the usability and effectiveness of a VR forest environment designed to include psychotherapy exercises. The study compares data collected from a Canadian sample with new data sample from participants at the Tokyo Institute of Technology in Japan.2. Collaboration for Cultural Adaptation: Working with Japanese researchers, the study seeks to create a culturally diverse VR Exposure Therapy prototype, tailored to meet the specific needs of TKS sufferers in Japan. <p>Methodology:</p> <p>The research involves a virtual forest where users can explore, and a virtual therapist provides audio-guided cognitive-behavioral therapy, mindfulness, and meditation exercises at various checkpoints. These exercises aim to reduce anxiety and enhance coping strategies. Over the past two months, we have been assessing the social anxiety levels and perceived usability of this virtual forest among the Japanese sample in a longitudinal setting (a total of 4 sessions with 1 session per week for every participant), collecting valuable feedback to refine the environment for the second phase of the project.</p> <p>Anticipated Outcomes:</p> <p>The methods developed in this research are expected to help users confront their feared social situations and re-evaluate distorted interpretations of these scenarios. By bridging the accessibility and effectiveness gaps in social anxiety intervention, this research aspires to enhance mental well-being on a global scale.</p>	

7. Research implementation and results under the program

Title of your research plan:

Developing and Evaluating a Virtual Forest to Reduce Social Anxiety

Description of the research activities:

Over the past two months, I collected data from a total of 26 participants (14 women, 12 men), aged 18 to 38, with most in their 20s as university students. Eight participants completed one session, one completed two sessions, and 17 completed all four sessions (approximately one session per week). We collected psychological measures, including social anxiety, state anxiety, and restoration, both before and after the intervention. Additionally, participants rated the usability of the virtual forest and provided feedback on its design and their subjective experiences.

Initial data visualization showed a decrease in social anxiety levels over the four sessions across the three conditions (condition a: forest only, condition non-vr: therapy only, and condition b: forest combined with therapy). Figure 1 illustrates this downward trend, suggesting that participants' social anxiety levels decreased over time with the use of our virtual forest application. Further statistical analysis, such as mixed ANOVA, will be conducted to evaluate differences among the conditions, which will help us understand which intervention is more effective.

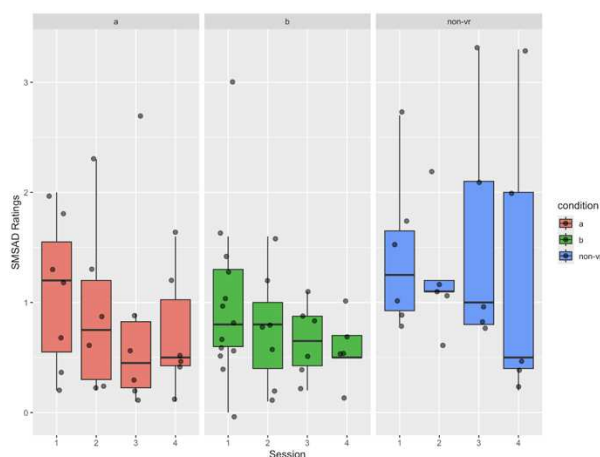


Figure 1. Social Anxiety Level Over 4 Sessions across Three Conditions

Participants' feedback highlighted their overall experience and suggestions for improvement. Many found the application calming, with one noting, "I really liked the calming forest environment. The sky was very nice and blue, and the animals were fun to look at. I also very much enjoyed the sounds of the wind through the trees and running water. It was very relaxing at the beginning." Another participant suggested adding visual indicators to assist with breathing exercises displayed on the user interface. Several participants also resonated strongly with the love and kindness meditation, learning more about self-compassion and its role in reducing social anxiety. I also found participants were able to think deeper and do more research on the therapy topics in their spare time after the intervention. Sentiment analysis will be applied later to critically assess participants' comments and gauge their opinions on effectiveness and design toward the virtual forest application.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

My three-month stay in Japan has been one of the most wonderful and memorable experiences of my life. I have received much support from my host supervisor's lab, allowing me to recruit more participants than anticipated. The gift card granting process also went smoothly, facilitating additional recruitment. I had the opportunity to learn about the research of many students in the lab, which deepened my understanding of research work in Japan. Additionally, I made meaningful friendships and gained a richer understanding of Japanese culture. Everyone I met was very kind and eager to share various aspects of Japan with me.

9. Adviser's remarks (if any):

JSPS Summer Program 2024

Research Report

1. Name: Andreas BRÄNNSTRÖM	(ID No. SP24501)
2. Current affiliation: Umeå University, Sweden, Department of computing Science	
3. Research fields and specialties: Engineering Sciences	
4. Host institution: Wakayama University	
5. Host researcher: Prof. Chiaki SAKAMA	
6. Description of your current research <p>My research, conducted within the Responsible Artificial Intelligence (RAI) group at Umeå University, Sweden, focuses on developing methods that allow Artificial Intelligence (AI) systems to model and understand human reasoning and behavior. By using formal (logic-based) approaches, I formalize principles for how mental states change over time and how AI systems can anticipate and respond to these changes for reaching goals. The aim is to equip AI systems with the ability to engage in personalized interactions while maintaining control over its actions to prevent negative outcomes.</p> <p>Deception is an inherent behavior in human interactions, and AI systems that lack a formal understanding of deception are not well-equipped to manage interactions where deception may be present. Whether it involves humans with malicious intents or systems which are deliberately (or unintentionally) designed with the capabilities of deceiving humans, there is a critical need for formal methods to recognize and reason about deceptive behaviors.</p> <p>Given the importance of understanding deception in strategic interactions, my research has naturally led me to explore these aspects of human reasoning. At Wakayama University, Japan, we have continued the work on mental state dynamics, with a particular focus on deception and manipulation strategies. By drawing upon computational methods such as formal argumentation, formal dialogue games, and previous research on formal accounts of deception, we model various forms of honesty and dishonesty in interpersonal dialogues.</p>	

7. Research implementation and results under the program

Title of your research plan:

A Formal Understanding of Deception in Interpersonal Dialogues

My main visit was at Wakayama University, where I worked in the lab of Professor Chiaki Sakama. This collaboration was particularly fruitful as it intersected Professor Sakama's prior work on formal accounts of deception with my own research on strategic interaction and formal dialogues. Together, we focused on formalizing deception and manipulation dialogues. We established axioms for belief change and manipulation, and formalized methods for recognizing and reasoning about manipulative behavior within formal dialogues. One of our achievements was designing an algorithm to identify deception and manipulation strategies in dialogue representations. By expressing deception in a formal language, we support the development of transparent AI solutions dealing with deception, where the system's reasoning process can be traced, and any recognized deception can be explained.

In addition to my work at Wakayama University, I had a brief but significant visit to the National Institute of Informatics (NII) in Tokyo, hosted by Professor Katsumi Inoue. During this four-day visit, I focused on exploring the ethical dimensions of research on Deception in AI. During the stay, I conducted a workshop on the topic of Trustworthy AI, which was open for in-person attendance at NII and online participation from other universities and institutions. The first part of the workshop introduced the participants to the European Commission's Ethics Guidelines for Trustworthy AI, while the second part facilitated group discussions on the topic of Deception in AI. The preliminary results indicate research directions and design principles for interactive systems dealing with deception.

My time in Japan was marked by productive collaborations and meaningful discussions that have led to the development of two forthcoming research papers. The first, focused on the formal framework for recognizing and reasoning about manipulation dialogues, developed at Wakayama University, will be submitted to the International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS) in October this year. The second paper, exploring the ethical aspects and design principles in research and development of deception-aware systems, building on data collected at NII, is also in development.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

My two-month research visit to Japan has been an enriching experience, both professionally and culturally. One aspect that stood out to me was the close support between members of the research group and their professor, which I observed in both labs I visited. This level of collaboration and mutual assistance is something I believe we can learn from and apply in Sweden. I am particularly motivated to continue the collaborations initiated during this visit and to further develop the connections I have made, both in research and in deepening my understanding of the Japanese language and culture.

JSPS Summer Program 2024 Research Report

1. Name: Natalia KUK	(ID No. SP24502)
2. Current affiliation: Stockholm University	
3. Research fields and specialties: Mathematical and Physical Sciences, Engineering Sciences	
4. Host institution: University of Tokyo	
5. Host researcher: Professor Shuichi Hasegawa	
<div>6. Description of your current research</div> <p>My current research is focused on developing trapped ions platform for quantum computation using ions in highly excited Rydberg states. The quantum computation field works on a progress in developing quantum simulators and quantum processors. The ultimate goal is to achieve quantum supremacy with quantum computers to solve particular problems. To achieve this goal, an increase in number of usable qubits is required. Scaling that number is the main technological challenge. High number of qubits is required to increase computational power and to afford for multiple ancilla qubits for quantum error correction implementation.</p> <p>Trapped ions are very promising due to their properties such as high level of control, near 100% state readout efficiency and long coherence times. Multiple gates schemes were developed for that platform, reaching very high fidelities for single and two-qubit operations. Usually, the gates operations are performed using motional modes, however they have some limitations like the achievable gate speeds which are limited by the trapping parameters and resulting motional modes frequencies.</p> <p>In my research, I work on development of fast gates using trapped Rydberg ions. Short gates times can be achieved using strong interactions of ions in Rydberg states. My PhD thesis project is focused on building an experimental apparatus for trapped Rydberg ions in cryogenic environment. The plan is to build a linear Paul trap and the first in the world chip trap for working with highly excited states. The cryogenic environment is required to decrease heating rates (rate of increase of phonons due to environment) in case of the chip trap and to reduce black-body radiation that can induce double ionization from Rydberg states and shorten the lifetime of a highly excited state.</p>	
<div>7. Research implementation and results under the program</div> <p>Title of your research plan: Experimental design of trapped ions systems for quantum computation</p>	

Description of the research activities:

The scope of activities included research visits to laboratories Osaka University, Center for Quantum Information and Quantum Biology, Kyoto University, Nuclear Reasearch Center in Tokai and RIKEN to learn about Japanese effort in quantum computation and trapped ions field, to conduct scientific discussions and exchange ideas. It served as an opportunity to introduce and reflect on the Japanese Moonshot Program and Swedish WACQT initiative that represent both countries' national efforts at building quantum computers. The project in Hasegawa Lab at the University of Tokyo included development of trapped ions setups, help with the assembly and advisory and didactical role towards younger fellows. During that process, the know-how on experiments with trapped ions and their components was passed to the group members via direct discussions and given presentations. Weekly journal clubs enabled widening of scientific perspective. Another task was concentrated on surface ion trap simulation for operation with two-species, Sr^+ and Ca^+ . The aim was to consider different electrode configurations that would allow for rotation of ions' motional modes axes. For efficient cooling, vectors of the motion should have a non-zero projection onto the plane parallel to trap's surface. The two simulated solutions consisted of traps with asymmetrical RF electrodes or splitting central DC electrode into two and applying asymmetrical DC voltages. In parallel, the group shared its experience with 3D microtrap design and processing, including a visit in a laser lithography company premises near Tokyo.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

The stay created multiple opportunities for experiencing the culture including the activities during the orientation week, Tanabata celebration held by the International Office of UTokyo Graduate School of Engineering, The Kagurazaka Matsuri Festival in Tokyo, multiple visits to museums and cultural heritage sites as well as enjoying Japanese food and popular leisure activities. The immersion into local work culture, taking part in business travels and getting to know Japanese academia was an experience on its own.

9. Adviser's remarks (if any):

The stay of Ms. Natalia KUK inspired our lab members very much. Not only her experience and knowledge of ion traps but also cultural discussions enlighten them including our international students.

Research Report (SP24504)

1. Name: Atefeh Khorsand Kheirabad	(ID No. SP 24504)
2. Current affiliation: KTH Royal Institute of Technology	
3. Research fields and specialties: Chemistry and Engineering Sciences	
4. Host institution: Tokyo University	
5. Host researcher: Prof. Junichiro Shiomi	
6. Description of your current research: <p>Scalable production of bio-based substrates for printed electronics is a challenge ascribing to the high-energy consumption during nanocellulose extraction from wood. To solve the problem, the focus of this project is on the production of scalable transparent flexible substrates directly from wood with some surface treatments to obtain specific properties suitable for printed electronics, such as high moisture/water stability, high thermal expansion stability, and stable thermal conductivity, which the last one is a vital factor for the proper performance, longevity of electronic devices by ensuring effective heat dissipation, temperature regulation, and the safe operation of electronic devices. However, the measurement of thermal conductivity is a challenge due to the shape and complexity of materials, environmental conditions, and so on, but more importantly the lack of access to special equipment and knowledgeable research group focused only on thermal properties of materials. The outcome of thermal conductivity measurements using various methods can reveal a window of opportunity to understand thermal properties of transparent wood substrates more profoundly and resolve significant issues regarding design and safe performance of these materials for printed electronics.</p>	

7. Research implementation and results under the program

Title of your research plan:

Flexible Transparent Wood Substrates for Printed Electronics

Description of the research activities:

The research group of Professor Junichiro Shiomi at the university of Tokyo is mainly focused on studying the thermal management of nanomaterials and measure the thermal conductivity using their own designed devices in various materials including soft matter, thin films, filaments, and porous materials. Their experiences together with all specific laboratory equipment assisted to this project to develop transparent wood-based substrates for applications of printed electronics.

My stay in Japan provided an opportunity to specifically study the thermal properties of transparent wood substrates and evaluate the required modification for the better thermal management of these substrates. Through my access to various equipment belong to this research group, which is listed in following, I could evaluate the performance of modified substrates with different surface properties. Equipment that I used for these measurements are including steady-state method (fully custom made), thermomechanical analyzer method (Netzsch TMA 402 F3 Hyperion) and laser flash (Netzsch LFA467).

Due to the anisotropic structure of wood-based materials (having a physical property which has a different value when measured in different directions), different thermal properties in the direction of wood fibers and perpendicular to fibers was obtained. The thermal expansion of all samples in the direction of fibers are much higher (50 times more) than other direction. So, when the temperature of substrates increases, there would be more expansion along the fiber direction. Moreover, Transparent wood samples have higher thermal conductivity compared to native and bleached wood samples, which shows the wood modifications improved the thermal conductivity and enhances their application for printed electronics.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I really enjoyed working/living in Japan. The cultural perspective of Japan is above my expectation. I attended Ikebana flower arrangement course to learn more about Japanese flower designs and gardens.

I have plans to visit Japan in future, beside I will keep contact with my home-stay family.

9. Adviser's remarks (if any):

JSPS Summer Program 2024

Research Report

1. Name: Sofia Stamouli	(ID No. SP24505)
2. Current affiliation: Karolinska Institutet	
3. Research fields and specialties: Biological Sciences	
4. Host institution: The University of Tokyo	
5. Host researcher: Prof. Yutaka Suzuki	
<p>6. Description of your current research</p> <p>Metagenomic methods have the potential to identify pathogens in case of suspected infection in an untargeted manner without prior knowledge. Metagenomics is rapidly moving from research applications to clinical diagnostics and is being used for applications such as microbiome analysis, describing the complex microflora of the gut [1], identifying previously unknown viruses [2], and detecting pathogens.</p> <p>The recent SARS-CoV-2 pandemic has illustrated the importance of preparedness for rapid identification of emerging pathogens. In an established collaboration between SciLifeLab and the Karolinska University Hospital, as part of Genomic Medicine Sweden (GMS)[3], we have developed a metagenomic assay for use in clinical infection diagnostics.</p> <p>An initial focus in “wet lab” assay designs has been to optimize and achieve high sensitivity for detection of RNA and DNA viruses in cerebrospinal fluid, serum and respiratory samples. Within clinical metagenomics, accurately identifying all possible taxa, including novel pathogens present in a sample remains a challenge. Different algorithms, parameters, and reference databases often yield different results. Selecting one tool or database risks per-tool or per-database biases, which might result in both false-negative and false-positive taxonomic classification. A pipeline for taxonomic profiling of shotgun metagenomics data has been developed in collaboration with nf-core community [4]. The pipeline is named nf-core/taxprofiler [5,6] and it supports the analysis of data generated both from Illumina and Nanopore sequencing platforms. It is written in Nextflow DSL2 workflow manager and it uses Docker/Singularity containers.</p> <p>We are currently in the process of launching a routine metagenomic diagnostic pipeline for surveilling 100-200 respiratory tract samples monthly. This initiative aims to characterize and monitor the current burden of respiratory diseases and to establish a sustainable infrastructure for rapid responses to future pandemic threats, which are likely be due to emerging respiratory viruses.</p> <p>References:</p> <p>[1] Hou, K., Wu, ZX., Chen, XY. et al. Microbiota in health and diseases. Sig Transduct</p>	

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7. Research implementation and results under the program

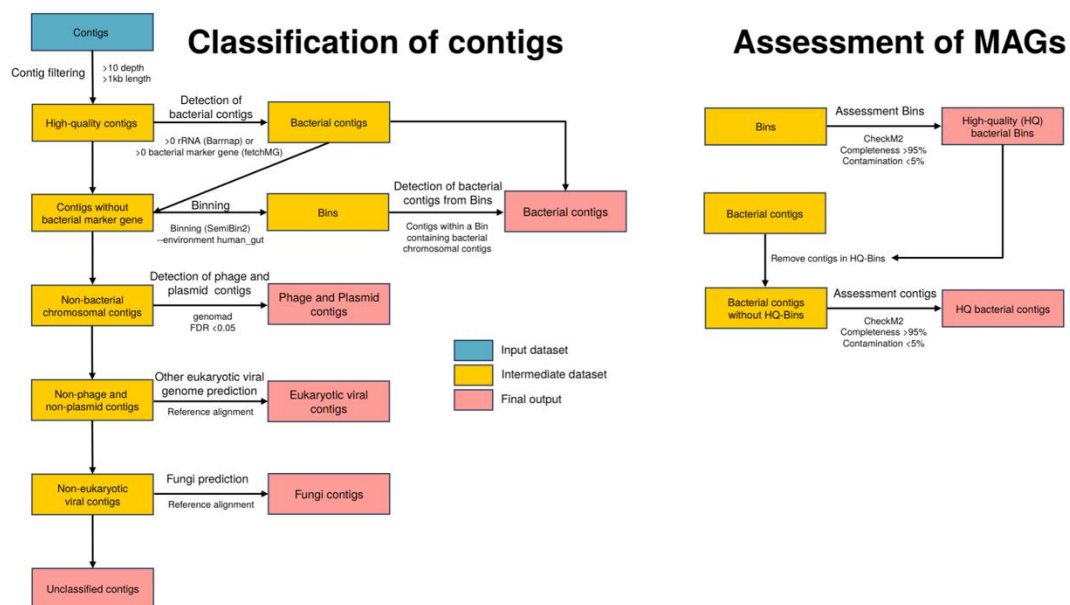
Title of your research plan:

Impact of the gut microbiome on the effect of treatment on oral cancer patients

Description of the research activities:

During my stay in Japan, I developed a Nextflow pipeline under the name *oralcancermeta* for the microbiome analysis of oral cancer patients before, during and after treatment. The pipeline is available on GitHub at [Suzuki-lab-beta/oralcancermeta](https://github.com/Suzuki-lab-beta/oralcancermeta). When I joined the lab, metagenomic sequences from 10 stool samples had already been collected and sequenced using long-read technology (Oxford Nanopore Technologies, PromethION). The collection of the remaining samples for the Japanese cohort is ongoing, and the pipeline can be applicable once all samples are collected.

The flowchart of the pipeline is described below:



The *oralcancermeta* pipeline automates the classification of microbial genetic elements from contigs generated by long-read metagenomic data. It categorizes the metagenomic sequences from stool samples into the following genetic elements:

- Bacterial chromosomes
- Bacteriophages
- Plasmids
- Unknown genetic elements

The Suzuki lab has established this method for oral microbiome analysis and is preparing a manuscript. As the study progresses, based on the results of this gut microbiome analysis, the lab will collect PBMC data from selected samples.

During my time in Japan, I also had the opportunity to conduct two research visits: one with the Integrated Open Systems Unit at the Okinawa Institute of Science and Technology, and another at the National Institute of Science and Technology, Okinawa College, where I presented the research conducted at both Karolinska Institutet and the University of Tokyo.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

9. Adviser's remarks (if any):

Metagenomic analysis using long read sequencing is a state-of-the-art technology, so there is no gold standard for analysis workflow. Sofia has built original analytical pipeline combining various bioinformatics tools using Nextflow and GitHub platform, which is suitable for co-development with collaborators. The pipeline is designed to support long-read metagenomic analysis and could enhance our understanding of the biological relevance of the human microbiome in relation to human health.

JSPS Summer Program 2024

Research Report

1. Name: Tamina Leonie Weiss	(ID No. SP24506)
2. Current affiliation: Prof. Claudio Cantù, University of Linköping	
3. Research fields and specialties: Biological Sciences	
4. Host institution: Keio University	
5. Host researcher: Prof. Toshiro Sato	
<p>6. Description of your current research</p> <p>The JSPS Summer Program offered me the unique opportunity to start a collaboration between my laboratory in Sweden, focused on the study of gene regulation, and the laboratory of Prof. Sato, worldwide expert in the organoid models. Organoids are advanced <i>in vitro</i> models that closely replicate human tissue and their associated stem cell niches. For example, epithelial stem cells derived from an intestinal biopsy can be cultured <i>in vitro</i> by supplying the niche factors that exist <i>in vivo</i>. The resulting cellular aggregates mimic the architecture, and the diversity of cell-types found in the tissue of origin. Therefore, organoids constitute an invaluable model to study how different specialized cells originate from a single stem cell. And this model, we now submit, is also ideal to study the mechanisms of gene regulation. While all cells in the human body share the same genome, they acquire specialized functions by selectively turning genes on and off. Specific DNA-binding proteins known as transcription factors (TFs) are the main players of this process. It follows that TFs play crucial roles in determining cell identity and in enabling cells to transiently adapt to signals from their environment. One fundamental among these signals is an extracellular protein called WNT that activates, in the signal-receiving cell, the WNT/β-catenin pathway, required to support stem cell identity. In a nutshell, a protein called β-catenin is constantly degraded by a destruction complex, containing, among others, the tumor suppressor APC. The consequence of extracellular WNT ligands binding to their receptor/co-receptor is to inhibit the deconstruction complex. Thus β-catenin can accumulate and translocate into the nucleus where it guides the transcriptional machinery to activate WNT responsive genes and drive cell proliferation.</p> <p>Gaining insights into the regulatory dynamics of the WNT-driven gene expression is essential for understanding how cells establish and maintain their identities, and how disease – including cancer – takes over when these mechanisms are disrupted. In fact, mutations that cause the loss-of-function of the <i>APC</i> gene result in the aberrant accumulation of β-catenin, allowing cells to bypass the WNT-ligand niche requirement and proliferate uncontrollably. However, the prevalence of <i>APC</i> mutations varies significantly between different epithelial cancers: they occur in about 80% of colorectal cancer cases but only in approximately 10% of gastric cancer cases. This variation suggests that stem cells in different tissues have distinct susceptibilities to intrinsic changes in WNT signaling activity – a mutation in <i>APC</i> in the colon seems to be more advantageous for cells to proliferate than in the stomach. How and why this happens is an outstanding unanswered question. We will study how TFs drive differential gene expression to foster or change cell identity in different contexts where WNT signaling is active. We will use the organoids model system to tackle several question concerning human disease, including the response to physiological or aberrant WNT signaling upon <i>APC</i> mutations occurring in different organs. Our laboratory has optimized a CUT&RUN (Cleavage Under Target & Release Using Nucleases) LoV-U (low-volume-urea) protocol optimized to detect the activity of a wide array of TFs. This will allow us to achieve our desired goal of studying gene regulation in several contexts using the organoids as model system and explore new targets that have been proven difficult to map, such as the WNT signaling central β-catenin.</p>	

7. Research implementation and results under the program

Title of your research plan:

Massive parallel mapping of transcription factor activity in human epithelial derived cancer organoids

Description of the research activities:

Prof. Sato's vast biobank of patient derived/genetically reconstructed organoids are the ideal starting point to study gene regulation in health and disease. My research activities in Japan can be subdivided into two subprojects since the original idea of the project was further developed upon arrival in Japan thanks to in-person discussion.

Project 1: Context-specific APC driver strength in gastrointestinal cancers

For this project, I cultured human colon and stomach organoids and gained insights into precise genetic engineering to mimic the APC cancer-driver mutation in healthy organoids. I subsequently cultured them in normal media conditions and WNT-ligand depleted media. I started to comparatively map three histone modifications for regulatory regions (H3K4me3, H3K27me3 and H3K27ac) as well as β -catenin using CUT&RUN to identify tissue specific difference in homeostatic and oncogenic WNT signaling. I optimized the protocol for targeting organoids with this technique, focusing on improving single-cell dissociation and extraction of cell nuclei. Furthermore, we designed strategies to engineer specific APC mutations have been linked to distinct WNT activation strengths, likely as a consequence of the impact on β -catenin's stability. Once generated, these APC-mutant organoid lines will be subjected to CUT&RUN analysis to investigate if the abundance of β -catenin dictates its DNA association signature. Parallel to the CUT&RUN analysis, we will sequence the APC genomic locus, to determine the successful engineering of mutations, and total RNA, to investigate potential changes in gene expression.

Project 2: Massive parallel profiling of transcription factors in transdifferentiated cancers

As an important achievement of my stay in Sato's laboratory, I learned how to culture the patient derived transdifferentiated GEP-NEN (gastrointestinal pancreatic-neuroendocrine) and SCLC (small cell lung) cancer-organoids. After organoids' culture expansion, I performed CUT&RUN to map the genome wide DNA association of the neuronal, 'alien' transcription factors ASCL1, NEUROD1, SOX2 and histone modification of regulatory regions. So far, we analyzed two patients per cancer subgroup. Adding more lines of different molecular subtypes in the future will give insights into inter-patient differences and mechanism of cancer evolution. The CUT&RUN protocol has been completed in Japan and will be followed by next-generation DNA sequencing and further bioinformatic analysis back in Sweden.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I immensely enjoyed my stay at Prof. Sato's lab, where I was warmly welcomed by the entire group. The supportive and friendly environment made my experience truly memorable, and I received outstanding assistance with any issues that arose. I was honored to participate in group meetings and discussions, gaining valuable insights into the many fascinating ongoing projects. The lab members went out of their way to introduce me to local customs, foods, and tips, even hosting a welcoming party. I am deeply grateful to Prof. Sato and JSPS for providing me with this remarkable opportunity.

9. Adviser's remarks (if any):

Tamina has provided an optimal CUT&RUN protocol for organoids, which not only boosted our collaboration but also benefited our technical infrastructure to understand epigenetic changes during disease progression. Tamina has brought fruitful discussions and an international sense of science to our lab. We will extend our collaboration after finishing the JSPS program and aim to publish the results.

JSPS Summer Program 2024

Research Report

1. Name: David Hardy	(ID No. SP24507)
2. Current affiliation: Linkoping University, Sweden	
3. Research fields and specialties: Mathematical and Physical Sciences Engineering Sciences	
4. Host institution: Sophia University	
5. Host researcher: Prof Masahiro Fujita	
6. Description of your current research <p>My research focusses on an emerging type of solar panel technology called “perovskite solar cells” (PSCs), aimed to produce efficient and low cost renewable energy. PSCs differ from commercial silicon solar cells in their material composition and device structure. They are much cheaper to manufacture than silicon, using abundant and low cost materials, and solution processed manufacturing methods. Moreover, PSCs are a thin film technology, meaning they are lightweight, and flexible. Therefore, there is a potential to vastly reduce material and manufacturing costs of solar panels while offering higher performances and new applications.</p> <p>PSCs have some issues however, mostly centered around their environmental stability. Under external environmental factors like heat and moisture devices degrade rapidly and become nonfunctional after a few thousand hours, a long way from commercial guarantees of 40 years.</p> <p>One of the principal causes of this instability relates to the formulation of the top-most layer in a PSC, called a “hole transport layer” (HTL). This layer is critical for device operation, separating the positive charges from the negative in the device, and can be thought of as analogous to the positive terminal on a battery. An HTL must have, adequate conductivity to rapidly transport photogenerated charges (current) out of the device, and high environmental stability. Typically, an organic material called “spiro-OMeTAD” is used for this layer as it can provide high efficiency, but it exhibits low thermal stability. Furthermore, a typical HTL must also be doped with small molecules to perform well. “Doping” introduces a small molecule to generate more free charge carriers into the HTL and thus increases its conductivity.</p> <p>Therefore, the properties of the HTL rely on those of the host hole transport material and dopant, which impact the overall device performance and stability. (I.e. hygroscopic dopants will absorb water into the HTL layer and damage the perovskite solar cell, or a hole transport material with a low thermal stability will degrade over time).</p> <p>In my research I am focusing on the application of thermally stable polymers PTAA and P3HT for hole transport layers. These polymers offer higher thermal stability than Spiro-OmeTAD but their performance is typically lower. Therefore, through experimentation I aim to find adequate dopants that can boost the performance of these polymer HTLs so they can match the efficiency of Spiro-OMeTAD while exhibiting higher environmental stability. Through this work we aim to move perovskite solar cells closer to commercialization.</p>	

7. Research implementation and results under the program

Title of your research plan:

Doping of polymer hole transport layers for efficient and stable perovskite solar cells

Description of the research activities:

Before coming to Japan, I had conducted some work with materials provided by my JSPS host. I also had obtained some exciting results from another material system, but the mechanism behind this result was unknown. Therefore, unravelling the mystery of this result has been the focus of my work.

We have measured:

- **DSC** to determine the thermal stability of my material.
- **UV-VIS** under different conditions to determine which factors are important to this doping process.
- **ESR** to detect the radical production (successful doping)
We attempted to conduct more in-depth analysis -but ran out of time
- **NMR** to determine what chemical products exist in my final materials

The collected data is mainly preliminary but has allowed me to develop hypotheses and will be used to plan further experiments at my home institution

In addition to these experiments, I have begun preparing a manuscript and the literature review for my thesis. I also travelled to visit Professor Wakamiya's group in Kyoto University, and Professor Murakami from AIST.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I attended the homestay program to get an insight into Japanese home life.

Talked with colleagues daily about many subjects and topics.

Travelled to museums and surrounding areas to see historic places, countryside and onsen

Ate loads of Japanese food, watched Japanese films in the cinema, and attended concerts

Attended language classes organized by JSPS and daily Duolingo on my commute

9. Adviser's remarks (if any):

David is not only enthusiastic about research and energetically conducting experiments, but also impressed me by how quickly he opened up to my group members and actively communicated with them. As an advisor, I am pleased to have had such a positive impact on my group members, and I am grateful for his behavior.

JSPS Summer Program 2024
SP24508 Research Report

1. Name: Daniel POPOSKI	(ID No. SP24508)
2. Current affiliation: Chalmers University of Technology	
3. Research fields and specialties: Chemistry	
4. Host institution: Kyushu University	
5. Host researcher: Prof. Hikari SAKAEBE	
6. Description of your current research As a graduate student with a background in Electrical Engineering at Chalmers University of Technology in Sweden, my research on Lithium-ion batteries aims to better understand how modern battery technologies degrade over time and learn how to improve battery lifetime and performance. Through my research visit at Kyushu University in Japan, I plan to extend my studies on battery electrode materials by adopting wisdom in material science taught by experts at Kyushu University. By bridging the strengths offered between our universities, I look to learn how our disciplines can complement each other with the goal to further develop our battery related research.	

7. Research implementation and results under the program

Title of your research plan:

Exploring characterization techniques of Silicon-Graphite electrodes with various Silicon-content for Lithium-ion batteries.

Description of the research activities:

My research activities consisted of investigating the characteristics and degradation of Silicon-Graphite electrodes of varying Silicon-content used in Lithium-ion batteries. I have explored material characterization techniques, utilizing the facilities offered at the department of Advanced Device Materials at Kyushu University, to study my electrode materials. The results will be used to further explore the materials and understand the performance trade-offs between various material compositions.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

This program has been a fantastic experience and my research visit graciously hosted at Kyushu University would not be possible without it. I am forever grateful to have received the opportunity to learn more about my research field from Japanese experts, and learn so much about the rich Japanese culture. Japan is a fantastic country and I hope to come back soon again.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Michelle Ochsner	(ID No. SP24509)
2. Current affiliation: Lund University, Sweden	
3. Research fields and specialties: Engineering Sciences	
4. Host institution: University of Tokyo	
5. Host researcher: Professor Hironori KATO	
6. Description of your current research <p>My research concerns the impacts of extreme weather on railway operations and infrastructure and how to adapt to climate change. By using a mixed methods approach, the aim of my PhD thesis is to understand how climate risks and uncertainties can be handled within the railway sector. In order to achieve this, the first half of my thesis quantified the vulnerability of the Swedish railway system to different weather conditions. This leads to important inputs for policymaking and decision-making by understanding what risks lead to the greatest vulnerabilities, thus providing insights on how to increase resilience. The second half of my thesis uses qualitative methods to address how climate change risks and uncertainties can be handled.</p> <p>Railways play an important role in mitigating the negative effects of climate change by providing a low-carbon and energy-efficient mode of transportation. However, the negative effects of climate change have already been experienced as an increase in the severity and frequency of extreme weather events has led to adverse impacts on railways globally. The increase in extreme weather events such as storms, rain, and extreme heat can lead to delays and increased maintenance costs. In addition, railway infrastructure has a long life-span, and were built before our current understanding of climate change. There it is important to understand the current vulnerabilities in order to better prepare and increase the resilience of infrastructure in light of climate change.</p> <p>I was interested in coming to Japan to learn more about how Japanese railways handle natural disasters such as earthquakes and typhoons. Japan has an international reputation for having extremely punctuality, reliable, and safe services despite dealing with many natural disasters. The lessons I learnt here will be taken back to Sweden as we prepare for an increase in extreme weather events and natural disasters that were not experienced in the past.</p>	

7. Research implementation and results under the program

Title of your research plan:

On Track for Climate Resilience? Insights from Japanese Railways

Description of the research activities:

- I participated in weekly lab meetings where students presented their research progress on a rotational basis. I also presented the results of the research conducted during my stay during one of the final meetings.
- I visited 2 railways museums: The National Railway Museum in Saitama and the Tokyo Metro Museum in Kasai, Tokyo. Here I learnt more about the history of railways in Japan. The Tokyo Metro Museum also had information about the operational measures taken under extreme weather such as heavy rainfall, flooding, typhoons, and earthquakes.
- During my stay I had weekly check-in meetings with Professor Kato where we discussed my progress and how I could be supported.
- I had interviews with 3 different railway companies around Japan and with the Railway Technical Research Institute (RTRI).
- In addition to the interviews, I also took part in a research seminar where I presented my work to the Centre for Climate Change Adaptation (CCCA) at the National Institute for Environmental Studies (NIES) and learnt more about climate adaptation efforts made in Japan.
- I had the opportunity to visit other researchers at the University of Tokyo and across Japan who work with transportation, climate adaptation, and disaster risk reduction
- Finally, I had the opportunity to travel extensively around Japan by railway and even experience some earthquakes, extreme rainfall, heatwaves, and typhoons first-hand. Two of my interviews with railway companies coincided with the team's meetings on how to handle the operations during Typhoon 7. It was interesting to observe first-hand how these situations are handled.

8. Please add your comments, including any cultural experience during your stay in Japan (if any)

This experience has been so valuable for me both personally and in terms of my research. I have learnt so much and was greatly able to extend my network. I especially enjoyed taking part in many activities such as a tea ceremony, kimono, festivals, fireworks, and collecting many Goshuin stamps from many temples and shrines, and Eki stamps from various train stations. Thank you to the IP lab for being so welcoming and making my experience so enjoyable and thank you JSPS for the opportunity!

9. Adviser's remarks (if any):



JSPS Summer Program 2024
Research Report

1. Name: Rawan Shekhani	(ID No. SP24510)
2. Current affiliation: Karolinska Institute	
3. Research fields and specialties: Biological Sciences Medical, Dental and Pharmaceutical Sciences	
4. Host institution: Tokyo University	
5. Host researcher: Prof. Dr. Radostin Danev	
6. Description of your current research <p>G protein coupled receptors (GPCRs) are an important class of membrane proteins that are essential in many cell biological processes and are involved in health and disease. Many clinically used drugs target GPCRs, which further explains the strong interest in studying these receptors to use this knowledge for drug discovery.</p> <p>Wnt signaling is an essential, conserved signaling pathway involved in development and tissue homeostasis, as well as disease when dysregulated. Frizzleds (FZDs) belong to class F of GPCRs. The overall aim is to obtain structural insight into FZDs and their activation mechanisms, to be able to use structure-based drug discovery methods for targeting of these receptors therapeutically. In this project specifically, the goal is to obtain a cryo-EM structure of a complex of Frizzled with its transducer protein. These efforts will provide structural information that aid in understanding of the activation mechanism and transducer coupling of Frizzleds. This in turn will improve the understanding of the functional consequences of these coupling modes, and allow for further investigation on their role in health and disease.</p> <p>Previous data that was collected and analyzed was found to suffer from strong preferred orientation, which yielded a cryoEM map with stretching artefacts. In hopes of improving the map, new samples have been prepared and a different data collection strategy was applied.</p>	

7. Research implementation and results under the program

Title of your research plan: cryoEM studies of GPCR complexes

Description of the research activities:

The research activities consisted primarily of cryogenic electron microscopy experiments, by imaging frozen GPCR samples. In addition to this, we plunge froze samples as well.

Screening was performed on a ThermoFisher Talos Arctica 200 kV microscope. Large scale data collection was performed on a JEOL cryoARM, 200 kV microscope whereby we collected in the range of 30-35k movies per sample.

The data was processed through following a single particle processing workflow, consisting of preprocessing the images (motion correction and contrast transfer estimation), particle picking, particle extraction, 2D classification and 3D classification and refinement to yield a final cryoEM density map.

In the figure below, the results from one of the major experiments is shown.

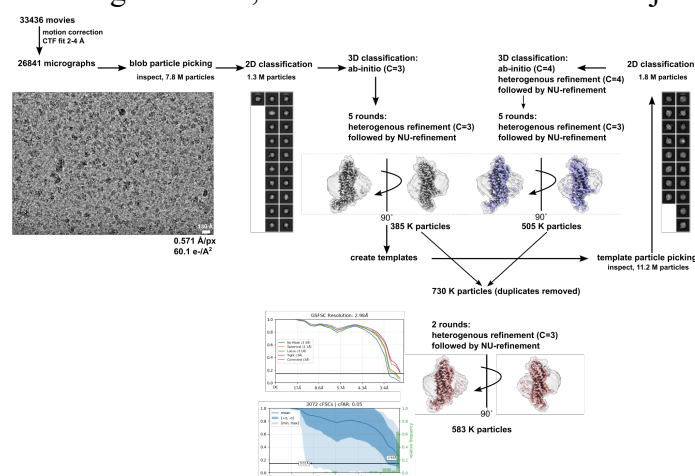


Figure 1. Data collection and single particle analysis.

Unfortunately, this and other experiments were not sufficient to solve the preferred orientation issue thus far. There are still some data processing strategies to try and an upcoming data collection, which hopefully will improve the result of this ongoing work.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

This was a great period in my host laboratory to work on my research and experience Japan. During the introduction week, multiple aspects of Japanese culture were introduced. In the research period, I had the opportunity to immerse myself at Tokyo University and Tokyo/Japan in general. I enjoyed the Japanese food and cafes in Tokyo. Other activities included visiting teamLAB borderless and a baseball game. I visited Niigata during their weekend festival, which ended with a firework show at the end of the festival.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 (JSPS 24511) Research Report

1. Name: Latras Athanasios	(ID	No.
SP24511)		
2. Current affiliation: KTH Royal Institute of Technology		
3. Research fields and specialties: Engineering Sciences		
4. Host institution: The University of Tokyo		
5. Host researcher: Prof. Takamasa Sakai		
6. Description of your current research		
<p>My research focuses on using biomasses, particularly proteins from agrifood waste, to develop sustainable materials. I aim to replace fossil-based materials with environmentally friendly alternatives by utilizing proteins like wheat gluten, a food industry byproduct, to create porous, absorbent materials for various industries. The main goal is to develop scalable protocols and methodologies for industrial use. Extrusion, a high-scale manufacturing technique, plays a key role, allowing for continuous production with controlled properties, such as porosity, mechanical strength, and absorption capacity. The emphasis on wheat gluten protein is significant as it's a renewable, bio-based resource sourced from waste streams, contributing to a circular economy. By transforming waste into valuable materials, this research promotes sustainability and adds value to agricultural processes. These porous materials could replace a range of fossil-based products, especially where absorption and filtration are essential. Additionally, my research explores the rheological properties of protein-based blends, crucial for optimizing the extrusion process. Understanding how reinforcement materials interact with the protein matrix helps enhance the mechanical properties, ensuring these bio-based materials can compete with fossil-based counterparts in performance and durability. Overall, my work is at the forefront of developing sustainable materials that support global efforts to reduce fossil fuel dependence and environmental impact, creating a more sustainable, functional, and environmentally responsible future.</p>		

7. Research implementation and results under the program

Title of your research plan:

Revolutionary Biodegradable Porous Absorbent Materials

Description of the research activities:

To enhance the material properties, such as swelling and retention capacity—key for applications like sanitary pads—proteins (wheat gluten and zein) were combined with agar-based hydrogels. Additionally, SBC, a safe chemical blowing agent, was used to promote pore formation during heat treatment. Three agar concentrations (1, 2.5, and 10% w/w) were tested for hydrogel formation, with the 1% concentration exhibiting the highest swelling capacity and the 10% concentration showing the highest retention capacity. These hydrogels were then mixed with wheat gluten, zein, or their blend in different weight ratios (5, 10, and 50% w/w of protein mass). Results indicate that a 50% mix of the 1% hydrogel maximizes swelling, while the 10% hydrogel improves retention. Material brittleness increased with higher hydrogel content and concentration. This research offers insights into how hydrogels affect protein-based materials regarding liquid absorption and retention, paving the way for further characterization.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

During my project in Japan, immersing in the local culture enriched my experience. The attention to detail in Japanese work culture aligned well with our research, and collaborating with Japanese colleagues, who emphasized harmony and thoroughness, enhanced our teamwork. Outside of work, the blend of tradition and modernity, from serene temples to vibrant urban life, broadened my perspective. This cultural immersion supported my professional growth and left a lasting personal impact.

9. Adviser's remarks (if any):

JSPS Summer Program 2024 Research Report

1. Name: Charlène PERIAN	(ID No. SP24513)
2. Current affiliation: Sahlgrenska Academy, The University of Gothenburg	
3. Research fields and specialties: Biological Sciences	
4. Host institution: Department of Diabetes and Metabolic Diseases, The University of Tokyo	
5. Host researcher: Pr. Toshimasa Yamauchi	
6. Description of your current research <p>My doctoral project seeks to investigate the intricate relationship between biological sex, the polycystic ovary syndrome (PCOS), and white adipose tissue functionality. By doing so, we hope to shed light on the underlying mechanisms and potential therapeutic targets for PCOS-related metabolic disturbances. White adipose tissue plays a critical role in energy homeostasis, metabolism, and overall health. Conversely, white adipose tissue dysfunction is closely linked to metabolic disorders including those associated with PCOS. My PhD aims at providing a new mechanism for the interindividual differences in the capacity for subcutaneous adipose tissue expansion. We are trying to establish the role of macrophages in the collagen degradation process that enables physiological expansion of inguinal white adipose tissue (IWAT) in mice. We are also trying to determine whether there are sex-differences in IWAT collagen turnover in mice and humans. Finally, we want to determine whether altered IWAT collagen turnover can explain the increased propensity toward visceral adiposity in a polycystic ovary syndrome-like mouse model.</p>	

7. Research implementation and results under the program

Title of your research plan:

Investigating The Role Of Nuclear Factor IA In Obesity And Metabolic Disorders.

Description of the research activities:

The research team I have joined has previously shown that the protein Nuclear Factor-IA (NFIA) is involved in the regulation of brown fat functions. Its activation in fat cells of mouse animal models exerts a protective effect against an obesogenic high fat diet. We isolated adipose tissue from knock-out (KO) mice, as well as a cohort of insulin sensitive/resistant patients to assess the gene expression profiles in relation to their metabolic phenotype. Therefore, I analyzed special genomics data (Visium 2.0 10x Genomics) from a control mouse, a NFIA-KO mouse, and one patient.

The genomics data from mice were clustered in three groups with different patterns of gene expression. I filtered the significantly upregulated genes in the NFIA-KO mouse to try to identify some targets that could be involved in metabolic disorders, Figure 1.



Figure 1 : Upregulated genes in the visceral adipose tissue of a NFIA-KO mouse.

I looked for the human homologues of these upregulated genes in the Mouse Genome Informatics database and selected the genes that were involved in metabolic homeostasis or inflammation.

When analyzing the human data, the cells were clustered in 5 different groups. After filtering the significantly upregulated genes, they did not overlap with the candidate genes that we had identified in the mouse data.

In consequence the focus is now to optimize the Visium analysis in order to enhance its sensitivity as the adipose tissue is not commonly analyzed with this technology.

8. Please add your comments, including any cultural experience during your stay in Japan (if any):

During my stay, I had the opportunity to spend a week-end with a Japanese family in Tokyo with the homestay program. This was a great experience as I got introduced to the Japanese culture and daily life. I also visited other cities in Japan such as Kyoto, Osaka, Nara. Additionally, I went for the Mount Fuji hike and went to Hakone and Kawaguchi.

9. Adviser's remarks (if any):

During the two months' period engaging in research on methodology of multi-omics analysis of tissue in the context of metabolic homeostasis, Ms. Charlène Perian added insight on the significance of changes in gene expression in the context of human disease. She also provided input to the research activity of other researchers, which was an enlightening experience for all concerned.

JSPS Summer Program 2024 Research Report

1. Name: Linnéa SAARANEN	(ID No. SP24514)
2. Current affiliation: Stockholm University	
3. Research fields and specialties: Humanities	
4. Host institution: Graduate School of Human Development and Environment, Kobe University	
5. Host researcher: Minae INAHARA (Associate Professor)	
<div>6. Description of your current research</div> <p>The last thirty years have been characterized by technological development and have been a time of digital change. As a result, the growth of social media platforms, robots, and AI has connected the human species and our bodies to the digital world more than ever. This new digital age has also had an impact on film and art scenes around the world, where new and improved technologies and digitalization have changed the prerequisites needed for visualizing new imaginary futures and for reimagining the concepts of body, space, and time in a highly technological society.</p> <p>My project takes its point of departure from the era of the new digital age, from the 1990s until today, intending to analyze the visual work of the Japanese female multidisciplinary artist Mariko Mori. As the main focus of this project, Mori has through her art visualized the concept of the cyborg and has continuously produced art that is in dialogue with technology, spirituality, and nature. In her early work, Mori often used her own body in a setting of the world of popular culture combined with science fiction aesthetics. Since then, Mori has continuously worked with different media and formats such as film, photography, sculpture, and performances in which she not only uses her own body but often involves the spectators in symbiosis with the artwork and the space that surrounds it.</p> <p>Through a feminist- and posthumanist theoretical framework, this project aims to contribute to a broader and deepened understanding of the concepts of body, space, and time in an era of digitality. This could open up new conversations about our contemporary digital society and its inhabitants (humans, non-humans, and all in between).</p>	
<div>7. Research implementation and results under the program</div> <div style="margin-left: 20px;">Title of your research plan:</div> <div style="margin-left: 20px;">Body, Space, and Time in Japanese Visual Cultures During the New Digital Age</div>	

Description of the research activities:

My research in Japan has been focused on fieldwork at museums and other institutions that provide artworks and materials that I will analyze in my project. The main fieldwork took place in Tokyo where Mariko Mori's solo exhibition "Kojiki" was held at the art gallery SCAI the Bathhouse. During my visits to the exhibition, I took field notes and collected photo and video material to be analyzed. I also had the chance to talk to the curators at the gallery and to meet Mariko Mori in person.

In Tokyo, I also collected material at other places where the art of Mariko Mori was displayed. This includes the Dior store at Ginza 6, The Tokyo Toranomon EDITION hotel, Toranomon Hills Business Tower, and SCAI Park. I also visited other museums and exhibitions to collect additional material on Japanese art such as SusHI Tech Square, Yayoi Kusama Museum, and Setagaya Literary Museum. Additionally, I attended the Asian Studies Conference Japan at Sophia University during two days where I met several scholars related to my field of study.

I also conducted fieldwork at other places in Japan such as Miyakojima, where Mariko Mori's artwork "Sun Pillar" is permanently installed. While visiting Naoshima and Teshima, I visited several art museums on both islands. I have also visited other museums such as Hyogo Prefectural Museum of Art in Kobe and the Expo Commemorative Park in Osaka. These visits have opened up new perspectives for my research project and broadened my understanding of Japanese visual culture.

At Kobe University, my host researcher Associate Professor Minae Inahara has helped me expand my research network in Japan and allowed me to attend seminars related to gender topics which have broadened my knowledge of gender-related issues in Japan. This is an important area of my study and this knowledge exchange has been of great value for my research project. In addition, my stay at Kobe University has created opportunities for future collaboration with both researchers at Kobe University and the extended network of researchers that I was fortunate enough to connect with during my stay.

8. Please add your comments, including any cultural experiences during your stay in Japan (if any):

My stay in Japan during the summer has been of great value to my research and I am very grateful to have been invited to stay at the Graduate School of Human Development and Environment at Kobe University. Since my stay in Japan included a lot of traveling and fieldwork, I got to experience a lot of different cities and places in Japan such as Tokyo, Miyakojima, Osaka, Kyoto, Naoshima, and Teshima. Kobe was also a very wonderful city to live in, where I got to see the beautiful Suma Beach, attend the Daikai Summer Festival at Ikuta Shrine, and watch the sun go down over the city from the rotating café at Kobe Tower.

9. Advisor's remarks (if any):