JSPS Summer Program 2021
Research Report

1. Name: Sean David Baxley	（ID No. SP21002）

2. Current affiliation: Georgetown University

3. Research fields and specialties: Biological Sciences, Medical Sciences

4. Host institution: Doshisha University

5. Host researcher: Prof. Masaya IKEGAWA

6. Description of your current research Here, we have created a novel "2-hit" animal model of psychiatric illness. We showed that maternal immune activation *in utero*, and repeated social defeat stress *in young mice* act synergistically- leading together to behavioral abnormalities mimicking those of human psychoses, and brain-wide dysconnectivity. Through imaging analyses, we elucidated various changes in neural activity, immune activation, and vascular connections in these mice. To better understand the neurophysiological modulations that occur in this mouse model, we analyzed the whole brain in targeted regions for changes in **monoamine activity and metabolism**. To do so, we sectioned the 2-hit mouse brain coronally at specific locations allowing us to visualize both through imaging mass spectrometry and immunohistochemical analyses. Additionally, during my time here I studied numerous examples of environmental health and policy and was able to present this data in a seminar with the acclaimed activist Aileen Smith, from her groundbreaking work on the Minamata disease. I studied the current governmental policy as it related to environmental health concerns such as Minamata: Relevant insurance systems, community health systems and welfare services. My studies helped to shed light onto the nature of mental health effects and examine the potential tools to identify brain abnormalities, in order to strengthen the health policies in place to address such burdens. This information, in turn, could point to specific areas in need of advancement of brain research and policy reform in Japan. I was able to learn about cutting edge neurological research and its application as it relates to brain health. In japan, I bridged scientific knowledge to improve healthcare, health care policy, and translational medicine by learning about cutting-edge science.

7. Research implementation and results under the program

Title of your research plan:

"Neurophysiological, metabolic, and immune changes in a 2-hit mouse model of psychiatric illness".

Description of the research activities:

- Whole mouse brain sectioning- identified novel method for coronal slicing. (I examined specifically the medial prefrontal cortex, the hippocampus, thalamus, PAG, raphe nucleus and the cerebellar nucleus)
- Immunohistochemical staining analysis for changes in monoamine levels such as important markers of psychophysiological metabolism changes like dopamine and serotonin
- These coronal sections of our 2HIT mouse model were further analyzed using state-of-the-art imaging mass spectrometry analysis for the high-resolution visualization and statistical analysis of changes in monoamine metabolism
- Various microscopy analyses and/or imaging techniques

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

I had an unbelievable time in Japan. My research experience was rich and rewarding and I was greeted with nothing but the upmost kindness from everyone in the laboratory. I was able to experience the vibrance of Tokyo, the tranquility of Nara, the awe and wonder of the various Kyoto shrines I explored, the natural beauty of Arashiyama, and numerous other destinations. I have now a deep appreciation for the Japanese culture, and the wonderful experience this country has afforded me.

9. Adviser's remarks (if any):

JSPS Summer Program 2021
Research Report

1. Name: Haruka Notsu	（ID No. SP21007）

2. Current affiliation:

The Pennsylvania State University

3. Research fields and specialties:

Social Sciences

4. Host institution: Ochanomizu University

5. Host researcher: Prof. Shigeru Iwakabe

6. Description of your current research

Although much research has been conducted on the therapist-client relationship in psychotherapy, little has focused on specific session-to-session factors that contribute to a stronger therapist-client relationship. In the present study, we focused on positive emotions as a potential factor associated with the working alliance, which is a specific form of the therapist-client relationship. We attempted to shed light on the associations between working alliance and positive emotion using session-by-session data and structural equation modeling. Specifically, we hypothesized that there will be a lagged effect of both alliance and positive emotion, so that stronger alliance in the previous session will predict higher positive emotion in the next session and vice versa. Although we did not have a specific hypothesis, we expected the relationship to be different for the three emotional categories.

7. Research implementation and results under the program

Title of your research plan:

Examining the role of positive emotion in working alliance in psychotherapy

Description of the research activities:

The present study used the dataset from a practice research network for Accelerated Experiential Dynamic Psychotherapy (AEDP; Iwakabe et al., 2020). The data consisted of alliance and emotion measures taken at each of the 16 sessions of the treatment. The research activities in the initial phase consisted of discussions on theoretical background of working alliance, AEDP and the role of positive emotions in psychotherapy. Afterwards, we engaged in detailed discussion on plans to analyze the data. Finally, the data analytic plan was carried out, and the results were interpreted.

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

Although the experience was somewhat limited due to COVID, it has been a great opportunity to talk to other academics in the field and build connections.

9. Adviser's remarks (if any):

JSPS Summer Program 2021
Research Report

1. Name: Vincent Antoine MONNIER　　　　（ID No. SP21206　　）

2. Current affiliation: Nantes Université

3. Research fields and specialties:

Chemistry

4. Host institution: Institute for integrated Cell-Material Sciences, Kyoto University

5. Host researcher: Prof. Shuhei FURUKAWA

6. Description of your current research

My research in France focuses on the synthesis of new chromophoric organic ligands for the elaboration of photo-redox active hybrid materials (such as Metal-Organic Frameworks, MOFs). Once synthesized, the resulting materials are studied under diverse scopes (electrochemical, photophysical, catalytical, …). This free subject allows for a wide diversity of ligands to be synthesized. This diversity of synthetic approaches inspired the following research project submitted for the JSPS Summer Program fellowship of 2021.

7. Research implementation and results under the program

Title of your research plan:

New arylene diimide ligands and their use in the elaboration of Metal-Organic Polyhedra (MOP) and derived materials

Description of the research activities:

The research activities focused on synthesis of MOP, which are molecular cages composed of several metallic cations (e.g. 4, 6, 24, …) bonded together by organic ligands, via a convergent approach. These cages exhibit geometries (e.g. cube, triangle, tetrahedron, cuboctahedron, …) dependent of : i) the shape of the ligand, ii) the nature of the metallic centers and iii) the synthetic conditions. For this precise project, 3 different naphthalene diimide (NDI) ligands were synthetized in France and brought in Japan. One key information for the characterization of MOPs is the obtention of single crystals allowing for structural determination, which is by far the best experimental proof the obtention of the foreseen MOP. No crystals have been obtained to this day, but since this process, relying on the progressive ordered packing of MOPs together via weak interactions can take up to months, a lot of attempts are still running.

Several other strategies are also explored, like using well established MOP synthesis with simpler ligands (e.g. 5-hydroxyisophthalic acid) and use the NDI ligand as a doping agent in various proportions to form hybrid cages.

The use of a new perylene diimide (PDI) tetrapyridyl ligand was also explored to reticulate pre-synthetized simple MOPs between them.

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

The team of Prof. Furukawa is excellent regarding science and social relations. A lot of different nationalities are represented, which helps a lot for the integration of newcomers. I also met a French community in Kyoto and made good friend with several Spanish people, with who I was able to explore Japan a bit. Visiting in 6 free weekends Uji, Osaka, Himeji, Tokyo and Kyoto in depth (of course) was a very intense and enjoyable experience that I can only recommend to whom is presented this opportunity. The Japanese culture is rich, dense and so different of the European's that one can simply not get bored (in a so short time).

9. Adviser's remarks (if any):

JSPS Summer Program 2021
Research Report

1. Name: Crystalle Chardet	(ID No. SP21209)

2. Current affiliation: LSPCMIB, Toulouse University, Toulouse FRANCE

3. Research fields and specialties: **Chemistry**
4. Host institution: Morii Laboratory, Institute of Advanced Energy, Kyoto University
5. Host researcher: Professor Takashi Morii

6. Description of your current research

Proteases are responsible for the hydrolysis of peptide bonds in living organisms. Serine proteases, one family of proteases, in order to perform this function, possess in its active site a catalytic triad composed of three key amino acids, Serine, Aspartic Acid and Histidine. Their cooperation and the structure of the protease allows the selective degradation of one specific substrate. The main drawback of this specificity is the limited spectrum of substrates that can be hydrolysed. Therefore, my PhD project aims at the bottom-up design and synthesis of functionalized oligonucleotides that could be used as serine proteases' mimics, broadening the spectra of possible substrates.

With solid phase synthesis based on the phosphoramidite approach, the oligonucleotides are decorated by organic functions surrogates for the side chain of Serine, Aspartic Acid and Histidine and substrates to study catalytic activity (Figure 1). Relying on the organization brought by the DNA secondary structures, we hope to mimic the active site of the serine protease and screen for a functionalized oligonucleotide able to perform ester or amide hydrolysis.

Figure 1. Summary of my project based on small secondary structures of DNA

Starting with assemblies such as hairpins or bulges structures (Figure 1), our goal is to increase the topological complexity by incorporating them into 3D structures such as DNA tetrahedra. This is one of the reason my stay in the Morii lab is the perfect opportunity to learn how to handle larger functionalized DNA structures such as DNA Origami.

7. Research implementation and results under the program
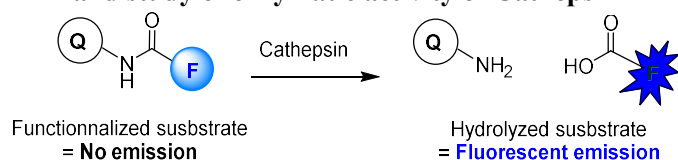
Title of your research plan:

Synthesis of modified Cathepsin Substrates for fixation on DNA Origami platforms and study of enzymatic activity of Cathepsin

Figure 2: Hydrolysis of fluorogenic cathepsin substrate

Description of the research activities:

Cathepsin is a protease responsible of the degradation of proteins *in cellulo* and a promising target in cancer study or tumor imaging as it is overexpressed in malignant tumors. The idea at the heart of this project, already ongoing in the lab before my stay, is the functionalization of protein substrates of Cathepsin (molecules recognized and hydrolyzed by Cathepsin) with a fluorophore (F) and its quencher (Q) at their extremities. These two moieties, initially paired on the peptide substrate, are separated when it is hydrolyzed by Cathepsin, allowing to study and quantify the protease activity. Indeed, the emission of the fluorescent moiety initially extinguished by the quencher, can be detected by fluorescence after separation of the pair F/Q (*Figure 2*). During my stay, I therefore performed the functionalisation of modified peptides substrates of Cathepsin with a fluorophore and a quencher as well as the conjugation of these peptides with an oligonucleotide strand. The oligonucleotide strand allowed then fixation on a DNA origami platform that could be used as an enzymatic activity sensor. Different modified peptides were prepared to find the right distance to accommodate the fluorophore and the quencher.

It was a great opportunity for me to learn new synthesis skills from peptide synthesis to modification with a fluorophore or quencher as well as to discover how to work with DNA origami structures, modify and analyze them.

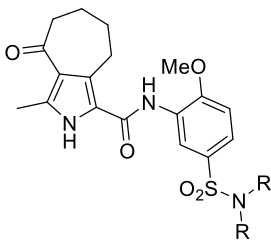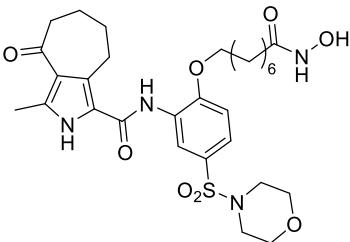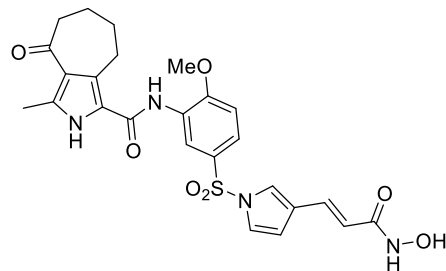8. Please add your comments, including any cultural experience during your stay in Japan (if any):

During my days off, I was able to travel a bit and I got the opportunity to visit Nara, Osaka, Hiroshima and Tokyo. Also, as I was living in Kyoto I got the opportunity to discover this great city and the way of life here in Japan. I got to discover a bit more about local culture, customs and traditions. I even learned a few words and basic communication skills in Japanese language. A great progress for me as I had none starting the program. I feel really lucky that I got this opportunity, especially in these days when everything is more complicated due to the pandemic, especially travelling. I also learnt a lot inside and outside my field of research as I have been really warmly welcome in my host lab.

Overall, this stay was a great introduction to Japan for me.

9. Adviser's remarks (if any):

Ms. Chardet brought a lot activity to our laboratory during her stay of just two months. She made significant contribution on the synthetic project. She is honest and extremely well liked in the laboratory. Her hard work and enthusiasms on science certainly motivated my students to face their ongoing projects more seriously. Also her stay in our laboratory really reminded us the joyful side of international scientific activity, which was quite nice especially during this pandemic.

JSPS Summer Program 2021
Research Report

1. Name: Robin Warstat	（ID No. SP21318）

2. Current affiliation: Albert-Ludwigs-Universität Freiburg

3. Research fields and specialties:

    Chemistry

4. Host institution: Nagoya University

5. Host researcher: Prof. Kenichiro Itami

6. Description of your current research

In the context of my PhD studies in the group of Prof. Breit at the Albert-Ludwigs-University in Freiburg I am working on the design, synthesis and biological evaluation of epigenetic modulators. Epigenetics is a young and rapidly growing field which is dealing which reversible changes in the chromatin. These changes can be at the DNA itself or at the histone proteins, around which the DNA is wrapped inside the nucleus. The modifications can regulate the transcription of gene sequences. In cooperation with Prof. Günther we developed a family of bromodomain inhibitors with an interesting selectivity profile which show promising activities for breast cancer therapy. Recently we evolved together with Prof. Hansen our inhibitors further and designed and synthesized some dual BRD/HDAC inhibitors. These show a superior effect compared to treatment with the combination of a BRD inhibitor and a HDAC inhibitor potentially due to the higher local concentration inside the cell and close to the desired targets. Besides that, dual inhibitors can reduce side effects which commonly occur in combination cancer therapy. Furthermore, our dual BRD/HDAC inhibitors exhibit complete growth inhibition on some leukemia cancer cell lines compared to only a 70 to 80% growth inhibition for the bromodomain inhibitors. In the scheme below you can see on the left side the fundamental structure of our bromodomain inhibitors, in the middle and on the right our two most advanced dual BRD/HDAC inhibitors.

BET-BRD7/9 inhibitor   dual BRD/HDAC inhibitor   dual BRD/HDAC inhibitor

7. Research implementation and results under the program

Title of your research plan:

SAR Study of Fairy Chemical ICA

Description of the research activities:

A few years ago, various plant-growth stimulation compounds produced by fungi have been discovered. However, the mode of action and the structure-activity relationship (SAR) of these compounds is still poorly understood, and their target proteins are still unknown. Itami and Coworker already synthesized and tested some AHX derivatives. During my stay in his group, I synthesized several imidazole-4-carboxamide (ICA) derivatives. AHX and ICA are two of the discovered plant-growth stimulants, while AHX promotes root-growth of rice, ICA inhibits it. Investigation of the SAR of these molecules could lead to the identification of the biological target as well as promising fertilizer for agriculture. To get a better understanding of the interaction of the molecules with their biological target, I modified the imidazole at different positions. The influence of these modifications on the root-growth still must be evaluated. Afterwards new compounds with even better activities can be designed and synthesized.
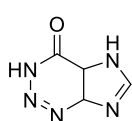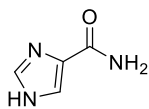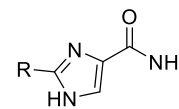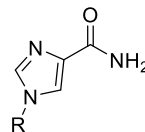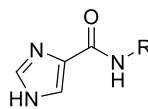
AHX   ICA   ICA derivatives

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

I really enjoyed my stay in Japan, especially because of all the kind and nice people I got to know during my time here. Besides that, I love the Japanese food and I did my best to try as many different dishes as possible (if you ever get to Yamanashi Prefecture, I recommend you try Hoto noodles!). Last but not least the landscape in Japan with all the autumn colours is amazing.

9. Adviser's remarks (if any):

JSPS Summer Program 2021
Research Report

1. Name: Ashley M. ATKINS   (ID No. SP21001)
2. Current affiliation: University of Hawaii at Manoa
3. Research fields and specialties: Social Sciences; Biological Sciences
4. Host institution: Kyoto University
5. Host researcher: Dr. Masato NAKATSUKASA

6. Description of your current research

For my dissertation research, I am studying Holocene human skeletal collections from Japan, particularly those from the hunter-gatherer-fisher Jomon group, the agriculturalist Yayoi group, and historical modern periods to investigate how the different activities associated with fishing and farming can be identified in postcranial skeletons through musculoskeletal stress markers. The transition from fishing, hunting, and gathering to full-time agriculture impacted populations worldwide. Japan has an incredibly unique perspective, as the Jomon had a dynamic way of interacting with their environment that we do not see with other hunter-gatherers. To conduct this research, I used two methods: one semi-qualitative and one quantitative. For the semi-qualitative method, I scored 72 muscle attachments (36 per side) from the upper and lower limbs to assess the musculoskeletal stress markers using a modified Hawkey and Merbs (1995) method. For the quantitative approach, I have created an innovative 3-dimensional way to measure the mean curvature of each muscle attachment.

7. Research implementation and results under the program

   Title of your research plan:

   HABITUAL ACTIVITY INDUCED MUSCULOSKELETAL STRESS MARKERS
   AMONG PREHISTORIC AND MODERN HUNTER-FISHER-GATHERERS AND
   FARMERS: A CASE STUDY FROM JAPAN

   Description of the research activities:

While in Kyoto, I collected data from 17 Jomon (hunter-gatherer-fisher) sites. I scored 72 muscle attachments (36 per side) from the upper and lower limbs to assess the musculoskeletal stress markers of 248 Jomon individuals. The musculoskeletal stress markers were scored for three main categories, and within each category there were four specific grades. The categories scored were robusticity, stress lesion, and ossification exostosis. The grades were 0 for the absence of expression, 1 for faint expression, 2 for moderate expression, and 3 for strong expression (Hawkey and Merbs, 1995).

For the quantitative method, I conducted the photogrammetry necessary to create the 3-dimensional surface meshes. The bone was sat upright on an electronic turntable so the camera

could get more than half of the bone in the viewfinder. For each bone, 108 photographs were taken from three different angles (36 photographs per angle) of one half of the bone, then the bone was flipped, and 108 more photographs were taken of the distal half of the bone. The 216 photographs of the bone were then uploaded into photogrammetry software. The software combines the photographs from all angles of both sides of the bone to create a three-dimensional surface mesh of the bone, complete with realistic productions of the musculoskeletal stress markers on the bone as the mesh is textured accurately. A curvature analysis was done on the surface mesh and then ran through a program created by my colleague to extract the mean curvature of the musculoskeletal stress markers. I did the photogrammetry for 75 of the Jomon bones housed at Kyoto University.

My research is still ongoing, as I am currently collecting data on Edo remains at the National Museum of Nature and Science in Tsukuba. As a result, I still need to finish conducting the data analysis. However, the general pattern of the preliminary statistical analysis of this data shows that the musculoskeletal stress markers of the Jomon (hunter-gatherer-fishers) had lower total scores than the Yayoi (rice farmers) remains I assessed from Kyushu University in 2019. This pattern agrees with my hypothesis that you can identify different activities in the postcranial skeleton and that farming is more physically stressful on the body than hunting, gathering, or fishing.

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

I have previously spent months in cities throughout Japan, but never Kyoto. Kyoto has now become one of my favorite Japanese cities. It is such a beautiful city! The traditional nature of Kyoto was amazing to me. Seeing geisha in the streets and performing traditional dances was wonderful, and there are so many gorgeous temples throughout the city. I highly recommend visiting this city!

I also had such a great time at this university. The department was so kind and friendly, and they always made me feel at home. I am still good friends with some of the graduate students I met there, and though I am currently in Tsukuba, I still have gotten to see some of them. We have planned a trip to Universal Studios in Osaka before I leave Japan. I am so grateful to have made lifelong friends through this program!

9. Advisor's remarks (if any):

JSPS Summer Program 2022
（**SP21003**） Research Report

1. Name: CALDERARO Silvina Beatriz (Bibi)	（ID No. SP21003）

2. Current affiliation: CUNY, The Graduate Center

3. Research fields and specialties:

    Humanities   Social Sciences   Interdisciplinary and Frontier Sciences

4. Host institution: Research Institute for Humanity and Nature

5. Host researcher: Prof. Saeko OKADA

6. Description of your current research

I came to Kyoto, Japan to better understand the concept and practical implementation of Satoyama Landscapes. My questions are if and how it can be understood as a regenerative process, what are the implications with regard to environmental education and literacy, and whether the different ways of practicing it tend toward conviviality with the more-than-human world.

7. Research implementation and results under the program

Title of your research plan:

Exploring Satoyama as natureculture framework and land-based practice from which to learn about multi-species conviviality.

Description of the research activities:

Upon my arrival in Kyoto and prior to my field trips (see below) I had several conversations with many RIHN faculty regarding different views on Satoyama, land uses and practices and extended sustainability research.

From June 11th until July 29th I engaged with the satoyama club MatsutakeYama Revival Corp. in Iwakura, Kyoto. Here I conducted several interviews of its members as well as informal conversations throughout the daily activities during their gatherings on Fridays and/or Saturday of each week. I also took many field notes and photographs. On July 29th upon the request of its members I presented a final report and engaged the members in participatory dialogue about their future goals and vision for the club.

On July 3rd I did a day field trip to Kameoka City and visited a Satoyama Club active in the area. I took field notes and photographs. Also visited a Cultural Center in the outskirts of town.

From July 4th to July 8th I traveled to the Echigo-Tsumari Triennial and areas linked to this event to do field observations, conduct interviews with local members of the community and artists. I will visited other Satoyama Landscapes related to agricultural and artistic practices having to do with revitalization projects and other Satoyama-Satoumi cultural practices. I was accompanied by the Japanese-English interpreter, Chisai Fujita-san. I traveled over 400 km. in the area by their car, visiting many different sites.

From July 10th to July 14th I traveled to the Tanba Takeda area. Here I participated on a daily basis in the operations of Hashimoto Organic Farm as well as doing field observations, conducting an interview with the farmer and other local community members, and visiting landscapes related to agro-ecological practices having to do with organic farming and other revitalization projects and cultural practices. I took many field notes and photographs.

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

I visited several temples, shrines, museums, and other cultural and environmental sites. I also took part in the Gion Matsuri festival. I attended a Noh theatre performance.
I tried many new foods both in restaurants and with street vendors.

9. Adviser's remarks (if any):

JSPS Summer Program 2022
Research Report

1. Name: Sara King	（ID No. SP21005）

2. Current affiliation: PhD student, University of Hawaii and Manoa

3. Research fields and specialties:
    Social Sciences

4. Host institution: Kanto Gakuin University

5. Host researcher: Prof. Momoko NAKAMURA

6. Description of your current research

My focus is within the field of sociolinguistics. My research deals mainly with the expression of speaker identity through the use of linguistic resources. The site of this expression may be in real-life interactions between two or more interactants or in scripted/un-scripted forms of media, in which case the use of linguistic resources often represents a mediatized and/or commodified use of a linguistic style of speech. I am most interested in linguistic resources related to (im)politeness, gender, and regional dialect. My research usually involves discourse analysis of interactions that considers native speaker's perceptions of the linguistic forms under investigation.

7. Research implementation and results under the program

Title of your research plan:

Japanese sports commentary at the 2020 Summer Olympics with su style

Description of the research activities:

My research examined the innovative use of *su* (a shortened form of the Japanese addressee honorific *desu*) by a male sports announcer at the Tokyo 2020 Summer Olympics. Recent work into the use of *su* style by young members of a sport club illustrated the ways in which *su* can be utilized much like addressee honorifics *desu*/-*masu* to express 'politeness' while a meta-analysis of online comments regarding *su* showed that many speakers actually find the use of *su* style to be impolite (Nakamura 2021). Because of this, we might not expect *su* style to appear in the speech of an announcer during a major television broadcast, but the *su* style that appeared at the Tokyo 2020 Olympics event was discussed by Japanese media outlets, garnering numerous positive evaluations as well. This appears to signal a change in the perception of *su* style and, as such, this research aimed to investigate the way *su* style was used at the Tokyo 2020 Olympics and identify how its usage may be similar to or different from the more canonical addressee honorifics *desu*/-*masu*. The findings suggested that *su* can function, not just as another form of addressee honorifics, but also as a linguistic resource that can index speaker identities relevant to ongoing speech activities. As a result, these findings contribute to our growing understanding of the multi-functional use of honorifics in Japanese.

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

During my stay at Kanto Gakuin University, I was very well taken care of, and everything was prepared for me upon my arrival. I felt very welcomed and supported. I would highly recommend other researchers to choose KGU for the site of their research in the future.

JSPS Summer Program 2022
Research Report

1. Name: Elaine N. MILLER	（ID No. SP21006）

2. Current affiliation: The George Washington University

3. Research fields and specialties:

    Social Sciences

4. Host institution: Kyoto University (EHUB)

5. Host researcher: Prof. Ikuma ADACHI

6. Description of your current research

My research aims to further our understanding of how sociality has evolved in primates therefore shedding light on the origins of human sociality. Previous research has shown that primates find value in observing and experiencing social interactions (Mason et al., 1963; Andrews & Rosenblum, 1993; Deaner et al., 2005; Mulholland et al., 2021). For my project, I investigated if chimpanzees show a preference for viewing brief video clips of conspecifics interacting with one another while performing an action, conspecifics independently performing an action or video clips of the surrounding environment with no conspecifics present. The data from experiments like this one yield a deeper understanding of what a chimpanzee finds rewarding and prompts further investigation. For example, if chimpanzees are motivated to observe social interaction, how does this inform their behavior?

7. Research implementation and results under the program

Title of your research plan:

Social, Nonsocial, and Environmental Video Preferences in Chimpanzees

Description of the research activities:

First, I produced a series of video clips from footage taken at the Tama Zoo. Some of the footage was collected by another party but posted publicly for use. I collected the rest of the footage as I traveled to Tama Zoo and recorded the chimpanzees. We chose to focus on creating video clips of three actions: grooming, playing, and eating. Additionally, I collected footage and produced clips of the environment.
To perform the experiments, chimpanzee participants enter the test booth. Participants are presented with three colored rectangles, each representing a different type of video content: 1. social interaction between chimpanzees such as two individuals playing together, 2. nonsocial action of chimpanzees such as two chimpanzees playing independently, and 3. the environment where these actions take place such as the giant climbing structure. After each trial, the chimpanzee receives a banana pellet as a reward. We measure the frequency at which each chimpanzee chooses each type of video. Although I have run several tests with multiple chimpanzees, it seems that they are still learning the associations between the colored rectangles and the video content they represent. We intend to continue experiments with the help of another research assistant. This way we can observe any preferences that the chimpanzees might develop as they improve their understanding of the task.

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

I deeply enjoyed my time as a JSPS fellow. I learned so much about chimpanzee behavior, and just as enriching, I learned so much about Japanese culture. I rode my bike all over Inuyama and some of the surrounding areas to visit castles and try different restaurants. I took the Shinkansen to Kyoto where I visited beautiful nature and landmarks. Nearby in Nagoya, I visited temples, shrines, and the castle. Prof. Ikuma Adachi supported me tremendously as he developed this project with me and taught me about the chimpanzees. He cared for me personally by making sure I had everything I needed to thrive.

9. Adviser's remarks (if any):

Miller 氏は、来日直後より実験プロトコルの精緻化、実験で用いるための動画素材の収集等を精力的におこない、短い期間でありながら、データ収集を開始するまでこぎつけた。また、研究室の他メンバーとも良好な関係を構築し、よき同僚として相互に刺激を与えあっていた。実験データをすべて取り終えることはかなわなかったが、今後当研究室で引き続き研究を推進する予定である。

JSPS Summer Program 2022
Research Report

1. Name: Mason LEIST	(ID No. SP21011）

2. Current affiliation: The University of Texas at San Antonio

3. Research fields and specialties: 　　Mathematical and Physical Sciences

4. Host institution: The University of Tokyo

5. Host researcher: Assistant Professor Itsuki SAKON

6. Description of your current research

It is widely known that cosmic dust includes carbonaceous and silicate species, but the detailed chemical identifications have not been made completely and their properties are still quite limited. In order to properly attain an interpretation of the observed infrared (IR) spectra of astrophysical phenomenon (including active galactic nuclei (AGN)), we must study the IR properties of the dust surrounding these objects. We do so by studying the spectral properties of our objects, then making a comparison to the measured IR properties of real dust samples, including laboratory analogues of cosmic dust.

In a laboratory setting, we synthesized Quenched Carbonous Composite (QCC) and Quenched Nitrogen-included Carbonous Composite (QNCC), which are laboratory analogues of cosmic organic dust. We've measured the infrared (IR) transmission and IR attenuated total reflection (ATR; 2-16 μm) spectroscopy of the following carbonaceous and silicate samples:

1. Bituminous coal
2. Enstatite
3. Amorphous silicate
4. Olivine
5. Carbonaceous-Chondrite
6. Graphite
7. QCC
8. QNCC

We then measured the far thermal IR (FTIR; ~16-100 μm) spectroscopy of these samples. These measurements will be used to deepen our knowledge of IR properties of dust and to create a catalog of graphite and silicate IR emission spectra to compare to newly observed IR spectra of AGN from the James Webb Space Telescope (JWST) as well as archival IR spectra from the Spitzer, SOFIA and Herschel observatories.

7. Research implementation and results under the program

Title of your research plan:

Resolving Polar Dust in AGN with JWST: Going Beyond the PSF

Description of the research activities:

I learned how to synthesize QCC and QNCC in a laboratory setting. We found the peak wavelength of the IR spectral features observed in our samples (§6) using ATR spectroscopy. We additionally found the peak wavelength of the IR spectral features observed in our samples (§6) using FTIR spectroscopy. We then combined these measurements for each sample to give us a spectral measurement between 2-100 μm. This has allowed us to build a catalog of spectral measurements for our samples which range in wavelength coverage from the near-IR (0.8-5 μm), mid-IR (5-25 μm) and far-IR (25-100 μm). Future works will include the comparison of these laboratory cosmic dust analogues of cosmic dust to the observed spectra we receive from JWST, as well as archival spectroscopic observations made by Spitzer, SOFIA and Herschel.

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

My time in Japan has been absolutely terrific! Sakon-san has been a wonderful host and I greatly wish to continue with this work and collaborate on future research projects. ToDai has also been a terrific host institution. I did my best while here to visit as many historical sites (i.e., Shensu-ji, Kanda Myojin shrine, Nezu Shrine), experience cultural aspects (i.e., the Grand Sumo tournament in Nagoya city, Samurai training in Shibuya, stay at a traditional Japanese Ryokan), see the outdoors (i.e., climbing Mt. Fuji, Lake Kawaguchiko), and sample much of the modern aspects (i.e., teamLab Borderless, Skytree tower) as well. This has been a fantastic experience, one that I shall treasure for life and I sincerely hope I am giving another opportunity to return to this fabulous country!

9. Adviser's remarks (if any):

During Mason Leist-san's visit, James Webb Space Telescope (JWST) team has publicly released very impressive first light images of JWST. He uses the JWST data to investigate the properties of active galactic nuclei (AGN). I, as a host researcher, believe he will be pioneering the frontier of this field using the very latest and revolutionary datasets brought by the JWST. The present two months' program has been a precious experience also for the host researcher and I would greatly wish that we continue and promote research collaborations in the future.

JSPS Summer Program 2022
Research Report

1. Name: Florestan Martin-Baillon	(ID No. SP21202)

2. Current affiliation: Université d'Angers

3. Research fields and specialties:

  Mathematical and Physical Sciences

4. Host institution: Kyoto Institute of Technology

5. Host researcher: Yûsuke Okuyama

6. Description of your current research

My research is focused on dynamical and geometrical aspects of group representations. Group representations from a finitely presented group to a Lie group arise naturally from the study of geometric structure on manifolds and low-dimensional topology. Such a representation acts naturally on several spaces called flag varieties, which are generalizations of projective spaces and Grassmanian varieties, and these action generically exhibit a rich chaotic dynamics due to their contractive nature. A fundamental problem is to understand how this dynamics changes when the representation varies: in a given family of representations, do the dynamical properties stay the same (the family is stable) or do they change abruptly (the family bifurcates) ?

I have introduced and studied a notion of dynamical stability, the proximal stability, for holomorphic families of representations into higher rank linear groups, generalizing a notion of stability due to Sullivan. This notion of proximal stability correspond to the stability of proximal elements (the elements which contribute the most to the dynamics) in the family of representations.

Generalizing work of Deroin-Dujardin, I showed that this property can be detected using a bifurcation current on the parameter space, a potential theoretic object, inspired by an analogous notion in complex dynamics. This bifurcation current is defined using the Lyapunov exponent of the representation.

This allows to study the dynamical aspects of representations using tools from potential theory, which has been proved very useful in the field of complex dynamics in several variables, in particular to show various equidistribution results in parameter space.

In collaboration with David Dumas, we are currently studying a particular class of representations, the holonomies of G-opers. We show that the Lyapunov exponents of such a representation can be expressed using geometric quantities associated to the oper, the Schubert degrees. This establishes a link between the geometrical and dynamical properties of the representations and allows to study the space of opers.

7. Research implementation and results under the program

Title of your research plan:

Degeneracy of Lyapunov exponents of meromorphic families of SL(n,C)-representations

Description of the research activities:

Our project was to understand how to generalize a result of Dujardin-Favre about meromorphic families of SL(2,C)-representations to SL(n,C)-representations for any n greater than 2.

This result of Dujardin-Favre gives an asymptotic for the Lyapunov exponent of the family of representations when the representation "goes to infinity" in a meromorphic fashion. More precisely, they show that this divergence is controlled by a non-Archimedian Lyapunov exponent, associated to an action on the Berkovich projective line naturally associated to the family. The first part of my stay consisted of understanding this result and the formalism of Berkovich projective spaces.

To generalize this result, we then had to study the combinatorial structure of the Berkovich projective space in higher dimension. Indeed, in dimension 1, the Berkovich projective line has the structure of a (hyperbolic) tree which makes some analytical considerations more amenable. In higher dimension, only a partial structure of building (in the sense of Bruhat-Tits) persists. We studied this building structure (using work of Parreau and Rémy-Thuillier-Werner) to try to adapt Dujardin-Favre's argument.

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

During my stay I had many opportunities to discover the incredible cultural heritage of Kyoto. I was amazed by the richness of the Japanese culture.

9. Adviser's remarks (if any):

We did intensive and fruitful discussions.
We also worked on several problems, and plan to
submit to an academic journal once our work would be complete.

JSPS Summer Program 2021
Research Report

1. Name: Laurène BARBIER　　　　　　　　　　　　　　（ID No. SP21203）

2. Current affiliation: Université Lumière Lyon 2

3. Research fields and specialties:
   Social Sciences, Linguistics

4. Host institution: Tokyo University of Foreign Studies

5. Host researcher: Prof. Shinjiro KAZAMA

6. Description of your current research

I will start a PhD on October the 1st 2022 as part of the SALTA (Spatial Asymmetries Across Languages) project funded by the National Research Agency (ANR) in France. The intended research focuses on the expression of spatial events and the Source/Goal asymmetry in Negidal, a moribund Tungusic language spoken in Far-Eastern Siberia. This research plan includes a grammatical sketch of the language in question. I also intend to investigate the influence of language contact with Russian with respect to the expression of spatial events. It is directly linked to my previous research as a Master student, which were revolving around the influence of Russian on Negidal syntax, and especially adverbial clauses and subordination in general.

7. Research implementation and results under the program

Title of your research plan:

The expression of spatial events and the Source/Goal (a)symmetry in Negidal

Description of the research activities:

During my stay at the Tokyo University of Foreign Studies under the supervision of Pr. Shinjiro Kazama, we glosed and translated in English his grammatical sketch of Lower Negidal dialect, now most likely extinct, which was at that time only written in Japanese. Lower Negidal dialect is by definition very close to Upper Negidal, which I investigated as part of my master thesis last year. This research activity will play a very important role in my upcoming PhD research, especially for the grammatical sketch I intend to write, as it contributed to strengthen my understanding of Negidal, thanks to the multilingual knowledge of Pr. Kazama and his rich experience of fieldwork.

We also transcribed and reflected on unprocessed audio recordings of Lower Negidal Pr. Kazama made in the 1990s. As the language is now extinct, but very close to the other dialect I am currently investigating, those recordings are highly valuable, as I only had access to Upper Negidal recordings and narratives so far. This work was therefore very fruitful for both my supervisor in France, Brigitte Pakendorf, and me.

During my stay, I also took the opportunity to meet Pr. Yo Matsumoto of NINJAL, who is a member of the SALTA project, as part of which I will conduct my PhD research. Following that meeting, he gave me the chance to give a talk to present my upcoming research at NINJAL in a hybrid form on September the 15th.

Finally, during the last week of my stay, I was also able to go on a business trip to Hokkaido for two main purposes. The first one was to attend the Slavic Linguistics 17 Conference at the Slavic Research Center of Hokkaido University where I could meet other researchers working of linguistics of Tungusic and Siberian languages and attend the various talks organized and related to my research. The second purpose of that trip was to go to the Hokkaido Museum of Northern Peoples, in Abashiri. There, I was able to see their important collections of Tungusic objects, which are impossible to see in France, and to go through documents at their research center and library, such as for example the journal they publish regularly, the *Bulletin of the Hokkaido Museum of Northern Peoples*.

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 2022
Research Report

1. Name: Nadia GUEROUAOU	（ID No. SP21204 ）

2. Current affiliation: Sorbonne University and University of Lille (co PHD)

3. Research fields and specialties:

      Humanities   Social Sciences   Engineering Sciences

      Interdisciplinary and Frontier Sciences

4. Host institution: Waseda University

5. Host researcher: Prof. Katsumi WATANABE

6. Description of your current research

My current research aims at assessing participants' moral attitudes towards the idea to use a voice-transformation technology to repair or enhance their emotional/psychological states. Voice transformation, as made possible by recent signal processing or artificial intelligence (AI) tools, has important existential and ethical implications. For instance, voice transformations can be used to make a lawyer or a call center operator's voice appear more convincing or trustworthy (Ponsot et al., 2018), or to make a call to emergency medical services sound more urgent and important (Boidron et al., 2017). All these applications raise questions about the perceived morality of their use, yet we have limited knowledge about the public's intuitive attitudes toward them.

Inspired by the methodology of recent work in 'experimental ethics', e.g. on the subject of AI-powered autonomous vehicles (Bonnefon et al., 2016), I have conducted a study in which I presented online participants with short situational vignettes, describing potential applications of voice technologies. Participants are asked to read each vignette and answer a short series of questions about how morally acceptable they think each situation was. In addition to questions about the vignettes, participants are also asked to answer questionnaires measuring e.g. personal attitudes toward morality (Moral Foundations Questionnaire MFQ; Graham et al., 2011) and toward technology/science fiction (Science Fiction Hobbyism Scale; Laakasuo et al., 2018). This attitudes towards new technologies are subjects to cultural differences, my aim is thus to study how culture impacts moral judgements towards the use of voice transformation technologies.

Every culture has rules about what is right or wrong, but they often disagree on the particulars of moral decisions. For example, most people refrain from acting in a purely self-interested manner in economic games, but different cultures have different expectations about what constitutes fair behavior in these games (Henrich et al., 2005). A recent online study by Awad et al, 2020 tried to approach the question of universals and variations in moral decisions investigating when people find it acceptable to sacrifice one life to save many, in 42 countries and 70,000 participants. They analyzed responses to three sacrificial dilemmas. In every country, the three dilemmas were ranked in the same way in terms of sacrifice acceptability, but the quantitative acceptability of each sacrifice, however, showed substantial country-level variations. In addition, our own french research has shown that attitudes towards voice transformations depends on an individual's familiarity with science-fiction and new technology It is well-known that attitudes towards e.g. robots differ in France and Japan (Haring et al. 2014) and it is possible that similar factors shape intercultural differences in moral attitudes to voice transformations.

7. Research implementation and results under the program

Title of your research plan:

Study of cultural impacts in moral judgements towards the use of voice transformation technologies.

Description of the research activities:

In order to learn about this cultural differences, I set out to meet researchers involved in projects related to the creation of these new tools for self-transformation. I designed a standardised interview to be able to . I also wanted to meet artists who are involved in art-science projects, because this form of expression allows us to address ethical issues that concern society in a way that proposes a different form of reflection than we can as scientists.I have met researchers and artists engaged in the question of AI, artificial life, robots, human-machine interactions. Every encounter allowed me to visit the lab of the researcher, to meet with the team and to try some devices (like the Face Transformation mirror of Dr Yoshida). Here is the list of the researchers and artists: Pr Takashi Ikegami at the University of Tokyo / Pr Philippe Codognet at Sorbonne University, on leave at CNRS. Director, Japanese-French Laboratory for Informatics (JFLI) / Pr Koichiro Eto at National Institute of Advanced Industrial Science and Technology / Pr Yuko Yotsumoto at the University of Tokyo / Pr Olaf Witkowsky Director of Research at Cross Labs (Kyoto) / Dr Shigeo Yoshida at OMRON SINIC X Corporation / Dr. Elena Knox, media artist and scholar. Some interviews could not be run before my departure, but I am in contact to do them from Zoom when back in France. It concerns Pr Arisa Ema, Pr Gentiane Venture and Pr Watanabe.

The interviews were 2H30 long and each one of them has been extremely enriching and each of this researcher I have met invited me to visit again, which I'd be glad to do. The aim is that my fellow researchers in France can hear also about these Japanese researchers' inspiring insights. I have read that in the past Japanese philosophy "tetsugaku" was inspired by western philosophy relativising it, interpreting it, sometimes fusing it with existing thoughts. Perhaps, in our turn, western researchers could do the same, be inspired by eastern point of view, not to adopt it as it is, but to digest it and thus vivify our reflection.

In addition, I have been presenting my research at the University of during Pr Yotsumoto's lab seminar and visiting Cross Labs in Kyoto.Also I have been visiting exhibitions related to this same topics at the Miraikan and ICC NTT.

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

My stay was extremely rewarding. The exchanges at Watanabe's Lab about our cultural differences gave me a better understanding of what life is like as a PhD student here and how research works in Japan. Also the setting of my welcome was wonderful, the Waseda campus and its incredible library in which I spent many hours will remain a beautiful memory. On a more personal level, I am a great lover of coffee and records. I was able to discover that Japan has a lot to offer in this respect, with its many jazz kissa and listening bars. I hope to return to Japan after my PhD and continue to discover this country which I have fallen in love with.

9. Adviser's remarks (if any):

She conducted a series of field works and intensive interviews in Japan in order to accumulate narratives of from regarding acceptability of AI-medilated technologies. These narratives alone are considered important data and will be the basis of further research development. Her presence significantly increased the international environment in my lab and casual interactions between her and lab members (including myself) and led to several research ideas, which we will explore in the future. We can be proud of ourselves for this research experience.

JSPS Summer Program 2022
Research Report

1. Name: GACHET Cécile	（ID No. SP21205　）

2. Current affiliation: Université Côte d'Azur, France

3. Research fields and specialties: 　　Mathematical and Physical Sciences

4. Host institution: Graduate School of Mathematics, University of Tokyo, Japan

5. Host researcher: Professor K. Oguiso

6. Description of your current research

My current research lies in birational complex algebraic geometry. More precisely, I am interested in various aspects of varieties with nef anticanonical divisors. On one side of this spectrum lie Fano varieties, namely varieties with ample anticanonial divisor: their birational geometry is particularly nice, as their nef cone is generated by finitely many classes of semiample divisors. They also are rationally connected, and the behavior of their rational curves (their degree with respect to the anticanonical divisor, their families of deformations) can tell a lot about their geometry. On this side, I recently proved that varieties of dimension n with strictly nef r-th exterior power are Fano varieties in the cases $r=3$, $n > 3$, $r = 4$, $n > 4$, and $r = n - 1$, $n > 1$.[1] This result is to be put in the context of the Campana-Peternell conjecture[2], that for $r = n$, varieties with strictly nef r-th exterior power of the tangent bundle (i.e., with strictly nef anticanonical divisor) are Fano varieties.

On the other side of the spectrum lie varieties with trivial canonical class, such as Calabi-Yau variety. Their nef cone is the subject of the Kawamata-Morrison Cone Conjecture, and the existence of rational curves on them is predicted by a folklore conjecture (see a related conjecture by Oguiso too). Before and during my stay in Japan, I have been working jointly with Hsueh-Yung Lin and Long Wang on establishing the Cone Conjecture for some particular Calabi-Yau varieties, and more generally, for some particular varieties with globally generated anticanonical divisor. We call them Schoen varieties as they generalize examples by Schoen [3]obtained as fibre products of rational elliptic surfaces over the projective line.

I also work on classifying certain contractions of Calabi-Yau varieties, namely those given by a nef and big divisor D such that $c_2(X)D^{n-2}= 0$. Equivalently, I am interested in classifying finite quotients of abelian varieties by a group acting freely in codimension 2 that admit a Calabi-Yau, or more generally a crepant resolution. This classification was carried out by Oguiso in dimension 3, and I recently extended it to dimension 4.

7. Research implementation and results under the program

1　C. Gachet, *Positivity of higher exterior powers of the tangent bundle*, arXiv 2207:10854

2　F. Campana and T. Peternell, *Projective manifolds whose tangent bundles are numerically effective*, Math. Ann. **289** (1991), no. 1, 169--187

3　C. Schoen, *On fiber products of rational elliptic surfaces with section*, Math. Z. **197** (1988) , 177-199

Title of your research plan: *Finite quotients of abelian fivefolds with a crepant resolution*

During my stay, I worked on extending my previous results to dimension 5. I obtained the following result, which I am currently writing down as a future preprint: Let A be an abelian variety and G be finite group acting freely on A in codimension 2. Then A/G admits a crepant resolution if and only, after a finite étale cover, it is isomorphic to a product

$$B \times E_j^3 / \langle \mathrm{diag}(j,j,j) \rangle \text{ or } B \times E_{u\_7}^3 / \langle M_7 \rangle,$$

where B is an abelian surface, u_7 is a certain quadratic integer, and M_7 is a certain (explicit) 3 by 3 matrix of multiplicative order 7. In particular, A/G admits no Calabi-Yau resolution.

Description of the research activities:

I divided my stay between work on my collaboration with Huseh-Yung Lin and Long Wang on the Cone Conjecture, and work on my afore-mentioned research plan. Giving talks at the student's seminar organized by Professor Oguiso, as well as attending the seminar regularly, was very benefitiary to my project. In particular, I learned a lot about real structures, both at the seminar and during the lectures of Professor Oguiso at Nagoya University, which I visited early on in my stay. That is reflected in a corollary of my joint work with H.-S. Lin and L. Wang: a simplified statement of what we prove is that a variety satisfying the Cone Conjecture has finitely many real structures. It is inspired by the work of Cattaneo and Fu[4]. A remark by Professor Oguiso also helped me conclude the proof of the afore-mentioned main result of my research plan.

I took the opportunity to discuss with Professor Ishii and Professor Tanimoto at Nagoya University, Professor Gongyo at University of Tokyo, and Professor Ito at Kavli IPMU.

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

I had the opportunity to enjoy the city of Nagoya during a research visit, as well as the nature around Tokyo, for instance in the Kanagawa prefecture, during my free time.

9. Adviser's remarks (if any):

Keiji Oguiso (host) is very happy to be a host of Doctor Cécile Gachet. She made several very substantial and important progress in her research and communicated with several mathematicians in Japan including her very interesting joint work with Doctor Long Wang and Professor Lin (he was previously in IPMU). I hope that Doctor Cécile Gachet will come back again to Japan for further research in future. I am very happy to be a host of her again if she would wish.

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4 A. Cattaneo and L. Fu, *Finiteness of Klein actions and real structures on hyperkähler manifolds*, Math. Ann. **375** (2019), no. 3-4, 1783--1822

JSPS Summer Program 2022
Research Report

1. Name: Pierre BRAS	（ID No. SP21207）

2. Current affiliation: Sorbonne University, Paris

3. Research fields and specialties:

    Mathematical and Physical Sciences   Engineering Sciences

4. Host institution: Osaka University, Graduate School of Engineering Science

5. Host researcher: Prof. Masaaki FUKASAWA

6. Description of your current research

My current research focuses on numerical methods for probability and statistics with applications to machine learning and mathematical finance, in particular for stochastic optimization using stochastic gradient descent methods.
I study the Langevin equation which corresponds to a noisy gradient descent, in order to solve minimization problems.
I also study algorithms giving approximation of the solution to stochastic differential equations. I propose improvements of these algorithms using control variates in order to accelerate the convergence rates.
My personal research website: https://perso.lpsm.paris/~pbras/.

7. Research implementation and results under the program

Title of your research plan:

Weak convergence rates of numerical schemes for Volterra (memory) stochastic differential equations with regular and fractional kernels

Description of the research activities:

My research in Japan has focused on establishing error rates of numerical approximations of solutions to Volterra stochastic differential equations. The difference with classical differential equation is that the future variations of the process do not only depend on the current value of the process, but on all the previous values of the process too (memory effect). Analysing such memory equations is more difficult and requires path-dependent analysis.

We establish convergence rates for the case where the kernel is regular and we show that they are the same as for classical stochastic differential equations; this result is new to our knowledge. We also tried to tackle the case of singular fractional memory kernels, i.e. of the form $(t-s)^{alpha}$ with alpha in the interval $(-1/2, 0)$. Such irregular trajectories are more able to account for short-term correlation effects in random time series such as in mathematical finance. Analysis of weak error rates (i.e. average error) is more complex than strong error rates (i.e. error trajectory per trajectory) and relies on specific methods: Malliavin calculus, partial differential equations theory, regularization by convolution...

This research is still an on-going work; we are planning to submit a paper in the next few months.

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

I could visit professors in Japan whose research also focuses on numerical stochastic analysis: Prof. Arturo KOHATSU-HIGA (Ritsumeikan University) and Prof. Toshihiro YAMADA (Hitotsubashi University, Tokyo).

9. Adviser's remarks (if any):

Pierre has made a serious effort to develop an infinite dimensional extension of weak error analysis. With his excellent contributions, we have reached a core idea to solve our problem and will be able to write a joint paper hopefully soon.

JSPS Summer Program 2022
Research Report

1. Name: Rajarshi SINHA-ROY	（ID No. SP21208　）

2. Current affiliation:

(a) Laboratoire des Solides Irradiés, E cole Polytechnique, CNRS, CEA/DRF/IRAMIS, Institut Polytechnique de Paris, Palaiseau F-91128, France;

(b) European Theoretical Spectroscopy Facility (ETSF), www.etsf.eu.

3. Research fields and specialties:

Mathematical and Physical Sciences

Interdisciplinary and Frontier Sciences

4. Host institution: Center for Computational Sciences, University of Tsukuba.

5. Host researcher: Prof. Kazuhiro YABANA

6. Description of your current research

Ultrafast Processes and Excitonic effects: my current research concerns developping new theoretical tools and the associated numerical codes for the description of ultra-fast dynamics of electrons during interaction of electromagnetic waves in materials. The approach is based on Time-dependent Density Functional Theory (TDDFT) for the electronic dynamics. The project relies on taking advantage of the availability of efficient exchange-correlation kernels for TDDFT expressed in the frequency domain to design new exchange-correlation potentials which could be used for the equations in the time domain, as they allow to incorporate directly the time dependence of the light pulse. The goals is to address the excitonic effects in ultra-short laser driven experiments in solids, and nanoclusters, in relation with the pump-probe experiments.

Magneto-Optical Properties of Metal Clusters: my other research interest is numerical simulation of optical, opto-magnetic and magneto-optic properties of metal clusters in the size range from clusters consisting of a few atoms to the ones have a size of around two nanometer. In particular, I use jellium description of the many-electronic system and perform real-time TDDFT calculation on them to study the generation of opto-magnetic effects such as Inverse Faraday effect in them. The objective of these simulations is to understand the quantum mechanical effects and limitation on the generation of orbital angular moment (and hence magnetism) in nanometric pieces of metals, and thus explore the possibility of using them in spintronic applications.

7. Research implementation and results under the program

Title of your research plan:

Simulation of Generation of Light-Induced Orbital Angular Momentum In Metasurface of Jellium Spheres: A Real-Time Time-Dependent Density-Functional Study

Description of the research activities:

My research activity during this stay was mostly learning the ab-initio real-time TDDFT approaches developped in the group of Prof. Yabana. In particular, the installation and the practical use of the code SALMON [https://salmon-tddft.jp/] have allowed to perform numerical simulation on two-dimensional metasurface of jellium spheres which mimic arrayed nanoparticles which, in present days experiments, are possible to be synhesized or deposited on matrix. We have calcuated linear optical response in this kind of jellium-metasurface and initial results shows quantum mechanical effects that can be captured using TDDFT. Taking advantage of discussing with the developpers of the code we improve it by fixing the some bugs, which allowed to make quick progress. We are looking forward to perform more simulation which will eventually lead to understanding of novel physical phenomena that would merit publication in peer-reviewed journal.

Discussions with the developpers and users of the code SALMON which has showed mutual interersts in scientific activities and thus paved the way for collaboration. Apart from my host Prof. Yabana, this includes,
(a) Dr. Shunsuke Sato, Center Center of Computational Sciences in Univ.of Tsukuba;
(b) P.I. Tomohito Otobe, and Dr. Shunsuke Yamada, Kansai Photon Science Inst. (KPSI), National Inst. for Quantum and Radiological Science and Tech. (QST); and
(c) Asst. Prof. Kenji Iida, Institute for Catalysis, Hokkaido University.

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

As I already had he homestay programme of JSPS online in 2021 I could not avail it this time. Nevertheless, the host of my homestay programme is a very nice person and she invited me to stay with them at their hous in Kyoto during the weekend of Gion Mtsuri (16th and 17th July 2022). It was a very good experience for me as I could witness Japanese culture very closely while staying with my host family, but also enjoying the vibrant cultural and festive weeken in Kyoto. Also, during my visits in Nara and Sapporo I could enjoy staying in different parts of the country and learn about the japanese ways of living.

9. Adviser's remarks (if any):

In this visit of Dr. Sinha Roy under the JSPS Summer program, we had an excellent opportunity to start our collaboration. We have exchanged ideas on magneto-optic excitations of metallic nanoparticles, and Dr. Sinha Roy have already made several calculations that show promising results using a computer code SALMON developed in our group. We have agreed to continue the collaborative research on this subject, and hopefully to extend it to a long-term collaboration.

JSPS Summer Program 2022
Research Report

1. Name: Margaux Forge	（ID No. SP21210　）

2. Current affiliation: University of Strasbourg / IPHC

3. Research fields and specialties: 　　Mathematical and Physical Sciences

4. Host institution: RIKEN

5. Host researcher: D. Sci. Hiromitsu Haba

6. Description of your current research

I'm working on the nuclear structure of super heavy nuclei. My current research is centered on experimental studies of two main subjects:

　1. The first one is held in the FLNR of Dubna (Russia) where I've studied the nuclear structure in terms of isomeric states of 254No (Z = 102) nuclei. The experiment consists of a particle accelerator of 48Ca crossing a target of 208Pb where a fusion evaporation reaction will occur in order to synthetize the 254No nuclei. Once is done, the nuclei cross the SHELS separator and is stopped at the focal plane where the GABRIELA set up is taking all the emissions coming from the implanted nuclei (gamma, electrons, x-ray and alpha). I'm focused on the data analysis of such spectroscopic data by using genetic correlation in time and space. All the programming is done with ROOT (C++). The results are then interpreted in terms of nuclear structure by building the decay scheme of the nuclei. A scientific paper is in writing and should be submitted in the next months.

　2. The second subject is centered on the synthesis of new element (Z = 119) in RIKEN of Tokyo (Japan). This experiment is using the RILAC particle accelerator and the GARIS3 separator and focal plane. The same king of work is done compared to FLNR experiments but I'm just focusing on alpha particle escaping from the nuclei in order to identify the new element in a whole bunch of data and noise.

I'm also working on the digital electronics where I'm trying to improve the dead layer of the old analogic electronics. The final purpose is to compensate the pile-up effect (dead time because of limitation in time of electronics acquisition) in order to access to nuclei with very short lifetime.

7. Research implementation and results under the program

Title of your research plan:

"Search of the synthesis of the new element (Z=119) with GARIS3 set up and introduction to digital electronics analysis"

Description of the research activities:

I could learn a lot on the instrumentation of GARIS 3 set up in RIKEN lab. The analysis of the main experiment has been performed online and shifts has been done in order to monitor the well-functioning of the experiment.

Other experiments have been done such as barrier distribution measurement and excitation energy function of $51V + Tb$ fusion evaporation reaction. I could familiarize myself with this new type of experience for the first time and I've performed its data analysis where good results has been obtained.

Since RIKEN is working in collaboration with Kyushu University, I get the opportunity to present my work on 254No results to my colleagues in Kyushu University and met P. Kosuke Morita, the leader man of the super heavy team who discovered the nihonium ($Z = 113$) element.

Finally, I could have an introduction to digital electronics and begin to work in the analysis of this new electronics with the $Z = 119$ experiment by using PSA (Pulse Signal Analysis) processing.

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

I took all my free time to visit Japan and have an overview on the cultural and naturel aspect of Japan. I could visit cities such as Tokyo, Kyoto, Fukuoka, Nara, Osaka, Nikko and some nature spots such as Mitsutoge, Fuji-san and Takao mounts. Japan is a very rich country in terms of religion, culture, nature and food! I could really experience a new way of living and enjoy a lot my mission to RIKEN thanks to a mix of hard work, new contacts and cultural tour of Japan.

9. Adviser's remarks (if any):

I would recommend to anyone to apply for a JSPS grant which will provide a rich adventure on a professional, human and cultural level.

JSPS Summer Program 2021
SP 21211 Research Report

1. Name: Paul BRUAND	（ID No. SP21211）

2. Current affiliation: LAAS-CNRS, Toulouse, FRANCE

3. Research fields and specialties: Engineering Sciences   Biological Sciences

4. Host institution: Institue of Industrial Science, The University of Tokyo

5. Host researcher: Dr. Soo Hyeon KIM

6. Description of your current research
The subject of my thesis is the development of a microfluidic technology for the purification and concentration of nucleic acids thanks to electrohydrodynamic migration. At LAAS, my work was focused on applying the technology to low molecular weight DNA between 150 and 2000 bp. With this device based on microfluidic, we are able to purify and size fractionate milli-liter DNA samples achieving enrichment of 10-fold within few minutes. After proof of concept, we are now trying to adapt the technology to specific applications. I have mainly worked for concentration and purification of circulating cell-free DNA in blood plasma thus trying to concentrate small sizes down to 100 bp within salty solutions. This research project in Tokyo gives me the chance to develop high molecular weight DNA application with the field of DNA storage.

7. Research implementation and results under the program

Title of your research plan:

Purification of high molecular weight DNA for DNA data storage application

Description of the research activities:

With researchers Anthony GENOT and Yannick TAURAN, we focused our activities on preliminary research for newly PEPR MoleculAeXiv research program in which LiMMS, a joint international laboratory between French CNRS and the University of Tokyo, is involved to develop DNA data storage. As a first approach, we worked on high molecular weight DNA synthesis and we set up the characterization methods with nanopore sequencing. This first part introduced me to molecular biology and sequencing technics. We managed to optimize the process to better nanopore sequencing efficiency. Secondly, I have worked on adapting my DNA concentration and separation device to high molecular weight DNA with the objective to use it as a cut-off device to purify the biggest sizes of the samples before sequencing. First approach attended to concentrate and separate single stranded DNA (ssDNA). Some preliminary results showed mild efficiency of the device on ssDNA so we moved on double stranded DNA instead. I proved the concentration of 500 ng of lambda DNA (~50kb) in a first place and then worked on finding parameters to selectively concentrate DNA above a cut-off size around 10 kb. We faced difficulties for size characterization of samples with Bioanalyzer but showed DNA selection at 1,5 kb. We still have to work on device stability to prove its application on DNA storage project.

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

JSPS summer program is an excellent occasion to experience Japanese culture.

9. Adviser's remarks (if any):

JSPS Summer Program 2022
Research Report

1. Name: Guillaume ABRIAT	（ID No. SP21212）

2. Current affiliation: University Paris-Saclay

3. Research fields and specialties:

   Biological Sciences

4. Host institution: University of Electro-communication

5. Host researcher: Dr. Daisuke Nakane

6. Description of your current research

My current research is about *Vibrio cholerae* behavior. During my PhD, I isolated some mutants lacking newly identified proteins that appeared to be defective for motility. Most of my work in France was about their characterization. During my stay in Japan, I was able to do further experiments by using state-of-the-art microscopy setup and I got further insight of the mechanism behind the identified mutants.

It is known that bacteria can sense their environment to orient themselves. Some of the mutants showed different behavior while swimming toward oxygen (aerotaxis).

We setup aerotaxis protocols that allows observation of population of bacteria acting differently toward oxygen. This led to a better understand of mutants' behavior and then, the role of newly identified proteins.

These mutants also exhibit different behavior at single cells level while observed under video-tracking microscopy. Thanks to flagellum labelling, I was able to precisely measure its characteristics and then understand at a more precise scale why they exhibit such difference.

7. Research implementation and results under the program

Title of your research plan: Advanced characterization of *Vibrio cholerae* motility behavior and flagellum characteristics

Description of the research activities:

Precise observation of *V. cholerae* flagellum

I was able to measure shape and locomotion of *V. cholerae* cell in high precision. I was able to successfully establish fluorescent labeling of *V. cholerae* cells and the polar flagellum, and then to observe the cells with high-speed camera and TIRF microscopy.

Characterization of *V. cholerae* swimming behavior

I setup aerotaxis protocols for *Vibrio cholerae* and thus, I was able to observe different behavior from different mutants while swimming toward oxygen.

The analysis of the movies taken showed very interesting data, that will lead to a publication in scientific journal.

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

I visited different labs in other University (University of Nagoya, Rikkyo University and Hōsei University) and did seminars about my work. Some visit will lead to future collaboration between my lab in France and the Japanese University.

I also want to Rikken Institute in Kobe and had fruitful discussions with several researchers there.

I was able to go to Mycoplasma meeting in Sapporo and enjoyed scientific talks.

9. Adviser's remarks (if any):

It was a great time for his stay in Japan. He is very active and worked hard to visualize the cell behavior under optical microscopy. His visit allowed us to promote collaborative research as well as exchange with our students and researcher in related fields. We are happy to keep in touch with him for research collaboration.

JSPS Summer Program 2022
Research Report

1. Name: Florentin JAFFREDO	（ID No. SP21213）

2. Current affiliation: IJCLab

3. Research fields and specialties: Mathematical and Physical Sciences

4. Host institution: Osaka University

5. Host researcher: Prof. Minoru TANAKA

6. Description of your current research

At small scales, the Standard Model (SM) of particle physics is the most predictive theory to date. However, we know that it cannot be the final theory of nature, as it cannot explain some observations such as the non-zero neutrino masses, the nature of dark matter, or gravity entirely.

When looking for New Physics (NP), the flavor sector of the SM (the part describing the various families of fermions) is particularly interesting since it is not really constrained by symmetries, as opposed to the gauge sector. In addition, some hints of deviation from the SM have been observed in experiment testing for the universality of lepton flavor.

My work consists in finding new flavor observables that could help discriminate between various NP scenarios. These observables are divided into 2 categories:

- low-energy observables: particle decay probability, particle oscillation frequency
- high-energy observable: distribution of LHC events.

The phenomenological study of these processes in the context of Effective Field Theory (EFT) or with explicit scenarios can both lead to constraints on the NP coefficients.

My current research mostly concerns flavor observables involving two quarks and two leptons, such as the semileptonic decay of Hadrons $\Lambda_b \to \Lambda_c \tau \upsilon$, or the $pp \to ll$ Drell-Yan processes at LHC.

7. Research implementation and results under the program

Title of your research plan:

Dark Photon and Muon Number Violation.

Description of the research activities:

A Dark photon is a hypothetical particle that closely resembles the usual photon, but which mainly couples to dark matter. The interaction with ordinary matter is expected to be very feeble, but is not constrained by any symmetry.

We considered some observables that could help constrain the dipole coupling of a dark photon to a muon and an electron. We computed the theoretical prediction for the following observables:

- Muonium-antimuonium oscillation: The atom constituted of an electron orbiting an antimuon can oscillate between a matter and antimatter state in the presence of a dark photon. We found that the proposed experiment to measure the oscillation frequency will not put any significant constraint on this scenario

- Muon decay to a single electron and a dark photon: Since the energy distribution of the outgoing electron is peaked in a region where the background is minimal, the constraint obtained is driven by the energy resolution of the detector.

- $\mu^+ e^- \to \mu^- e^+$ Collision: In a proposed high-energy muon-electron accelerator, a dark photon signature could be the presence of a "wrong charge process". We found that this process becomes enhanced at high energy compared to the (combinatorial and reconstruction) background.

- $\mu^+ e^- \to \gamma\gamma'$ Collision: Another signature in the same collider would be an excess of mono-gamma events. We compare the prediction for this cross-section to the simulated background generated by the SM processes $\mu e \to \gamma \nu_\mu \nu_e$ and $\mu e \to \gamma \mu e$.

Overall, these 4 observables (in addition to others such as the muonium hyperfine splitting frequency) can be powerful probes of NP in future experiments. The novel computations of the theoretical predictions and background is expected to form the basis of a paper.

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

During the O Bon university closure, I spent 4 days travelling with two friends across the Tohoku region using the JR-East pass.

9. Adviser's remarks (if any):

JSPS Summer Program 2022
Research Report

1. Name: GAYOUT Ariane Marie Marguerite	（ID No. SP21214 ）

2. Current affiliation:

Laboratoire de Physique, ENS de Lyon, CNRS UMR 5672, Lyon, France

3. Research fields and specialties:

   Mathematical and Physical Sciences   Engineering Sciences

4. Host institution: Chiba University, Biomechanical Engineering lab

5. Host researcher: Prof. Hao Liu

6. Description of your current research

Butterflies use ¥mostly vortex-dominated unsteady aerodynamics to fly as they do not have sophisticated wings to achieve high aerodynamic performance like that of birds or planes.

As an aerodynamicist, my aim is to understand the underlying aerodynamic mechanisms in terms of the coupling between the unique flapping motion of the butterflies and the novel aerodynamic force (lift, thrust) production owing to the vortex generation. For this, I developed a project during my now-completed PhD with a specific focus on the butterfly flight in altered gravity.

By modifying the gravity, we expected the butterflies to change their flapping motion as a mean to adjust their lift production. We placed butterflies in a container on a rotating table to increase gravity through centrifugal force and then filmed their body and wing motions through multiple cameras to reconstruct the 3D trajectories and flapping-wing kinematics. Afterwards, we built up a computational fluid dynamic model to compute the highly unsteady vortex flows around the butterflies, based on the realistic morphological and kinematic models of the butterflies, which can mimic the measurement-based kinematics of both moving body and flapping wings.

7. Research implementation and results under the program

Title of your research plan:

Flight adaptation of butterflies to hypergravity levels: experiments and flow reconstruction through numerical simulations.

Description of the research activities:

Ahead of the stay, an experimental campaign on the rotating table has been conducted, leaving plenty of experimental data to be analyzed.

With the help of a bachelor student, I analyzed multiple videos of butterfly flight at three different gravity levels for two different species of butterfly.

Once the analysis of a video was completed, the flight kinematics were given to a PhD student for numerical implementation and simulation of the flow around the butterfly.

From the raw experimental data, it appears that the two species do modify their flight kinematics when exposed to increased gravity but do not adapt the same way.

The simulation, that got delayed due to some analysis difficulties of the experimental data, shows promise on the possibility to understand why the adaptation is different for the two species by the estimation of the lift production.

In addition to the work at Chiba University, I visited Pr. Tanaka's lab at Tokyo Institute of Technology and Pr. Sunada's lab at Nagoya University. Both were opportunities to give a seminar on this work, as well as my PhD work on more fundamental aerodynamics.

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

During the stay, I had the opportunity to try out various Japanese handicrafts, such as tea rolling, glass blowing and chopstick making, as well as travel to Tohoku over Obon vacation with other JSPS fellows. The host family program was also great and I will do my best to keep contact with them even after leaving Japan. I also got to meet interesting people and expand my network thanks to this JSPS fellowship through lab visits and seminars, which is otherwise difficult during shorter stays.

I am thankful to both JSPS and my host Pr. Liu for making this stay possible, all the more despite all the Covid perturbations that had the stay postponed one year.

9. Adviser's remarks (if any):

JSPS Summer Program 2022
Research Report

1. Name: Edouard Sorin	（ID No. SP21215）

2. Current affiliation: University of Bordeaux

3. Research fields and specialties:
   Engineering

4. Host institution: Research Institute for Sustainable Humanosphere Kyoto University

5. Host researcher: Dr. Abe Kentaro

6. Description of your current research

I work on the characterization of the mechanical properties of wood at the macroscopic and mesoscopic scales. I am doing this through the study of the reinforcement of wood structure and its influence on crack propagation. In order to understand this influence, the fracture properties of wood must be accurately characterized. For this, I am using the EQLEFM and the R-curves to take into account the progressive damaging of wood, which leads to an auto-similar crack propagation. I also use numerical models in order to propose a predictive method to calculate the load-carrying capacity of structural element subjected to splitting.

In addition, I have been developing a non-destructive method for the characterization of in situ trees. The aim of this method was to realize a configurable numerical and physical model of an in situ tree which can be tested in laboratory conditions in order to transpose the method to forest testing conditions.

Thanks to those works I acquired expertise in characterization methodology at different scales, from the hundred mm specimen to the in situ tree, and in the numerical modeling of wood. These skills can be used to characterize and model wood-based materials.

Since 2021, I am also working to develop the circular economy in the building sector, by creating a numerical model which can characterize the material building stocks of a specific territory in order to help the local authority to develop a circular economy strategy on their territory. I also work to improve the eco-design of buildings by using new materials and construction methods to reduce the greenhouse gas emission.

7. Research implementation and results under the program

Title of your research plan:

Study the possibility to use nanocellulose fibers as a reinforcement material for structural elements.

Description of the research activities:

When I first applied for the JSPS Program in 2020 I wanted to see the possibility to conduct research in Japan to develop the use of wood.

But I could not come in 2021 due to the pandemic, and now my research interest has evolved to consider not only the wood but any material which can help to limit the greenhouse gas emissions.

So, I wanted to see how collaboration between the French laboratories I am in contact with and the Japanese laboratories could improve the capacity to limit those greenhouse gas emissions using wood and bio-based material.

That is why I wanted to learn more about the research work of Dr. Abe and Pr. Yano on the nanocellulose fiber, but also on the work carried out by other researchers of the RISH laboratory.

During my 2 months stay I learned a lot about the potential of the nanocellulose fibers. Firstly by the fabrication process possibilities, and the capacity of the nanocellulose fibers to be added to polymers in order to strengthen them. This material can also be used for 3D printing, which can be of huge interest in order to repair equipment. The nanocellulose fiber can also be used as a proper material by creating a composite microstructure (honeycombed or multiple layers), which provides great mechanical performances. Secondly by the mechanical properties of the composite nanocellulose fibers (CNF), especially the bending and tensile strength which shows a great potential to use it as a reinforcement or repairing material for structural elements. And the conservation of the mechanical properties after many recycling cycles, which is an important property to reduce the greenhouse gas emission.

I was impressed by the maturity of the fabrication process developed by the RISH and by the implication of the Toyota group to create a car made mostly in CNF. This material can be of interest for many European industrials because European regulations constantly require a reduction in greenhouse gas emissions.

So in order to understand better the mechanical behavior of the CNF, I offered to Dr. Abe and Pr. Yano to carry out some failure test of 100% CNF composite made with a honeycomb structure.

I also met other researchers of the RISH, like Pr. Isoda who works on the failure of wood structural elements. We see many links between our researches, and he may come to visit the I2M laboratory in Bordeaux (France) in October to discuss more about possible collaborations between the I2M and the RISH.

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

I had a really good experience at the laboratory with the researchers and the students, which were all so kind and friendly with me. I wish to stay in contact with everyone.

I had the chance to travel to different parts of Japan during the weekends so I could see many aspects of the Japanese culture by going to Kyoto (of course), Tokyo, Hiroshima and even Okinawa. I could test many different food specialties, and I discovered the great taste of ramen. I visited different temples, whose architecture can be a great inspiration for wooden construction.

I also loved the Japanese landscapes with this combination of forest, mountain and water which is very different from what you can find in Europe. But what I will remember most about Japan is the beauty of the sky which keeps changing its appearance, sometimes completely clear or very cloudy, I really enjoyed looking up to admire it.

9. Adviser's remarks (if any):

Dr. Sorin was actively interested in our research topics and worked on experiments using our samples.

We had many discussions, which helped us to understand each other's research better.

Furthermore, he also interacted and discussed with various researchers outside of our laboratory.

JSPS Summer Program 2022
Research Report

1. Name: Ariane Bigenwald	(ID No. SP21217)

2. Current affiliation: University of Nantes

3. Research fields and specialties:
Social Sciences, Law

4. Host institution: Rissho University

5. Host researcher: Pr. Yasuhiro MARUYAMA

6. Description of your current research

The Japanese criminal system has been dominantly interpreted as exercising "reintegrative shaming" and "benevolent paternalism", two models trying to account for both its moral and police intrusiveness and its leniency, and giving pride of place to its rehabilitative practices. To this day indeed, Japan diverts most of its criminal cases from traditional criminal proceedings and prison terms by suspending prosecutions and sentences and placing official emphasis on probation.

However, scholars voiced concerns about these approaches, questioning rather the actual lack of reintegration of criminals into society and noting the rise of punitive trends in criminal policies in the recent years (*genbatsuka* and "penal populism" amongst others).

The controversial contradictory rehabilitative nature of the Japanese justice with its tendency for punitiveness points towards the coexistence of two distinct criminal justice systems, which, in turn, raises the question of their respective boundaries. How do actors of the criminal justice determine the attitude they adopt and the system to which they will allocate offenders? How are offenders categorized and distributed to either system?

My research explores the socio-legal norms of this dividing line, focusing on the balance between objective factors (seriousness of crime) and subjective factors (offender's character). I use sentencing jurisprudence as a proxy for prosecutor's sentencing standards, prosecutors being the most powerful actor in the judicial sphere.

Temporary/contextual findings:

In the past, surveys found, apart from crime related factors, a range of determinant defendant's characteristics in sentencing such as: motive, past offenses, age, social ties, education, employment and working history, family situation, economic situation, and relation to organized crime groups. Important factors include as well settlement, compensation paid to victims, family support, impact on society, and, tantamount to Japanese legal context, apology and remorse.

In a survey on prosecutors' beliefs about factors influencing suspension of prosecution decisions, Johnson (2002) tested similar elements, albeit differently or more precisely formulated. All of 253 prosecutors interrogated considered, amongst other elements, risk of reoffending, repentance, motive, compensation and prior record to be "important" or "sometimes important". Only 3 to 10% of them gave no importance to age, social status and family ties. Other primary factors included damage done by the offense, and victim's feelings.

Some of these factors, in Johnson's view, strongly correlate with prosecutors' commitment

to rehabilitation and help them shape their appreciation of an offender's correctability. Prosecutors locate offenders along a spectrum of bad character, roughly divided into three categories: the "good person in trouble", the "person headed for trouble", and the "really bad person". This assessment is balanced with consideration for the seriousness of crime, in order to give either priority to correction and leniency or desert and harsher punishment. Sinisterness of character and seriousness of the crime thus generally stand in reverse proportion in terms of importance: the less serious the crime, the more consideration will be given to character and correction, even for "bad people"; the more serious the crime, the less rehabilitation matters, including for "good people in trouble". These variations, Johnson contends, help explaining diverging opinions amongst scholars about prosecutors' actual care, or lack thereof, for rehabilitation. These claims are compatible insofar as they each operate above and under the line drawn by assessing correctability through character and seriousness of offense.

As for sentencing, this dividing line, along with consideration for the small ratio of cases reaching the trial stage, potentially point towards a stringent selection process in which, the further an accused person gets, the less his or her correctability actually matters. It also calls for attention as to the rhetorical (or unsubstantive) nature of the criteria (seriousn./sinistern.) used by prosecutors. That remark is twofold. First, some criteria usually taken as a token of Japanese criminal justice's commitment to rehabilitation, such as the expression of remorse, can be analyzed as purely formal. Given that 90% of offenders forcefully or voluntarily confess, the average "going rates" likely concern "remorseful" defendants. Confession of guilt becomes a prerequisite to prosecutors plea-bargaining practices, and as such, give a rehabilitative outlook to criminal proceedings, meanwhile ensuring certain conviction and large discretionary power. Rather than substantively showcasing a defendant's sincere regrets, confession of guilt rather serves a mechanical role. Second, as Johnson stresses it, prosecutors way of determining punishment reverses the basic assumption and philosophical principle that the "punishment fits the crime". Instead, prosecution "has discretion to choose from a number of crimes a charge that both "fits the facts" and "fits the punishment" (Johnson, 2002, p.185) based on its evaluation of desert and correctability. So much so, that one may wonder to what extent are prosecutors' assessment of correctability truly what it is believed to be. In other words, sinisterness of character and seriousness of offense might be rhetorical categories serving as justification of one another and of punishment.

Finally, this division is porous. Serious crimes can get lenient sentences and petty crime get a severe punishment. In his book "2 円刑務所、 ５億失効猶予" (Prison for 2 yen, suspended sentence for 500 million), Koichi Hamai explained discrepancies in depicting Japanese criminal justice as a win-win game to the detriment of few losers. Criminal judicial process, through reliance on expression of remorse, cooperation, and victim participation, ensures satisfaction to both the accused, who'll get a lenient sentence in exchange for compliance, and the process itself, which gets confirmation of its own efficiency. As a result, financial resources (to pay compensation), personal connections (to have support and written pledges), and intellectual ability (to play the game and express expected remorse) set the gap between losers and winners, at least for first-timers. Then, prior record and weak social foundations play their role in fostering the vicious circle of recidivism and harsher punishment (Hamai, 2014).

7. Research implementation and results under the program

Title of your research plan:

Winners and losers of Japan's criminal system

Description of the research activities:

My research activities consisted in reviewing past academical literature and Supreme court jurisprudence, as well as mediatic content on criminal cases. I also conducted informal interviews with legal professionals (defense attorney, prosecutor, probation officers) and with academical specialists.

The main goal of these activities was to reduce my working hypothesis and define a methodology that could be realistically implemented for future longer-term research.
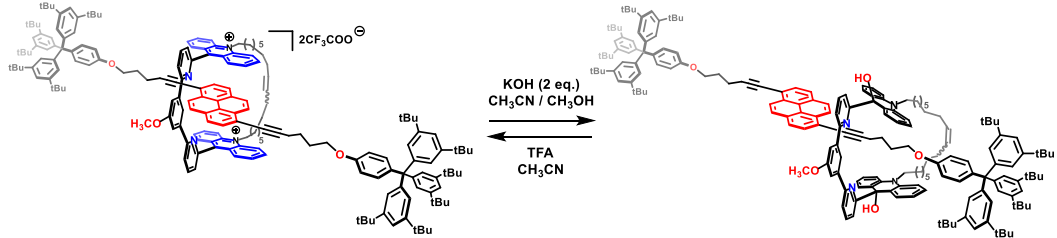
8. Please add your comments, including any cultural experience during your stay in Japan (if any):

I enjoyed my stay in Japan. My host researcher and organization showed me great hospitality. My supervisor made me try multiple Japanese food and drinks, introduced me to a lot of professionals working in our field, and even invited me to his friend's tea ceremony. I visited two probation officers' work environment in Nishinari-ku, in Osaka.

I had time to visit Hiroshima and Kyoto. Every week I discovered new places in Tokyo with other JSPS students. I have every intention of coming back to Japan soon, keep learning the language and fostering research there.

9. Adviser's remarks (if any):

JSPS Summer Program 2021
Research Report

1. Name: Johnny HU	（ID No. SP21218）

2. Current affiliation: University of Strasbourg

3. Research fields and specialties:

   Chemistry

4. Host institution: Hokkaido University

5. Host researcher: Prof. Takanori SUZUKI

6. Description of your current research:

My Ph.D work focuses on the design and study of switchable supramolecular systems. I introduced multi-response recognition units, namely acridinium moieties, in molecular systems like cyclophanes. During the first year of my Ph.D, I synthesized a cyclophane incorporating acridiniums units. The recognition units of this receptor are electro-deficient and can interact with electron rich aromatic guests (such as perylene). In addition, these receptors are chemically and electrochemically switchable upon addition of hydroxide anions or electrons leading to the dissociation of the complex (**Figure 1**). This system also showed a selective interaction to perylene towards other PAHs. This work led to a publication : J. Hu, J. S. Ward, A. Chaumont, K. Rissanen, J.-M. Vincent,* V. Heitz,* H.-P. Jacquot de Rouville,* *Angew. Chem. Int. Ed.,* **2020**. (DOI: 10.1002/anie.202009212).

Figure 1 : Chemiochromic and electrochromic properties of the bis-acridinium macrocycle.

During the second year of my Ph.D, we were interested in synthesizing an interlocked molecule such as a [2]rotaxane incorporating the cyclophane. The design of this system is composed of a bis-acridinium macrocycle and an axle incorporating a pyrene station with two bulky stoppers. A complexation study showed a binding constant between the macrocycle and pyrene to be 300 L mol^{-1} in CD_3CN. The [2]rotaxane was synthesized in five steps and the last step was done by clipping strategy in presence of Grubbs(I) catalyst. Upon addition of a base (hydroxy anion) conduct to the dissociation of the macrocycle and the pyrene station leading to the motion of the macrocycle on the axle, showing chemiochromic properties of the [2]rotaxane (**Figure 2**).

Figure 2 : Chemiochromic properties of the [2]rotaxane

7. Research implementation and results under the program

Title of your research plan:

Study of Heterocyclic Segregation reaction by using selenadiazole derivatives :

A New Protocol to Tribenzophenanthrene-type Receptor

Description of the research activities:

My research was to study "Heterocyclic Segregation" (Het-Seg) which is a quite unique reaction, by which the N atoms in the heterocycle can be segregated to form other different ring systems in the same molecule. Prof. Takanori SUZUKI's group very recently developed the protocol to perform Het-Seg under moderate reaction conditions in solution phase by using selenadiazole derivatives. To study this reaction, selenadiazole derivatives were synthesized by Suzuki-Miyaura coupling reactions to form tetraarylquinodimethanes **1** with different substituents on the aryl group (**Scheme 1**). With Het-Seg reaction, I could obtain phenanthroline derivatives **2**.

X : H, CH₃, OCH₃, F, Cl
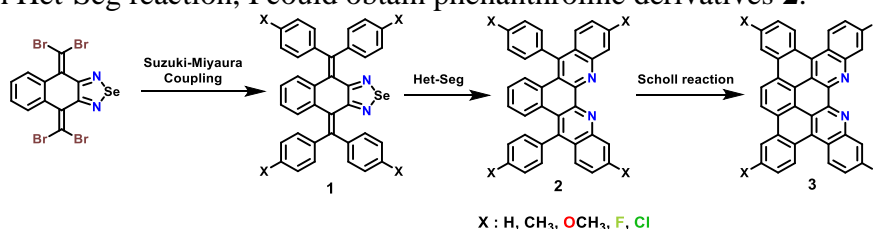
Scheme 1 : Synthesis of the phenanthroline derivatives

The next part of the project was planned that the phenanthroline derivatives **2** will be use in the Scholl reaction to form a further pi-extended analogues **3** and it will be studied as metal binding ligand and as a buffer-layer material in developing dye-sensitized solar cells.

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

I was very well welcomed in the group of Prof. Takanori SUZUKI. Despite not being able to understand Japanese, all the members of the group did their best to communicate with me in English and help me to be integrated into the group. It was comforting to see that everyone was thoughtful and considerate with me. It was a great opportunity for me to see a different culture and learn in the group of Prof. Takanori SUZUKI. Japan is well known for its politeness and good manners. I really appreciated this aspect, and it was a pleasure to share all this respect and good manners. I was happy to be able to come in Japan and I enjoyed all the Japanese foods and sightseeing.

9. Adviser's remarks (if any):

Despite the changing schedule of several times, Johnny could finally made it and joined to our laboratory. During his stay, he has worked hard and promoted the "Heterocyclic Segregation" project. I hope we could publish a collaborating paper, so that his experience through the Summer Program would be more productive for his carrier. Incidentally, due to the schedule changes over the years, the title of his research has to be modified from that of the original planned.

JSPS Summer Program 2022
Research Report

1. Name: Niklas GRABICKI	（ID No. SP21303）

2. Current affiliation: Humboldt-University of Berlin

3. Research fields and specialties: Chemistry

4. Host institution: University of Nagoya

5. Host researcher: Pro. Shigehiro YAMAGUCHI

6. Description of your current research

My current Research focusses on the design, synthesis, and characterization of novel polycyclic aromatic hydrocarbons. The synthesized molecules find application in various fields of chemistry, for example as supramolecular hosts or molecular switches that can be addressed with an external stimulus such as light. These molecules can be envisioned as building blocks in the construction of novel materials, large self-assembled systems, and organic optoelectronic devices.

While the design of the new molecules is usually supported by quantum chemical calculations the synthesis uses state of the art methods to transform commercially available molecules in totally new ones. The newly synthesized molecules are then fully characterized to confirm their expected structure with nuclear magnetic resonance spectroscopy, mass spectrometry, and if applicable single crystal X-ray diffraction.

7. Research implementation and results under the program

Title of your research plan:

Post-Functionalization of Highly Fluorescent Organic Macrocycles

Description of the research activities:

During my stay I performed reaction screening of various conditions to achieve the post-functionalization earlier synthesized highly fluorescent macrocycles. Before these conditions were performed on the valuable macrocycles the conditions were tested on the non-cyclic monomer unit. While the tested conditions were successful in the post-functionalization of the monomer unit, the same reaction conditions lead to decomposition of the macrocyclic structures.

I further designed and synthesized in collaboration with a PhD student of the Yamaguchi group a new fluorescent derivatives of a chiral polycyclic aromatic hydrocarbon molecule that might be useful as a new class of photomagnetic switch in the future.

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 present my research at the University of Kyoto in the group seminar of Shigeru Yamago and during an invited lecture at the National Institute of Materials Research. This was a great experience to present and discuss with experts in the field.

9. Adviser's remarks (if any):

JSPS Summer Program 2021
Research Report

1. Name: Martin IHRIG	（ID No. SP21304 ）

2. Current affiliation:
Institute of Energy and Climate Research Materials Synthesis and Processing (IEK-1) Forschungszentrum Jülich GmbH; Wilhelm-Johnen-Straße; 52425 Juelich; Germany

3. Research fields and specialties:
　Engineering Sciences

4. Host institution:
Kyoto University

5. Host researcher:
Prof. Takeshi Abe

6. Description of your current research

Batteries are omnipresent in modern day life. The development of new gadgets and applications require batteries with higher capacity, longer cycle and shelf-life, higher safety standards and a wider temperature window for operation than found in the currently used battery systems. Better battery systems are a prerequisite for the continuous development of electronic devices. One of the worldwide leaders in battery research, development, and commercialization is the Japanese Research community and economy. Japanese researchers have also been the pioneers in the solid-state battery field. This type is often considered as the "next-generation" battery technology.

My research focus is on next-generation Li batteries. I use an oxide-ceramic electrolyte as the backbone for my all solid-state Li batteries. I focus on ways to process the oxide-ceramic electrolyte and possibilities to assemble them into complete Li batteries. During my research stay in Japan, I want to focus on two areas. The first is to work together with the Japanese Researchers to improve my battery systems and the second is the possibility of creating networks and cooperation to exchange ideas, materials, batteries or battery components, and characterization techniques.

7. Research implementation and results under the program

Title of your research plan:

Evaluation and optimization of the garnet- and garnet-polymer-based solid-state Li batteries.

Description of the research activities:

For the first part, my work was set in the labs of Prof. Abe at Kyoto University. Here we focused on the combination of oxide-ceramic electrolytes with polymer electrolytes and to assemble, characterize, and understand so called "polymer-ceramic" solid-state Li batteries. For this research, I prepared cathodes and cathodic half-cells (cathode attached to an oxide-ceramic separator) in the labs of my home institution in Germany. These samples were combined with polymer electrolytes and separators prepared at Kyoto University. The first approach was to attach my cathode to a polymer electrolyte-based anodic half-cell and electrochemically analyze the battery. Unfortunately, the first experiments failed due to short circuiting of the battery. After optimization of the assembly, the polymer-ceramic batteries were cycled and showed promising electrochemical properties. However, the electrochemical properties rapidly faded and require more and detailed electrochemical as well as structural characterization. This process requires significantly longer time than 3 months and we decided to apply for a joined JSPS/DAAD (German funding agency) project to further work and cooperate on polymer-ceramic Li batteries. During the experiments, we also thought about the possibility to extend this approach to Na-based batteries and plan to include them in our continued cooperation.

Another focus area was to understand in more detail the grain boundaries within the oxide-ceramic electrolytes and the interface between electrolyte and cathode. These interfaces are essential for any Li-ion conduction in such materials and require to be understood in detail. We have thought about the possibility to compare various processing techniques and the effect of sintering parameter on their influence on the grain boundary and electrolyte/electrode interface. So far, the acquired data is not enough for a research paper, however we are confident to be able to collect enough data soon to conclude this research.

For the second part, my research stay was used to connect with Japanese researchers. Many researchers and groups in Japan focus on batteries and quite some work on the same oxide-ceramic electrolytes as me. Among solid electrolytes, the oxide-ceramic electrolyte is one of the most promising types and is focused by research for quite some time already. Nevertheless, a lot of research is still required to fully understand the electrolyte and maybe even more important to utilize it in battery systems. However, often this research is lacking the strength of excellent prepared initial materials, for example phase purity, highly crystalline, and nano-sized electrolyte materials or the availability of advanced processing techniques to prepare cutting-edge oxide-ceramic-based cathodes, half-cells, or batteries. During my Ph.D. study and post-doc, I acquired a lot of expertise in advanced processing techniques for the oxide-ceramic electrolytes but could not focus on the materials development and synthesis. However, in Japan many research groups have and still focus on the synthesis of the oxide-ceramic electrolyte, but often lack the appropriate advanced processing

techniques. My intention was to combine my expertise with theirs and by that improve my own results by being able to utilize improved and optimized oxide-ceramic electrolyte materials. In addition, I can also support the Japanese colleagues by providing them access to the excellent processing facilities at my home institute. To start cooperation with Japanese researchers, I have visited the group of Prof. Abe at Kyoto University (who was my host), Prof. Iriyama at Nagoya University, Prof. Inada at Toyohashi University, Prof. Shimanoe and Watanabe at Kyushu Univeristy, Prof. Yamada at Nagasaki University, and Prof. Imanishi at Mie University. I gave a scientific presentation in their groups and discussed with them about my and their research interests. I have found the possibility to cooperate in the future either by exchanging materials and processing them at my home institution, or by sending them materials for optimization prior to their processing, or by simply working together on research topics to avoid redundancies and focus on the relevant aspects to obtain enhanced garnet-based batteries. The electrochemical characterization of the materials, components, and batteries can be done either in Japan or Germany.

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

The JSPS summer program provided me the first opportunity to experience both Japan and get in touch with the Japanese Research Society. My stay was in Kyoto and the city is full of fascinating locations and offers a lot of tourist activities. It is also super easy to commute to other places due to the well-established train network and the advantageous location of Kyoto. I was able to discover the surroundings of Kyoto and experience the awesome and rich Japanese food culture. I think Kyoto is a "must-see" location for every visitor of Japan.

9. Adviser's remarks (if any):

【SP21305】

JSPS Summer Program 2022
Research Report

1. Name: Augusto MODANESE	（ID No. SP21305）

2. Current affiliation: Karlsruhe Institute of Technology (KIT)

3. Research fields and specialties:

 Mathematical and Physical Sciences

4. Host institution: National Institute of Informatics (NII)

5. Host researcher: Prof. Yuichi Yoshida

 6. Description of your current research

I am deeply interested in the computational complexity of local computational models, in particular models in which each unit is a very simple form of computer. My PhD research is focused on the complexity of sublinear-time (one-dimensional) cellular automata. The setting there can be roughly described as a very limited form of distributed computing on a line graph. One might argue that cellular automata are the simplest such model possible since each cell is the most primitive computational unit there is (namely a deterministic finite automaton).

I have studied both deterministic and probabilistic versions of the model, and I have also demonstrated a link between lower bounds for a particular variant of sublinear-time cellular automata and outstanding problems in complexity theory. My most recent work in this direction is concerned with the construction of pseudorandom generators for a specific subset of streaming algorithms called sliding-window algorithms, which are algorithms whose current behavior depends exclusively on the last few bits read. This effort is also tightly related to a previous work of mine on probabilistic cellular automata: As a direct result of this work, one immediately obtains derandomization results for probabilistic cellular automata.

7. Research implementation and results under the program

Title of your research plan: Testing Evolution of Dynamic Environments with Respect to a Local Rule

Description of the research activities:

Inspired by previous works by Goldreich and Ron as well as Nakar and Ron, we consider the problem of testing if a dynamic environment evolves according to a local rule or is far from doing so. Here "testing" refers to the general framework of *property testing* and, in particular, concerns randomized algorithms that query only a subset of their input.

Unlike the previous works mentioned above, which focused on cellular automata (i.e., path graphs), we consider the setting where the underlying communication graph is arbitrary. This setting is arguably much more attractive for potential applications since it encompasses phenomena such as spreading of diseases (e.g., following a threshold rule) or consensus processes (e.g., following a majority rule) in social networks.

Our efforts were mostly focused on what we considered the most simplest local rule possible and which has been studied in other contexts under the name of *bootstrap percolation* (BP). In the so-called 1-BP rule, each node has one of two states: white or black. A node in the white state becomes black one if any of its neighbors is black in the previous step; meanwhile, a black node always remains black.

Previous work shows that rules of this kind must always converge to a fixed single or pair of configurations. Hence (and, again, also inspired by the previous work by Nakar and Ron) we focused on the case where the number of steps the environment runs for is much smaller than the time needed for the configuration to converge. Most of our efforts were on the case where the environment performs a single step, which proved to be already challenging and rich enough for a deeper study.

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

I had a great time in Japan visiting many museums and parks in Tokyo and also going to historical places and landmarks like the Imperial Palace, Asakusa temple, Meiji-Jingu, and Kamakura. The food was amazing (so many things to try!) and it was also great to make new friends and have the chance to practice my Japanese. I really wish I can come again sometime soon!

9. Adviser's remarks (if any):

【SP21306　　】

JSPS Summer Program 2022
Research Report

1. Name: Laura Montag
（ID No. SP21306）

2. Current affiliation: PhD Student and Teaching Assistant at **Ruhr University Bochum**, Chair for Production Management, Universitätsstraße 150, 44801 Bochum, Germany

3. Research fields and specialties:
  Social Sciences

4. Host institution: Institute for Environmental Strategies (IGES), 2108-11 Kamiyamaguchi, Hayama, Kanagawa, 240-0115 Japan

5. Host researcher: Dr. Yosuhiko Hotta

6. Description of your current research

My current research focuses on the interplay between the research fields of Circular Economy, Supply Chain Management and Sustainability. The main research questions that guides my dissertation are the following: What are circular supply chains? How can they be conceptualized, understood and applied in the business context?

I therefore worked on a systematic literature review on the nascent research field of circular supply chain management. To answer this question, I conducted systematic literature review based on the Web of Science and Scopus databases. The bibliometric analysis provided an overview of CSC evolution and identified three temporal, thematic clusters. The content analysis identified 127 articles that explicitly mention the term CSC(M). Following this, six archetypal elements of the CSC and four propositions on the CSC's uniqueness were formulated.

In another research article, together with a colleague and my supervisor, we focused on maturity assessment of circular supply chains. Maturity models are suitable for monitoring, assessing, and evaluating the transformation process and determining the status quo of a supply chain. However, as the implementation of circular supply chains is still in its infancy, circular maturity frameworks at the supply chain level are not available yet. Therefore, the purpose of this study was to conceptualize a framework for analyzing the maturity level of circular economy adoption in the supply chain context. The developed circular supply chain maturity framework paves the way for circular economy adoption at supply chain level by understanding current level of circular maturity and thus supporting the circular economy implementation process at supply chain level.

【SP21306　　】

7. Research implementation and results under the program

Title of your research plan:

Roadmap to a Circular Economy 2030: A Comparative Review of Circular Business Model Visions in Germany and Japan

Description of the research activities:

The aim of my research stay at IGES was to conduct a comparative review of the Circular Economy policies, especially the Circular Business Model visions, in Germany and Japan. The following research questions guided the desk research:

- What visions regarding Circular Economy (CE) do GER and JP have?
- What are similarities and what are differences?
- What policies support the transition toward a CE and especially toward Circular Business Models (CBM) in GER and JP?
- How can CBM be understood (from a theoretical/academic) point?

A first step was a brief literature review on CBM and their theoretical frameworks. Based on this, I conceptualized a CBM matrix that includes eight CBM archetypes. In a second step, I reviewed the various CE-related policies in Germany and Japan and searched for clear connections between these and the CBM archetypes.

The main outcome is a comparative and comprehensive review of the CBM literature, the policy viewpoint in CE in Germany and Japan as well as a detailed discussion on similarities, differences and possible ways forward in the transition toward a holistic and systemic Circular Economy.

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

I was able to use the national holidays during my research stay to explore Japan a bit and experience some of its unique culture. I visited Kyoto, Nara and Osaka, travelled by Shinkansen and made wonderful memories!

In addition to that, I met many interesting people, both Japanese and international, and thus, made great connections that I hope to keep up in the future.

9. Adviser's remarks (if any):

JSPS Summer Program 2021
Research Report

1. Name: Markus ULMSCHNEIDER	（ID No. SP21309）

2. Current affiliation: German Aerospace Center

3. Research fields and specialties:
    Engineering

4. Host institution: RIKEN AIP

5. Host researcher: Dr. Qibin ZHAO

6. Description of your current research

A wide range of applications demand accurate positioning in indoor or urban scenarios. In such situations, Global Navigation Satellite Systems (GNSSs) achieve only weak positioning performance due to low received signal power as well as shadowing and multipath propagation. Positioning may then be performed using WLAN or other radio signals. One common approach is to estimate the time of flight of a signal from anchors to a receiver as basis for estimating the receiver position. However, in particular in indoor scenarios, there are often not enough anchors available and multipath propagation significantly reduces the positioning performance.

In a new approach called multipath assisted positioning, though, multipath components (MPCs) are regarded as line-of-sight (LoS) signals from so called virtual anchors. The locations of the physical and the virtual anchors can be estimated jointly with the user position using simultaneous localization and mapping (SLAM). We have previously introduced such an approach called cooperative Channel-SLAM, where multiple users cooperatively estimate the locations of physical and virtual anchors simultaneously with their own position. Exploiting multipath propagation for positioning is a new paradigm and allows for estimating a receiver position with only one physical transmitter.

The core of cooperative Channel-SLAM is a particle filter jointly estimating the state of the user and the states of the transmitters based on estimates from a channel estimator. A particle filter is a Bayesian tracking filter that approximates the involved probability density functions (PDFs) with a set of weighted points, so called particles, in the state space. While the particle filter is non-optimal, it works very well in many estimation problems without limiting assumptions such as linearity of the models and Gaussian noise distributions.

A possible simple implementation of the particle filter consists of three steps that are performed iteratively. In the first step, called prediction, each particle is propagated through a possibly non-linear function obtained from a movement model. In more mathematical terms, new particles are drawn following the proposal density.

In the second step, the update, the particles are weighted based on observations. In Channel-SLAM, these observations are times of flight of signals from physical and virtual transmitters to the receiver. Particles whose state matches the observations well gain a high weight, and the weights of particles whose states do not match the observations well are decreased.

In the third step called resampling, the particles are resampled in a random manner based on their weights in order to prevent degeneracy, i.e., to prevent that one or very few particles have a high weight while the majority of particles has a weight close to zero.

7. Research implementation and results under the program

Title of your research plan:

A Tensor-Based Particle Filter

Description of the research activities:

A major drawback of particle filters is their high complexity for high dimensional state spaces. In particular, the number of particles increases exponentially with the state dimensions. In Channel-SLAM, we use a Rao-Blackwellized particle filter, which can reduce the dimensionality to a certain extent. Nevertheless, the computational complexity in the particle filter prevents a Channel-SLAM implementation in real-time.

The particles in a particle filter are typically represented in matrix form, where the size of this particle matrix is the number of state space dimensions times the number of particles. One idea to reduce the computational complexity in the particle filter is to represent the particle matrix in a decomposition format. While a classical example for matrix decomposition is the singular value decomposition, one can represent the particle matrix in a tensor (a generalization of vectors (order one) and matrices (order two) to higher order arrays) format and use a tensor decomposition such as the tensor train. While approximating the original particle matrix in Channel-SLAM with a tensor decomposition format exploiting a low rank structure in the particles, the goal is to increase the performance of the filter, or lower its computational complexity.

My work started with a formal representation of the particle matrix in tensor train format. Based on this representation, I derived the prediction, update and resampling steps of the filter.

Tensor decompositions methods are based on the assumption of an underlying low-rank structure of the data. The domain of the data may dictate the quality of the low-rank approximation. For example, when the data is transformed into a different coordinate system, the low-rank assumption may be more or less reasonable. In positioning, different kinds of measurements (time of flight, angle of arrival, …) lead to different ranks of the underlying data in different coordinate systems.

In summary, I derived a tensor decomposition-based particle filter. However, my first results show that the complexity of this new filter in its current form is still somewhat above the complexity of the standard particle filter, in part due to a costly rounding procedure. Hence, more research will be necessary in order to beat the particle filter complexity, in particular regarding the low rank structure of the data.

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

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9. Adviser's remarks (if any):

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JSPS Summer Program 2022
Research Report

1. Name: Laura Johanna KÖNIG	（ID No. SP21310 ）

2. Current affiliation: University of Westminster, London, UK

3. Research fields and specialties:

    Humanities

4. Host institution: Saga University Faculty of art and Regional Design, Arita Campus

5. Host researcher: Professor Yuhki TANAKA

6. Description of your current research

I have been in Arita 4 years ago, stayed here for 6 months and studied about porcelain at the ceramic campus. Besides new technical skills, I got a brief but however fascinating and influential insight into the spirit of Japanese craftsmenship; one which can be found in broader social contexts as well. This spirit is connected to values and actions I observe increasingly disappearing European culture, going on the expanses of mental health. Those values and actions are all connected to spending time, attention, and care with oneself and the (social) environment. In these two months in Arita, I researched through interviews and observations on the activation of time, attention, and care in the local (craft) culture and their link to daily life. I came to learn about stories behind this spirit, I perceived as beneficial, and what universal knowledge can be found in it. Following the French Philosopher Francois Jullien, I reflected on the fruitful space "in between" two cultures, looked at contrast, and the reactions through my European mind.
In the practical research, I worked with a vessel that materialites the values I intend to cultivate: A Japanese Infnat Feeding Bottle, which was exhibited alongside other example at the Wellcome Trust. London. Its shape distuignished from all the others and was not obviously practcial for its labeled purpose. Throughout the research it turned to be a traditional, local sake bottle in its original purpose and probably was used as a feeding bottle during the cultural and medical exchange with Europe in Early Meiji Period. Despite the fact that pouring sake and serving food / medicine to infants or invalids are both deeply conntected to the act of serving others (time, attention, care), this vessel also became a symbol for the act of translation and transition, where the circle to my theoretical work closes.

7. Research implementation and results under the program

Title of your research plan:

FEEDING / LISTENING
A theoretical, practical, and poetic research on the spirit of serving others

Research activities:

The overspanning research methodology during my stay in Arita was collecting. Through conversations, observations, and interviews with local craftspeople and teachers, I gained impressive insights into values embedded in Japanese (Craft) Culture. Accompanied by my two supervisors, I could talk to craftspeople who are Masters in their profession and get answers to my questions about the link between values practiced in their work and broader social contexts. We visited in total 12 persons in Arita, Hasami, Nagasaki, and Karatsu.
During the studio work, I copied the vessel of interest and explored its handling, benefits, and functions. Symbolically, I did to the object what I did in the process: applied gestures and images connected to the activations of time, attention, and care.
The result is a narrative installation and three books, summarizing the theoretical preface (THINKING), documenting the practical work and the background of the Feeding / Sake Bottle (FEEDING), and collecting and reflecting on conversations and interviews (LISTENING). They are exhibited at Arita Campus, Saga University, until the end of October.
Since the aspect of translation, transition, and interpretation between Japan and the West is crucial to this investigation, I visited Dejima (Nagasaki) and Hirado--two places essential to this exchange in history. The historical aspect enriches my poetic, subjective, contemporary view on transition.

Two months are short, and therefore, evaluation and reflection are, at this point, relatively short. In September, I will start studying the practice-based Ph.D. program at the University of Westminster, and the collected impression will be the starting point for the research ahead.

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

Overall, I had an influential and exciting experience in Arita, Japan. It was my second time here, and I was surprised myself how familiar the town and the workshop still felt. I could start working immediately. This was my first independent research project. From my supervisors, I received great freedom in my research and its schedule and great support in realizing it. If I get the chance again, I am happy to return to Arita. This town is impressive, and so are the people living in it. There is so much more to discover and talk about.
The cultural experience became part of my research, and I am happy I could weave all impressions together.

JSPS Summer Program 2022
Research Report

1. Name: Cărbune Maria	（ID No. SP21311 ）

2. Current affiliation: Japanese Studies Institute, Heidelberg University

3. Research fields and specialties:
<u>Humanities</u>

4. Host institution: Gakushūin University

5. Host researcher: Prof. Dr. Suzuki Ken'ichi

6. Description of your current research

The Imperial Bureau of Poetry (Outadokoro) was a literary and political organization in Japan between 1869-1945 that enjoyed great influence in the literary circles. In my dissertation, I examine the literary and socio-political impact of Outadokoro's undertakings between 1869 and 1912 as pertaining to both the fields of political mythology and of modern waka court poetry. The Outadokoro was restored in 1869 in the Imperial Household Ministry as a part of the new Meiji government´s attempt to legitimize their rule through the symbolism of the imperial house by reviving institutes, court rituals and titles patented after those of the Nara period, when imperial prestige was allegedly at its highest. The poets of Outadokoro were of diverse backgrounds rooted in Kokugaku national learning, Confucian and Shintō studies, and were highly active in literary and political fields. They fulfilled the role of custodians of the imperial image by publishing thousands of imperial poems in wide circulating newspapers, school textbooks and New Year's karuta card games, providing the Emperor Meiji and his court with literary criticism and guidance and shaping the poetical canon of the early Meiji period. The wide-ranging influence of Outadokoro is reflected in their revival of the annual imperial poetry competition, Utakai Hajime, which under their tutelage was gradually opened for participation to commoners, as the competition was used to bridge the distance between the mystical, secluded Emperor Meiji and his emerging unified people. My research project focuses on the Outadokoro's instrumentalization of waka poetry as one of the of nation-building tools through which the political myth of the Emperor Meiji as a living god, descendant of an unbroken line of emperors, was reinforced and disseminated to the nation's subjects, so that the institution of the emperor came to serve as the metaphysical and mythical core of the national family.

7. Research implementation and results under the program

    Title of your research plan:

Archival research on the development of the Imperial Bureau of Poetry and its support of nation-building efforts and war propaganda at the turn of the 20th century.

Description of the research activities:

During my stay in Tokyo, I focused my research on three main topics: firstly, photographing the court diaries of the Imperial Bureau of Poetry in the archives of the Imperial Household Agency (*Kunaishō*). These court diaries detail the daily activities of the members, the changes in structure of the bureau and notable events. They are essential for any work researching the history of *Outadokoro*. In addition, I discovered other court diaries detailing the poetry selection and organizational activity surrounding the New Year's imperial poetry competition, *utakai hajime*. Secondly, I researched and made copies of the literary publications of *Outadokoro*'s members in newspapers such as *Kokumin Shinbun* (The People's Newspaper) and *Yomiuri Shinbun*, and in contemporary literary magazines. The passionate nature and frequent degree of publications of *waka* poems during the Russo-Japanese war and later on particular political events, in which the poems meant to add political authority and solemnity to the writings and persons involved, was a crucial discovery for my dissertation. In addition, I explored in depth how the imperial poems were chosen for publication, having a content focusing on the relationship between the emperor and the people, and the *kami*, reminiscent of State Shinto indoctrination efforts. The days on which the poems were most often published, from the Emperor's Birthday, Jimmu Tenno Day, The National Foundation Day, also confirm the association I maintain in my thesis between political mythology and Meiji-period *waka* poetry. Thirdly, I endeavored to add and discover additional secondary sources such as literary criticism of the *Outadokoro* works and activities, on the poems of Emperor Meiji and wider works regarding the poetry circles of the Meiji period.

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

  Beyond the research activities, I have also visited cultural expositions and museums, such as the Meiji Jingū complex and museum, the Yasukuni Shrine and its museum, and the Meiji Memorial Museum. I have also had the opportunity of giving a research presentation to PhD students of Gakushūin University and get useful feedback and recommendations. I believe my Japanese has also improved due to the close academic contact and my intensely speaking it in my everyday life here.

  I am very grateful to JSPS for this wonderful opportunity to conduct much needed research in Tokyo., I believe it will greatly improve the quality of my dissertation.

9. Adviser's remarks (if any):

Ms. Maria Carbune's research in Japan and her discussions with Japanese researchers in order to elucidate the role of the Outadokoro in Meiji Japan provided both new perspectives and satisfactory research results in the JSPS Summer Program.

JSPS Summer Program 2021
Research Report

1. Name: Felix Aaron FINKELDEY	（ID No. SP21312）

2. Current affiliation: TU Dortmund University

3. Research fields and specialties: Engineering Sciences

4. Host institution: Keio University

5. Host researcher: Prof. Yasuhiro KAKINUMA

6. Description of your current research

In the context of tool manufacturing, different processes are utilized to create the tools necessary for a variety of applications, such as injection molding processes. These processes include, but are not limited to, milling and grinding. When it comes to milling, this method is used to machine a desired shape of the component and can already produce a high-quality workpiece surface. However, in order to further improve surface quality, grinding can be utilized as an additional step. By utilizing a combination of milling and grinding, the tools that are machined can be used in, e.g., injection molding processes to efficiently form materials such as thermoplastic polymers in large quantities and in a relatively short amount of time. Additionally, these tools can also be used for other manufacturing processes such as die casting, blow molding, and thermoforming. Furthermore, the tools can also be used for different materials such as metal, wood, and ceramics. To achieve the desired surface finish, different types of grinding methods can be used such as surface grinding, cylindrical grinding, and centerless grinding. By utilizing the right combination of milling and grinding processes, the tools can be manufactured to meet the specific requirements of each application.

Machine learning (ML) has the potential to greatly improve the efficiency and effectiveness of tool manufacturing processes. By analyzing large amounts of data and identifying patterns, ML algorithms can be used to optimize the milling and grinding processes. In my current research efforts, I am mostly concerned about introducing ML methods in order to model cause-effect relationships in processes along the described process chain comprising milling, grinding and injection molding. To this end, different components of these manufacturing processes are analyzed, including tools, workpieces, machine tools and the processes itself. For milling, e.g., the real-time prediction of wear-influenced process forces were investigated. Furthermore, a novel methodology was developed to analyze digitized grinding tools and, subsequently, use them in simulation approaches by augmented semantic segmentation of images. For machine tool analysis, the prediction of pose-dependent dynamics for two different milling machine tools of different kinematic properties was studied. Moreover, ML techniques were used to predict the quality characteristics of injection molding processes for various parameter settings. The study explored the use of both measurement data and simulation results as sources of information, and developed a method to determine when simulation data could be used and when experimental measurements were needed. The research found that this approach has the potential to greatly reduce the number of resource-intensive physical experiments required.

7. Research implementation and results under the program

Title of your research plan:

Feature engineering for predicting thermal deformations of machine tool components

Description of the research activities:

Carbon fiber reinforced plastics (CFRP) have been gaining popularity in the machine tool industry as they provide high damping properties which improve machine dynamics and also offer high specific stiffness. However, thermally induced deformations can occur during machining operations and can affect product quality, prevent compliance with specified workpiece tolerances and lead to reject parts. It is usually possible to use numerical simulation approaches, which rely on calibrated material models, to support process design and prevent or compensate errors resulting from deformations. However, the identification of such material models for CFRP is still an active area of research and the applicability of numerical simulations is therefore limited. To address this issue, my research activities comprised developing a learning-based approach for predicting deformations of spindle components based on temperature signals measured at 300 different positions on the milling machine used. To reduce the number of temperature sensors required for training and to quantify and analyze the importance of possible sensor positions, various feature engineering techniques were incorporated. As a result, high prediction accuracy could be achieved with a small amount of data necessary. Additionally, recommendations for the number and position of temperature sensors could be derived. Currently, a scientific journal publication of the study is pursued in cooperation with the Kakinuma-Lab.

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

I really enjoyed my stay. It was an intense and very enriching experience which I will remember for the rest of my life. The culture in Japan I experienced was very different from German culture. I enjoyed the high degree of politeness and carefulness toward other persons. There also were many efforts to integrate me into typical Japanese traditions and rituals.

9. Adviser's remarks (if any):

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JSPS Summer Program 2022
Research Report

1. Name: Ning Guo	（ID No. SP21313 ）

2. Current affiliation: International Audio Laboratories Erlangen

3. Research fields and specialties:

  Engineering Sciences

4. Host institution: NTT Communication Science Laboratories

5. Host researcher: Dr. Tomohiro Nakatani

6. Description of your current research

Audio signal processing and coding.

7. Research implementation and results under the program

  Title of your research plan:

  Comparative study of adaptive beamformers for low-latency online enhancement of source-of-interest mixtures

Description of the research activities:

In this internship we have investigated on several low-latency online enhancement algorithms for multi-channel microphone array signals.

We did experiments and a listening test to evaluate their performances.

We have got useful conclusions and plan to publish our work at a field related conference in the near future.

JSPS's support in the carrying-out of this research activity will be mentioned if our work during this internship appears in a publication.

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

The 2-months-stay under the JSPS fellowship has been very enjoyable and fruitful for me. I learned a lot of new technical knowledges during the collaboration at NTT.

Besides, I enjoyed causal talks during lunch with the colleagues at the lab. We also tried together different Japanese cuisines.

The home-stay arranged by JSPS was a super nice experience for me.

9. Adviser's remarks (if any):

JSPS Summer Program 2021/2022
Research Report

1. Name: Stefan Repp	（ID No. SP21314）

2. Current affiliation: University Ulm, Ulm, Germany

3. Research fields and specialties:
   Chemistry

4. Host institution: Institute of Science and Engineering Kanazawa University

5. Host researcher: Dr. KIKUKAWA Yuji

6. Description of your current research

In my PhD thesis I synthesize new molecular metal-oxide, also called Polyoxometalates, and characterize their system. This material can be applied in wide range of application: catalysis, energy storage, .biomedicine, … Often early, high-valent transition metals in their highest oxidation states (e.g. Mo(V/VI), W(V/VI), V(IV/V)) are used for synthesizing atomic precise clusters as Polyoxometalates. I focus especially on polyoxovanadates and investigate their system in organic solvents. For synthesizing different kinds of cluster template and heterometals are used. The templates are needed to establish a specific shape for the cluster and the heterometals can tune their properties. Still the mechanisms and formations of the cluster are not well understood that it takes a long time to establish a new cluster.

We succeed synthesizing the well-known half-ball dodecavanadate $\{V_{12}O_{32}\}$ with Cyclen on the open cavity site. To synthesize the structure, tetravanadate $\{V_4\}$ was mixed with Cyclen and Metal-salt in DMSO. This solution was acidified to a specific pH and on the next orange/red crystals can be gained. The compound was determined by single-crystal X-Ray diffraction. Twelve pentagonal Vanadium-units are connecting to a half-ball structure with a Template in the cavity. The open cavity is blocked by the Cyclen structure, which interacts per hydrogen-bonding with the oxygens of the polyoxovanadate and of the inner template. The cluster is surrounded by a counter cation, stabilized by DMSO ligands, for compensating a part of the charge. The rest negative charge is neutralized by the protonated Cyclen.

We succeed to use different charged counter cations, because the Cyclen has a flexible protonation state to compensate the rest charge. Furthermore, the structure can be synthesized with different kinds of Templates by controlling it by the added salt and the acid. However, the template cannot be exchanged after the structure is formed. The material is building a long 1D chain by alternating Cyclen and the vanadate cluster. Further characterization and investigation of the compound is limited because of their poor solubility in common organic solvents. We aim to understand the system more and conclude a different route to synthesized different polyoxovanadate cluster.

7. Research implementation and results under the program

Title of your research plan:

Investigating the interaction between Cyclen and $\{V_{12}\}$ by using ^{51}V-NMR.

Description of the research activities:

With the great help of Associated Prof. Dr. Kikukawa and Prof. Dr. Hayashi the interaction between cyclen and $\{V_{12}\}$ was observed by ^{51}V-NMR.

At the beginning the original compound was synthesized and characterized by ^{51}V-NMR. The mechanism from the starting material to the end product was investigated by different solvent conditions, water sensitivity and pH. Furthermore, fully protonated Cyclen with HNO_3/HCl/HBr was synthesized and added to the precursor.

As next step they showed me how to synthesize their $\{V_{12}\}$ with Nitromethane template. The already formed $\{V_{12}(Nitromethane)\}$ was dissolved fully protonated Cyclen was added to the solution. By ^{51}V-NMR the main peak shift was investigated, which indicate the interaction between Cyclen and the open cavity. The nitromethane template was exchanged by this process.

At the end I got leant how to exchange the template in the half-ball $\{V_{12}\}$-cluster. These cluster were synthesized with Tetraethylammonium and Tetrabutylammonium as a counter cation. A specific amount of the prepared $\{V_{12}(X)\}$ system was dissolved in solution and cyclen was added. The solution was acidified in many steps by a 0.5 M p-TSOH solution. As well here the interaction from an already prepared $\{V_{12}\}$ with Cyclen was observed by protonation. With more protonation the cyclen should come closer to the polyoxovanate and shift their peaks in the NMR system.

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

The fellowship gave me the chance to meet Mr. Kikukawa and Mr. Hayashi and their very friendly institute member. We could exchange many ideas and our expertise about the polyoxovanadate field. I enjoyed very much Kanazawa and I will always remember the beautiful time there. I had a very good time on the many trips/restaurants my host professors showed me here in Japan. Furthermore, I got the chance to be at Spring-8 and visit many different places in Japan. I am very grateful to enjoy this summer here in Japan and I will always remember this good time.

9. Adviser's remarks (if any):

I (Yuji Kikukawa) am proud that I could become the host researcher for Stefan Repp. Although his program was postponed for one year under the COVID-19 situation, he kept high motivation. Just after he arrived at Kanazawa, he started to prepare samples. Due to his high research skills, he quickly learned and acquired several new measurement knowledge and techniques. When he got the interesting results, he shared and discussed the results with us. I hope the result is published in near future. I am convinced that this relationship continues through the international research collaboration. I appreciate JSPS providing Summer Program.

JSPS Summer Program 2022
Research Report

1. Name: Jantje Hinrika de Vries	（ID No. SP21316）

2. Current affiliation:

Personality Psychology and Psychological Assessment, Freie Universität Berlin

3. Research fields and specialties:
 Social Sciences

4. Host institution:

 Personality Psychology Lab of the Faculty of Letters, Arts and Sciences of Waseda University

5. Host researcher:

Professor Atsushi Oshio

6. Description of your current research

My present research focusses primary on personality development across the life span. Within this topic I investigate how external and internal influences such as critical life events affect personality traits and life satisfaction. Critical life events are referred to "transitions that mark the beginning or the end of a specific status" (Luhmann, Hofmann, Eid, & Lucas, 2012; p. 594). A great body of research has shown that certain life events not only adjust personality traits sustainably (socialization effect) but also, based on existing personality characteristics, that specific events are more likely to be experienced than others (selection effect). Moreover, I focus on the personality trait Greed and underlying processes such self-efficacy, as well as fixed versus growth mindsets. Using a large German data set, I applied latent change score modeling which is a useful powerful and flexible class of structural equation models and allows to combine the strengths of path- and latent variable modelling, so that multiple hypothesized developmental relationships can be assessed with unobserved (latent) variables. Using this statistical procedure, I also explore the development of intellect and associated individual performances and job outcomes.

7. Research implementation and results under the program

Title of your research plan:

The Development of Greed – a Longitudinal Investigation on Cultural Differences Between Germany and Japan

Description of the research activities:

The Personality Psychology Lab of the Faculty of Letters, Arts and Sciences of Waseda University offered me the possibility to delve into the depths of personality development since they also established a longitudinal data set on personality development. Thus, we merged the data set from FU Berlin and Waseda University to investigate cultural differences in certain personality traits between Germany and Japan. Specifically, we investigated the development of Greed. Greed refers to the intense and selfish desire wanting more, e.g., money or power. This trait is especially interesting to investigate when comparing individualistic versus collectivistic countries. Moreover, a great advantage of our research was its longitudinal approach. This way, we were not only able to compare certain states of Greed but also focus on longitudinal trends on the development of Greed in the Japanese and German society. To do so, we conduced sophisticated statistical analyses and applied latent structural equation modeling.

All in all, I am really grateful of having the opportunity to work with Professor A. Oshio and his team. Working with the Personality Psychology Lab of Waseda allowed me to generate a new lens for the area of my work and sharpened my understanding of individual personality development of Greed as well as intercultural differences.

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

  I am really thankful to be working with Professor Atsushi Oshio. I had a warm and friendly welcome and working with him as well as his team was very nice. I believe we established a really fruitful collaboration between the Waseda University and Freie Universität Berlin now and the work which we started in Tokyo will continue after the time of the scholarship. I would come back any time and would recommend everyone interested in their topics to reach out and work with Prof. Oshios' Lab!

9. Adviser's remarks (if any):

JSPS Summer Program 2021
Research Report

1. Name: Ruijie YE	（ID No. SP21320）

2. Current affiliation:

Institute of Energy and Climate Research – Material Synthesis and Processing (IEK-1), Forschungszentrum Jülich GmbH, Germany

3. Research fields and specialties:

   Chemistry

4. Host institution: Mie University

5. Host researcher: Prof. Nobuyuki IMANISHI

6. Description of your current research

The garnet-type Li-ion-conductor $Li_7La_3Zr_2O_{12}$ (LLZO) is regarded as a promising oxide-ceramic based solid electrolyte material for solid-state lithium battery (SSLB) owing to its wide electrochemical stability window, chemical stability versus Li metal and excellent conductivity. However, one of the challenges regarding the fabrication of such SSLB is the industrial scalability of manufacturing methods. Tape-casting is known to enable the large-scale production of free-standing ceramic components and cells. Additionally, in conventional tape-casting, organic solvents are usually employed, which might cause health and safety issues and lead to high cost for solvent recovery. Hence, development of a green, water-based processing route is favorable.

In my current research at IEK-1 of Forschungszentrum Jülich, I developed an aqueous tape-casting process of the garnet-type Li-ion-conductor LLZO using biopolymer as binder. The obtained free-standing LLZO sheet after sintering, with high relative density and low thickness, shows high ionic conductivity at room temperature. This free-standing LLZO sheet can be later used as separator in the SSLB having an electrolyte-support configuration.

However, the effect of water on LLZO in this aqueous processing is still unclear, since LLZO is already found instable in water with undergoing a Li^+/H^+ exchange reaction. Prof. Imanishi and co-workers at Mie University have been investigating the effect of the Li^+/H^+ exchange reaction on phase formation as well as ionic conductivity of LLZO for years and have therefore expertise in this research area. The Li^+/H^+ exchange reaction plays an important role in my work, and it is also necessary to understand it from the fundamental point of view. It is believed to be helpful for me to have discussions and scientific research work with Prof. Imanishi and his colleagues.

7. Research implementation and results under the program

Title of your research plan:

Effect of multiple doping on the performance of LLZO

Description of the research activities:

The LLZO with mono- or multi-doping of Ga, Nd, Sm, Ge, Te, Ti, Nb, Ta, and/or Sb were synthesized by solid-state reaction. The starting materials were oxides, hydroxides or carbonates of each above-mentioned elements, and were well mixed by means of ball-milling. The mixture powders were subsequently calcined at different temperatures between 800 °C and 1000 °C. The obtained calcined powders were then uniaxially pressed into pellets for the final sintering at different temperatures above 1000 °C. After sintering, the obtained sintered pellets were stored in an inert atmosphere.

The crystal structure and the phase purity of the sintered pellets were evaluated by means of X-ray diffraction (XRD), which exhibited cubic LLZO phase without any impurities in the samples, meaning that the solid-state synthesis was successful. The densities of the sintered pellets were measured by Archimedes method and scanning electron microscope (SEM) images, which showed relative densities of 80-90% compared to theoretical ones. The ionic conductivities of the sintered samples were measured by means of electrochemical impedance spectroscopy (EIS). The results showed that the multiple doping had only limited improvement in the total conductivity due to the low density, but a great improvement in activation energy for ion transport was achieved.

The water-stability of the sintered pellets could not be tested during the two-month stay, and will be conducted after I go back to my home institute in Germany.

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

The Prefecture Mie has lots of sightseeing spots. On weekends I visited the important and famous Ise-Jingu, which is part of UNISCO world cultural heritages, and learned a bit of Shinto and Japanese history. I also visited Iga city -- the Ninja city, where I experienced the unique Ninja culture. In Matsusaka city I tried the most famous Matsusaka Wagyu beef, and in Ise city delicious sushi, sashimi and seafood. In Tsu city, the capital city of Mie, I luckily experienced the yearly celebration event 'Tsumatsuri'. Outside of Mie, I first visited Nagoya city, which is the nearest metropole to Mie, where I visited the Nagoya castle and Osu Kannon. Besides, I also traveled to Fukuoka city in Kyushu -- the birthplace of Ramen, and Hirosaki city in Prefecture Aomori – the main production site of apple in Japan, which is right in the season in October. I really enjoyed the life in Mie and Japan, and two months are indeed too short to explore Japan.

9. Adviser's remarks (if any):

JSPS Summer Program 2021
Research Report

1. Name: Hannah Muelbaier	（ID No. SP21321）

2. Current affiliation: Goethe University Frankfurt

3. Research fields and specialties:

Biological Sciences

4. Host institution: University of Tokyo

5. Host researcher: Prof. Dr. Wataru Iwasaki

6. Description of your current research

Symbiosis is an evolutionarily successful strategy to optimally exploit resources in a habitat. However, researchers are only at the beginning of comprehending the molecular basis of organismic interactions. In my PhD project, I want to combine method development with applied analysis. Specifically, a bioinformatic toolkit will be created to trace protein interaction networks across many taxa. A novel software will inform about lineage specific changes in protein function and will assess the effect of limited search sensitivity. The applied part of the project concentrates on pioneering communities, i.e. meta-organisms that are the first to conquer new, and often extreme, habitats, such as saline and nutrient-poor soils. Using newly determined genome sequences of symbionts, will help to identify encoded protein interaction networks, and their integration across symbiotic partners. Comparisons with results from closely related non-pioneering taxa will shed light on how species adapt to extreme environments.

7. Research implementation and results under the program

    Title of your research plan:

    Scalable *De Novo* Orthology Inference Using Protein Representation Learning

Description of the research activities:

Thanks to the steep increase in the number of publicly available genomic datasets, it is now common to include hundreds or thousands of genomes in a single study. This data deluge is challenging orthology inference methods, which may be unable to process datasets of such magnitudes. For example, graph-based *de novo* orthology inference methods that rely on all-vs-all alignments may require days to weeks to infer orthologous relations even for a few dozens of eukaryotes. With SonicParanoid2, a method was proposed that adopts machine learning to reduce the runtime of homology searches and uses protein representation learning to increase the breadth of orthology inference. The method infers orthologous relationships using functional domains annotated using the PfamA database, and then filters those predictions based on the orthologs obtained using homology searches. However, SonicParanoid2 still requires all-vs-all alignments due to the low amount of domains that can be annotated using PfamA as training data. In my project, we explored alternative resources that can be used to increase the amount of training data for the domain-based orthology pipeline. By using the CDD domain database instead of PfamA and adding regions with a compositional bias to the training data, we were able to increase the number of predictions by 50%. More importantly, we decreased the number of false positives and doubled recall in most of the tests in the QfO benchmark. Lastly, we showed that the domain-based pipeline is highly scalable using a set of 2,000 prokaryotic MAGs.

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

The JSPS summer program was a great opportunity to experience Japan from different perspectives. As a member of Iwasaki Lab I had great research experience while, especially on the weekends, I was able to enjoy a lot of different places to learn more about Japan, its culture and awesome food. I visited different places in Tokyo, Kyoto and Osaka. One of my best memories will be climbing Mount Fuji with some members of Iwasaki Lab. I'm thankful for all the great memories, the warm welcome and all the things I learned during my stay about Japan and my research field.

9. Adviser's remarks (if any):

Hannah proved to be a very talented student, and was able to complete more tasks than was expected in such a short period of time. Aside from her working achievements, she shared her culture with the Lab members creating cultural and professional bonds that, I am confident, will be long-lasting.

JSPS Summer Program 2022
Research Report

1. Name: Aline Dreher	（ID No. SP21322　）

2. Current affiliation: Ruhr University Bochum

3. Research fields and specialties: 　Humanities

4. Host institution: KyushuUniversity

5. Host researcher: Prof. MIZOGUCHI Koji

6. Description of your current research

With my dissertation project, focusing on the problematic connection between archaeology and politics during the period of Japanese expansionism between 1895 and 1931, I aim to provide a deeper understanding of the dynamics behind the process of shaping identities and policy-making by the use and dissemination of archaeological knowledge. Just as the Japanese state mobilized archaeology in the course of nation building in realizing its potential for the construction of national identity, archaeological research was integrated into colonial policy in order not only to form a new Japanese identity within East Asia but also to create a new identity of its colonial subjects in Korea, Manchuria, Mongolia and Taiwan. My preliminary results suggest that early archaeological and anthropological theories and research in the colonies were integrated into policy depending on differing political goals of each colony. While archaeological research in Korea aimed to connect Koreas past to Japan's own national identity, in Taiwan and Manchuria it mainly followed economic and military purposes to ensure Japan's grows as a rising colonial power in East-Asia. The evaluation of the role of individuals within the policy-making process provides further insights into the dynamics of how archaeology was implemented into the different colonial agendas and that early field researchers like Torii Ryūzō involved themselves actively in shaping colonial policy.

7. Research implementation and results under the program

Title of your research plan:

Archaeology and Politics in the Japanese Colonial Empire (1895-1931)

Description of the research activities:

My research in Japan was mainly conducted in the Central Library of Kyūshū University and the National Diet Library in Tokyo. I focused on the collection and evaluation of Japanese historical sources related to governmental use of archaeological and anthropological knowledge in the colonies of the Japanese empire. I was able to identify several sources of the Bureau of Aboriginal Affairs of Taiwan at the Central Library of Kyūshū University which are particularly noteworthy, since they provide a deeper understanding of how close early archaeological and anthropological field research was involved in specific political and economic projects of the Government General of Taiwan in order to facilitate the rule over its colonial subjects and the development of natural resources.

I was also able to identify materials that slowly providing a deeper understanding of how archaeology was involved in the process of identity-creation depending on changing political goals within the Japanese empire. While archaeological practice and theories of the early years of colonial rule mainly served to consolidate Japan's own national identity as a colonial power in competition with the West, it seems that in the later years the focus gradually shifted, and Japan started to put extensive efforts in creating new identities for its colonized people as well.

Publications of politicians like Okuma Shigenobu (1838-1922) indicate, that archaeological theories of a multi-ethnic origin of the Japanese, which were closely related to Japan's new identity as an expanding colonial power, had an impact on political thinking. Nevertheless, this theories seems to have been rather ignored in the education of the youth in mainland Japan. An initial evaluation of the youth magazine "shōnen kurabu" suggests a prevailing image of the rather conservative view of the origins of the Japanese based on the mythical narratives of Kojiki and Nihon Shoki.

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

The professors and students at my institute welcomed me very kindly and provided me with kind support and precious advice during my whole stay. It was a great experience not only to meet my former professors and fellow students once again but also to make new acquaintances and friends. Coming back to Fukuoka felt like coming back home.

9. Adviser's remarks (if any):

JSPS Summer Program 2021
Research Report

1. Name: Thorsten Fabian AUER	（ID No. SP21324）

2. Current affiliation: Paderborn University, Department Management

3. Research fields and specialties:
   Humanities　&　Social Sciences

4. Host institution: Oita University

5. Host researcher: Kunio IKARI

6. Description of your current research

My research investigates in preconditions influencing the propensity toward unethical behavior in various societies. Specifically, I examine the impact of perceived ethnical differences on individual decision-making using experimental economic settings.

The present research activity is based on the assumption that building a trustful relationship is facilitated when individuals of the same ethnic population engage with each other. A specific form of relationship between individuals emerges when the demand of one individual for a good that is at the disposal of another individual can be acquired through a personal favor or additional payment. Individuals that engage in this kind of behavior are more prone toward corruption.

Which factors lead to individual differences in the propensity toward corruption remains of interest for scholars as well as for officials. A significant predictor of corrupt behavior are informal institutions comprising social norms and values that prevail in a country or region. Additionally, previous literature has shown that the propensity toward dishonest and norm-violating behavior is socially transmitted when individuals acquire norms and adapt their behavior based on their experiences in their social environment. Thus, established ideas on social interactions are likely to influence the propensity toward unethical behavior. In most societies, a delineation of the individual's social environment emerges by apparent differences to other individuals.

The ethnicity of an individual is a detectable characteristic that influences the behavior toward this individual through stereotypical thinking, which emerges through social transmission and adaptation of former cultural norms in a society. The inclination toward corrupt behavior has been shown to differ depending on the perceived country of origin of the opposing individual. However, we also find different ethnicities within a country, often as a consequence of migration. In the case of Japan, which is perceived as a rather homogenous society in terms of ethnic affiliation, the Zainichi Koreans form the largest minority group that is confronted with discrimination. Hence, I investigate in conditional corruption among Japanese individuals when being confronted with a partner perceived as Korean to emphasize the underrepresented issue of ethnic discrimination in the Japanese society. The results will be compared to a German sample when being confronted with a Turkish partner.

7. Research implementation and results under the program

Title of your research plan:

The influence of ethnicity on cooperation in unethical contexts - An experimental study on corrupt behavior and ethnic discrimination in Japan and Germany

Description of the research activities:

I used an experimental bribery game in which players can cooperate to achieve an outcome that is advantageous to them by disobeying cultural norms and taking risk. Over ten rounds, they make interactive decisions in three stages giving them the chance to earn a varying amount of virtual money depending on the decisions made. Risk is implied by the random chance to be detected and excluded from the game.

Specifically, in three sessions, participants of local companies and institutions were randomly assigned to either the role of the briber (neutrally framed as Player 1) or the role of the bribee (neutrally framed as Player 2). Player 1 can decide for a transfer payment, while Player 2 decides on the acceptance of that transfer as well as on applications of Player 1, which finally determines the earnings for every round for both players. The pairs of players were randomly matched and assigned to a treatment. They only received the predestined name as a specifying information on their partner. In the control group, both players were shown a Japanese name when the matching to a partner was completed, while in the treatment group, a Korean name was displayed. Even though many Zainichi Koreans adapt Japanese names, the use of the Korean names in Japan increases making it a credible procedure.

So far, analysis on descriptive statistics of the anonymized data shows no differences in the offering and acceptance rates of the transfer payment between the control and treatment group. This would imply no discriminating behavior against Korean partners. However, further analysis is needed, and an additional sample of Japanese and German students will complement the present sample to achieve an adequate power for the analysis and to make valuable comparisons between both societies.

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

Returning to Oita six years after my first exchange as a master's student brought back so many memories and even some reunions with friends that I got to know at that time or even later when they visited my home institution in Germany as an exchange student. This nostalgic feeling kept on during the entire period and made me realize how important it is to maintain good relationships to the people that have taken care of you. But even though there were so many things that I just remembered when coming back to these places there have also been many new people and places that I got to know. Experiencing the Japanese society six years later with a more mature view on certain things was valuable, and I am very thankful for the opportunity to gain so many in-depth insights to the cultural habits of Japan.

9. Adviser's remarks (if any):

JSPS Summer Program 2022
Research Report

1. Name: Kenneth Brezinski	（ID No. SP21401）

2. Current affiliation: University of Manitoba

3. Research fields and specialties:

    Humanities   Social Sciences   Mathematical and Physical Sciences

    Chemistry   <u>Engineering Sciences</u>   Biological Sciences

    Agricultural Sciences   Medical, Dental and Pharmaceutical Sciences

    Interdisciplinary and Frontier Sciences

4. Host institution: National Institute of Informatics

5. Host researcher: Dr. Kensuke FUKUDA

6. Description of your current research

My current research focus is on incorporating complexity techniques into deep learning architectures and applying those to problems in Cyber Security. It is becoming ever more difficult to identify malicious behavior on a host operating system, as adversaries attempt to obfuscate their payloads and mimic the behavior of benign programs. For example, a malicious executable will use a partial benign payload to fool signature-based anti-virus software, and then fail to executive it's payload when it recognizes it is being analyzed by a security researcher.

The motivation for incorporating Complexity is that information tends to follow a certain pattern when you examine it under different scales of measurement and tends to follow a so-called Power law distribution. Based on the measurement of complexity, one can identify anomalous behavior, or incorporate these patterns into predicting future outcomes.

The research group of Dr. Fukuda focuses on network traffic, and previous work carried out by the group has focused on Cyber Security and Complexity measures of internet traffic.

7. Research implementation and results under the program

Title of your research plan:
Automatic Taxonomy Generation for Firewall Rules using Graph Autoencoders

Description of the research activities:
Preliminary work was carried out to develop an architecture which can facilitate the generation of firewall rules to identify anomalous network traffic. Hand-curating firewall rules requires substantial domain expertise on the part of the Network System Administrator, and rule coverage can drift over time as conditions change.

This work investigated backbone network traffic that handles traffic between Japanese education and research institutions and the rest of the internet. To that end, we hypothesized that a Graph Autoencoder architecture can learn deviations from normal behavior in an unsupervised manner (without labels), then determines highly salient features to craft firewall rules based on local optimization techniques. This has the impact of automated the generation of firewall rules entirely, as well as providing metrics of interest which can warrant further investigation by network security administrators.

I began my work by familiarizing myself with the MAWI networking dataset, and created scripts to parse, organize and preprocess the data in such a way as to make it usable for model training. This also included handling previous annotations of the network traffic data that is used for model validation and labelling. I then worked on several prototype Graph Neural Network Autoencoders that learn anomalous behavior from baseline behavior through learning what a normal host-to-host structure looks like, and which attributes of the hosts are consistent with the rest of the network.

Results demonstrated good overlap with previous labelling, but also showed additional hosts were associated with anomalous behavior that were not previously covered by the annotations. The next step involved in incorporating explainability into the learned process, by highlighting select hosts and conditions that contribute to a greater degree to the anomaly score of the Autoencoder. This included highlighting the most likely anomalous node candidates and their neighborhoods, as well as highlighting which attributes to pay attention to. We noted certain IP addresses of interest as well as port usage which likely led to anomalous behavior.

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

During my internship I had the opportunity to explore much of Tokyo and surrounding areas. Some highlights include visiting the Ghibli Museum, watching a Yomiuri Giant baseball game, visiting the Tokyo National Museum, and watching Kabuki at the Grand Kabuki in Ginza. I participated in various Autumn festivals including the Tori-no-ichi Fair and Hachioji Ginkgo Festival, and had the chance to plan weekend trips to both Nagoya and Fukuoka. During these trips I visited Nagoya Castle, the acclaimed Toyota Museum of Technology, and watched the November Sumo Tournament.

9. Adviser's remarks (if any):

JSPS Summer Program 2021
Research Report

1. Name: Enrico Corato	(ID No. SP21501)

2. Current affiliation: Lund University

3. Research fields and specialties:

    Engineering Sciences

    Interdisciplinary and Frontier Sciences

4. Host institution: Tokyo Institute of Technology

5. Host researcher: Prof. Kentaro Nakamura

6. Description of your current research

My research is about employing sound to manipulate objects suspended in solutions in sub-millimeter channels, a field which is called *acoustofluidics*. The main focus is on medical diagnostic: with ultrasounds, biological fluids can be analyzed in a gentle and contact-free manner. Combined with microfluidics, this allows for precise examination of samples characterized by small volume and/or rare targets. In summary, we build bulk acoustic waves (BAW) micro-devices for handling of bodily fluids.

Currently, the methods employed in acoustofluidics have several limitations that prevent its use in real-life diagnostic facilities, such as clinics and hospitals. First of all, the throughput of the systems is limited due to their small dimensions, considerably lengthening analysis time and thus making the procedures too expensive. Secondly, small objects like bacteria and viruses cannot be effectively processed in present systems. The sub-micron scale of these particles makes them susceptible to the fluid streaming, which prevents their efficacious manipulation, unlike for cells and other bigger suspended bodies. Finally, the systems are yet not reproduceable enough to reach the market. This is due to coupling between the actuators and the microfluidic devices, usually made by gluing the parts together. Needless to say, this operation introduces huge variability because of the thickness of the layer, the curing conditions, the presence of bubbles, and other reasons.

The collaboration with Professor Nakamura at the Tokyo Institute of Technology is meant to help us overcome the current limitations of our systems, with the goal of fabricating devices able to input high energy in microchannels in a reliable and reproduceable manner. This is pursued by designing and fabricating ultrasound transducers which would take the output vibration of piezoelectric actuators and focus it in a fluidic chamber. Ideally, in this latter a sound standing wave would be generated, creating a pressure field able to manipulate objects suspended in fluids.

7. Research implementation and results under the program

Title of your research plan:

High power ultrasonic transducers for microfluidic applications

Description of the research activities:

During my stay at Tokyo institute of Technology, I have deepened my understanding of ultrasonic transducers, with particular focus on high frequencies (MHz range).

The first encountered issue is that the most generalized assumptions usually employed in the theoretical handling of sonotrodes cannot be applied at such high frequencies, as the sound wavelength becomes smaller than the transducers dimensions. Hence, I have performed numerical simulations and drafted an optimization algorithm to reach some good designs to be fabricated. Now, we have three possible routes that we will explore: a horn-like structure to be coupled on the side of a microfluidic channel; a horn-like structure with a microchannel embedded in its structure; a linear double-parabolic ultrasound concentrator to be coupled with a microfluidic channel. For each of these, some prototypes have been or will be built, and the acoustic energy in the fluid will be measured.

Another issue we tackled was how to couple transducer prototypes with microfluidic channels. Few ideas have been discussed and we contacted some Japanese adhesive companies which might satisfy our specifications. I am going to try various solutions once I will be back at my home university.

In summary, we have established the ground for a fruitful collaboration within two field of expertise, i.e., microfluidics and high-power transducers. This could revolutionize how acoustofluidics work and finally lead to its widespread application in the medical field and beyond.

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

 I managed to have a quite thorough visit of Tokyo metropolitan area in the weekends during my stay.
Furthermore, despite the limited time and occasions, I had the chance to have some interactions with Japanese students and researchers, thus getting a glimpse in the academic environment here.

9. Adviser's remarks (if any):

Some of the basis for the new acoustofluidic device have been founded in this limited length of stay. I believe that the fruits obtained in these two month will be important seeds for further collaborative studies between the two organizations.

JSPS Summer Program 2021
Research Report

1. Name: Jonas Mattisson	（ID No. SP21502）

2. Current affiliation: Uppsala University

3. Research fields and specialties:

Interdisciplinary and Frontier Sciences

4. Host institution: The University of Tokyo

5. Host researcher: Prof. Yoichiro Kamatani

6. Description of your current research

Age related disease can often be attributed to mutations in our DNA, which we accumulate throughout life as our cells continuously replicate. This type of mutations are commonly known as somatic mutations, or post zygotic mutations, to differentiate them from the mutations that one can considered to be born with. The most common somatic mutation in the blood of aging men is the mosaic loss of chromosome Y (mLOY), where the complete Y chromosome has been lost in a fraction of circulating blood cells.

Even though the Y chromosome is much smaller than the X counterpart, and house fewer genes, mLOY has been linked with increased male morbidity and mortality. This include conditions such as Alzheimer's disease, autoimmune conditions, diabetes, age-related macular degeneration, as well as a wide range of different types of cancer. Evidence suggest that mLOY could even be a cause of cardiovascular disease. However, the mechanism by which chromosome Y loss in blood cells could cause disease in other organs still remains unknown.

mLOY has been estimated to affect up to 20% of all men above the age of 40, and more than 40% and 50% of 70 and 90 year-olds respectively. Other known risk factors include smoking, air pollution, alcohol consumption as well as a genetic component. Most mLOY studies have thus far focused on the describing these epidemiological aspects. In my research I therefore try to understand the underlying cell biology behind the loss of chromosome Y and how it's linked with disease. I have previously published papers studying mLOY based on DNA, RNA and protein data, yet no studies have reported an association between Y loss and metabolites. Metabolites refers to molecules involved in metabolism, an essential processes for cellular function, the analysis of which is called metabolomics. Considering the key function and known disease association of certain metabolites, metabolomics has the potential to describe new mechanisms linking mLOY and disease.

7. Research implementation and results under the program

Title of your research plan:

The metabolomics of mosaic loss of chromosome Y

Description of the research activities:

In this project, the metabolomics of 12 673 men in Biobank Japan was analyzed in regards to mLOY. For each metabolite a statistical model was created that had to account for other factors previously reported to be linked with mLOY. This included age, smoking, alcohol consumption, BMI and certain diseases. These factors, referred to as covariates in the model, as well as mLOY and metabolite measurements had to be preprocessed before being included in the statistical model.

Once the data had been prepared, different model was run to find the type of model and set of covariates that best described the metabolomics of mLOY. Finally a list of 21 metabolites was found that significantly correlated with Y loss. However, the metabolites associated with mLOY surprised us. Additional analysis was therefore performed including 1) Mendelian randomization, to test the causality of the association. 2) Validation in UK biobank, another large cohort. 3) Survival analysis to test if whether there is a link with mortality.

The process of writing an article regarding these results is currently underway.

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 2021
Research Report

1. Name: Luigi Belcastro	（ID No. SP21503）

2. Current affiliation: Linköping University

3. Research fields and specialties:
   Engineering Sciences

4. Host institution: Shizuoka University

5. Host researcher: Prof. Keiichiro Kagawa

6. Description of your current research

Spatial frequency domain imaging (SFDI) is an optical technique that employs sinusoidal patterns of light to detect the frequency-dependent response of the material and quantitatively measure its optical properties (absorption and scattering coefficients).

SFDI finds several uses in biomedical imaging as a diagnostic tool. The absorption coefficient (μ_a) gives information about the concentration of biological chromophores of interest (melanin, hemoglobin species, fluorescent markers…) while the scattering coefficient (μ_s) contains information about the size and quantity of microscopical scattering particles (cell nuclei, collagen fibers, liposomes…).

Our research focus is to obtain more information about the biological structures from light scattering, which could improve the diagnostic capabilities of the technique. In particular, we are interested in applications for wound healing and skin conditions (e.g. melanoma). Most optical techniques, including SFDI, use models of light transport that assume a homogeneous medium. In reality, skin is composed by several layers with different optical properties. The ability to differentiate optical properties of thin layers of tissue and estimate their thickness would be highly beneficial for the previously mentioned applications.

An underutilized property of SFDI is that the penetration depth of the patterns of light is influenced by the spatial frequency of the sinusoids. By performing measurements at several spatial frequencies, we process sub-sets of data that contain information about different volumes of tissue. This data is used as a means to reconstruct the optical properties in depth. We have also developed a simple 2-layer model (thin layer of tissue on top of a thick layer), that is a more accurate representation of the physiology of the applications we want to investigate (wound healing and skin conditions).

Penetration depth is also influenced by the optical properties of the material. Both absorption and scattering of light in biological tissue are higher in the visible spectrum (VIS), compared to the near infrared spectrum (NIR). This results in light in the NIR spectrum having higher penetration compared to visible light. By adding NIR information to our SFDI system, we aim to obtain an even better separation of the properties between the deep layer and the superficial layer.

The work at Shizuoka University will consist in using a custom multi-aperture camera developed by the Kagawa research lab to build a SFDI device with both visible and NIR capabilities.

7. Research implementation and results under the program

Title of your research plan:
Use of cross-channels to increase spectral resolution of custom multi-aperture camera in spectral imager

Description of the research activities:

An SFDI imaging device was assembled and characterized using the components provided by Kagawa Lab. A multi-aperture camera was used as a sensor, containing 4 different colored filters in the visible and near infrared spectrum (VIS-NIR). The absorption spectrum of the filters was characterized with the use of a monochromator and light power sensor. The light source consisted in 4 LEDs in the VIS-NIR spectrum, combined using dichroic mirrors. The light was directed on a digital micromirror device (DMD), which was used to project the sinusoidal patterns.

Since the DMD was operated in video mode, the gamma curve of the projector was not linear, so it was characterized and corrected to avoid distortions of the patterns.

From the characterization of the device, we determined that there were 6 spectral bands in which we can measure data (4 in the VIS spectrum and 2 in the NIR), given by the overlap of the LED and filters spectra. The central wavelength and bandwidth of these bands has been calculated.

Once, assembled and characterized, the SFDI device was used to acquire data on thin layered silicone phantoms with different scattering properties. Our multi-frequency approach was used to process the data and obtain measurements of optical properties at several depths. These measurements have been applied to our 2-layer model to attempt to estimate the thickness of the thin phantoms and their individual optical properties.

The phantoms optical properties were also separately measured using different optical techniques, during laboratory visits to other research institutes in Hamamatsu and Osaka.

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 2021
Research Report

1. Name: Salahuddin Mohammad	（ID No. SP21504　）

2. Current affiliation: Uppsala University, Sweden

3. Research fields and specialties:

    Interdisciplinary and Frontier Sciences

4. Host institution: University of Tokyo

5. Host researcher: Dr. Shinsuke Koike

6. Description of your current research

The prospective research project in Japan, Brain/MINDS Beyond human brain MRI project (FY2018 ～ FY2023) works on establishing clinically-relevant imaging biomarkers addressing multi-site harmonization. The data is collected from healthy traveling subjects (TS) at 13 research sites in Japan. However, psychiatric and neurological disorder data across the lifespan is also scheduled here. In addition, measurement procedures designing, neuroimaging protocols development, image data analysis and databasing are done. Towards obtaining multimodal brain images like T1 and T2-weighted, resting state, task functional and diffusion-weighted MRI, the Harmonization protocol (HARP) was established for five high-quality 3T scanners. Human Connectome Project (HCP) style approaches are used for data processing and analysis. This project is the first one intends to implement a rigorous and prospective harmonization protocol with multi-site TS data. This allows researchers to study brain disorder data collected across lifespan, facilitating identification of disease-specific pathophysiology and imaging biomarkers for clinical science.

Current research focused on Autism spectrum disorder (ASD), which is a common neurodevelopmental disorder with increasing high prevalence in the world. Application of advanced facility like machine learning tools on MRI data along with clinical and demographic data, while following harmonized protocols to process MRI data to aid detail investigation of ASD. Comparing multiple number of datasets along with ongoing research data of Japanese population, performing cross sectional and comparative analysis. Follow the HCP style protocol to analyze different human brain connectomes in relation to ASD. Working with advanced neuro-imaging data based different classifiers, which has previously been shown to have significant outcome in relation to ASD and Schizophrenia while experimentation with newer classifiers.

7. Research implementation and results under the program

Title of your research plan:

Classification of autism spectrum disorder sub-groups using MRI data-based machine learning method

Description of the research activities:

Autism spectrum disorder (ASD) is a common neurodevelopmental disorder with increasing high prevalence in the world. While the prospective research project in Japan, Brain/MINDS Beyond human brain MRI project works on establishing clinically-relevant imaging biomarkers addressing neurodevelopmental and neuropsychiatric disorder, current research focused on ASD. The data were collected from healthy traveling subjects (TS) at 13 research sites in Japan. The well-established Harmonization protocol (HARP) for five high-quality 3T scanners was used to obtain multimodal brain images like T1 and T2-weighted, resting state, task functional and diffusion-weighted MRI data. Human Connectome Project (HCP) style approaches were used for data processing and analysis. Advanced facility like machine learning tools on MRI data along with clinical and demographic data were applied to aid detail investigation of ASD. Multiple number of datasets along with ongoing research data of Japanese population were compared, cross sectional and comparative analysis were done. Experimentation with advanced neuro-imaging data based different classifiers were performed.

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

Japanese culture experience was fascinating as it included learning Japanese peoples' living style, politeness and distinct manner of blending the history with modern technological advancements. Exploring exquisite Japanese cuisine was top to notch as an experience. Research visits allowed taking the cultural experience expanding beyond the fast life of capital Tokyo city to historical Hiroshima city and beauty of Kobe city.

9. Adviser's remarks (if any):

JSPS Summer Program 2022
Research Report

1. Name: Handika Sandra Dewi	（ID No. SP21506）

2. Current affiliation: Luleå University of Technology

3. Research fields and specialties: Engineering Sciences

4. Host institution: Joining and Welding Research Institute Osaka University

5. Host researcher: Prof. Masahiro Tsukamoto

6. Description of your current research

Lasers play a vital role in manufacturing industries, particularly for 3D printing (Additive Manufacturing), cutting, and welding of metallic components. It offers fast and precise manufacturing of complex-structured components, which was unable to achieve using conventional manufacturing techniques. As there is an increase demand for improving the quality of laser processed components and developing the process itself, research on laser-based processes is of interest.

My research in Japan focused on studying the influence of gas assisted deep penetration laser welding on stainless steel. Applying assist gas, such as Argon, during laser welding is known to be able to increase welding penetration depth. In laser cutting, Oxygen is one of the most common assist gases as it induces exothermal reaction during the process which eases the cutting process particularly for thick steels. Accordingly, applying Oxygen during laser welding can significantly increase the welding penetration depth and make the process more efficient than using Argon. To test this hypothesis, I carried out laser welding processes on stainless steel using Argon and Oxygen. I performed in-situ observation using high speed X-ray imaging and analysed the welding penetration depth and pores creation related to the gas parameters during the process.

Additionally, I examined wire-based Additive Manufacturing (AM) using single infrared laser beam and powder-based AM using multi-blue-laser-beams. The availability of blue laser promises increased efficiency of laser processes due to high absorptivity of most material in regard to the blue spectrum. Moreover, the current AM techniques employ wire or powder shaped materials to deposit components. Hence, wavelength of the laser and type of the materials can become vital parameters in AM processes and of interest to study for improving the produced components and developing the process itself. To study the nature of these processes, I correlated the deposited specimens of the same material (Inconel on stainless steel) and processing conditions. The results show that in powder-based AM using multi-blue-laser-beams at a constant powder feeding rate and scanning speed, dimension of the deposited layer increases as the total laser power increases. This implies that increased laser power can promote powder attachment on the substrate during deposition process. Nonetheless, such behaviour was not found in the wire-based AM using single infrared laser beam. In this case, increased laser power, at a constant scanning speed and wire feeding rate, lead into chaotic melt pool and thus poor bead quality. However, increasing the wire feeding rate could add the height of the bead. It should be noted that temperature distribution in the deposition layer of single- and multi-beam process can be different due to the positioning of the laser beam, which might be the cause of this finding.

7. Research implementation and results under the program

Title of your research plan:

Influence of Oxygen as assisting gas on penetration depth during laser welding of stainless steel

Description of the research activities:

The research activities consist of three stages as follow

(1) Finding optimum laser parameters: laser power, welding speed, and gas flow were varied to achieve a good weld quality. Parameters which showed good weld quality were chosen and reapplied during X-ray observation.

(2) In-situ X-ray observation: the X-ray parameters were kept constant during the experiments. Laser welding with 3 variations of laser power and gas flow rates were performed for both Argon and Oxygen gas.

(3) Analysis of the high-speed X-ray videos.

The high-speed X-ray videos show that welding penetration depth increases as a function of Argon gas flow rate, while increase of Oxygen flow rate gave relatively constant value of the penetration depth. Penetration depth of the Oxygen assisted welding processes is generally shallower than the Argon assisted welding processes. There are two possible causes of this behaviour. (a) Plasma was created during Oxygen assisted welding processes which attenuate the laser beam and thus reducing the energy input to the specimen. Nevertheless, laser-induced-plasma requires very high-power density which is less likely to occur during this process. Accordingly, the most probable reason is that (b) the high content of alloying elements in stainless steel reduces the impact of exothermal reaction during Oxygen assisted laser welding processes, leading into lower temperature values than expected during the process.

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

It was an honour and pleasure to work at Tsukamoto-sensei's lab. There is a strong sense of belonging in the group where everyone was willing to help each other and so it was easy to ask for help. Everyone was very friendly which then allowed me to learn Japanese and merge with their culture. I am glad to attend this program!

9. Adviser's remarks (if any):

JSPS Summer Program 2022
(SP21509) Research Report

1. Name: Cecilia DE BERNARDI	（ID No. SP21509）

2. Current affiliation:

Mid Sweden University, Sweden

3. Research fields and specialties:
   Social Sciences

4. Host institution: Hokkaido University

5. Host researcher: Professor Johan R. Edelheim

6. Description of your current research

My research in Sweden focuses on different aspects of outdoor recreation and sport activities in relation to sustainability. The project I am involved in has so far worked with artificial turf as a sport surface. This has evolved to also incorporate artificial snow, which was my focus coming to Japan. Hokkaido is especially interesting from this viewpoint because there is a lot of snow and very limited need for artificial snow production. This is what I knew I wanted to research before I came to Japan. There are, however, also other aspects of my research that have become relevant during my stay in Hokkaido.

My doctoral thesis investigated Indigenous tourism. After I came to Japan, I discovered I was staying in the region of Japan where the Ainu population lives, so I have resumed some of my activities related to Indigenous tourism, and I have connected them to my current research on sustainability and outdoor recreation. Indigenous knowledge is an area that is often tied to sustainable use of nature, and harmony with nature, so I believe it is a good starting point to study how the sustainability of different outdoor activities can be enhanced by studying local Indigenous knowledges, as well as Indigenous tourism.

The second area of research that became relevant is the one dealing with heritage and how places are marketed and described to the wider public. Once I came to Japan I received a call for chapters that inspired me to study the connection to nature, religion, sacredness and other kinds of belief systems. This is once again connected to my main research topic related to sustainability in outdoor and recreation activities. In Japan, many outdoor activities are connected to cultural and religious heritage. Forests are often accompanied by a shrine and nature is sacred in different ways compared to Western spirituality. Ainu culture is once again relevant in this regard because many aspects of nature are not only venerated according to the Shinto belief system, but also according to Ainu spirituality.

Thirdly, I have previously studied how people see the places they visit according to different views of rurality. In the Japanese countryside (especially in Hokkaido in this case), many farms and other places connected to agriculture and rural life can be found and visited by tourists. People travel from the busy cities such as Tokyo and experience nature in different ways by visiting these places. This is another kind of outdoor recreation activity that can be tied to sustainability and to a balanced relation to nature.

In conclusion, my fieldwork in Japan has provided me with a very good use of my broad research profile. By connecting different aspects that are closely tied to Japanese culture and history, I am able to return to Sweden with a wider knowledge that can connect outdoor recreation activities to a sustainable relation to nature in outdoor recreation and sports.

7. Research implementation and results under the program

Title of your research plan:

My research plan did not have a title, but I would call it: Outdoor recreation, sports and sustainability: lessons and cases from Japan

Description of the research activities:

During my JSPS fellowship, I have firstly consulted literature on Japanese and Ainu belief systems, the history of Japan and Hokkaido in particular, books specifically about Shinto and how it is connected to outdoor recreation and nature. I then started to look on the internet for cases (i.e. websites, reviews and descriptions of places) that express a connection between sacred, nature, rurality and outdoor recreation. I have gone on a fieldtrip in which I have explored different outdoor recreation areas and gathered visual and observational data that will be included in a published output. At the same time, I also prepared my survey and interviews regarding the sport side of research and this focused on snow and winter sports. I have distributed my survey through different channels and I have interviewed one person working with winter tourism in Hokkaido. I have also gotten in touch with researchers at the Center for Advanced Tourism Studies (CATS) here at Hokkaido university. We have discussed drafting a project on Ainu and Sámi food. Furthermore, I got in touch with the researchers conducting a project on adventure tourism in Sámi and Ainu communities. The plan is for me to become formally part of the project including joint publications. Furthermore, I also taught in the Hokkaido Summer School with my colleagues about feline tourism and iyashi and animals.

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

This was my first time staying in Japan. I participated to the homestay program both online and offline during my stay. I have visited different places in Hokkaido with my host family and I have learned a lot about Japanese culture. My host family was very happy to learn more about Sweden and Europe in general. They also took me to sing karaoke. There are many things I have seen and learned about Japan by staying with my family that I would not have learned on my own and I am very grateful for the experience.

9. Adviser's remarks (if any):

It has been a joy hosting Cecilia this summer at Hokudai and getting frequent updates on her research activities. I have followed Cecilia's research career through her doctoral candidature, and into this early career researcher stage. A recurring theme has been her philosophical curiosity, and a healthy lateral thinking skill that allows her to connect matters that at the surface might seem separate, but at their core stems from the same roots. I foresee many joint publications and research projects in the future too where we can link Japanese and Nordic themes together.

SP21511 Research Report

JSPS Summer Program 2022 (2021)
Research Report

1. Name: Huseyin Erdogan	ID No. SP21511　　　）
2. Current affiliation:	
3. Research fields and specialties: 　　Chemistry　　　　　　　Biological Sciences 　　Medical, Dental and Pharmaceutical Sciences	
4. Host institution:QST	
5. Host researcher: Dr Yuhei Takado	

6. Description of your current research

Looking at brain metabolism impairments in neurodegenerative diseases models of mice such as Alzheimers disease models, summarize and analyse data from both NMR and qPCR and contribute to discussion and result writing of a paper on the subject. Additionally, chances to get some experience with different methods such as NMR and 13C MRS experiments as well as viewing Two-photon microscopy on live mice brains.

7. Research implementation and results under the program

Title of your research plan: Metabolism comparison in different mice models related to neurodegenerative diseases.

Description of the research activities:

Understanding and learning new instruments used in this research fields such as NMR, MRS, qPCR, and two-photon microscopy.

More understanding and experience with data visualization of different data sets, graph creation and scientific writing.

Improvement of communication with international researchers/scientist

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

It was a very pleasant experience to witness and work in a new environment even if it was only for 2 months it gave me plenty of experience, adapting to a new habitat and trying to improve my own communication in a country were very few people talk English. How much help I got when I needed it from strangers and overall how polite the people were everywhere was a great experience.

9. Adviser's remarks (if any):

JSPS Summer Program 2022
Research Report

John Olof Ludvig Andersson
SP21512

Nippon Institute of Technology, NIT
Timber Engineering Laboratory

8th of August 2022

1. Name: *John Olof Ludvig Andersson*	（ID No. SP21512）

2. Current affiliation: *Konstfack University of Arts, Crafts and Design*

3. Research fields and specialties:

Humanities   Social Sciences   Mathematical and Physical Sciences
Chemistry   <u>Engineering Sciences</u>   Biological Sciences
Agricultural Sciences   Medical, Dental and Pharmaceutical Sciences
Interdisciplinary and Frontier Sciences

4. Host institution: *Nippon Institute of Technology, Timber Engineering Laboratory*

5. Host researcher: *Professor Hideyuki Nasu*

6. Description of your current research

Material explorations with the aim of reintroducing forgotten and neglected methods, materials and techniques, mainly working within a Swedish traditional context with local materials. Insights and results are intended and directed toward application within Architecture and Design, mostly as part of homes or in the form of products.

7. Research implementation and results under the program

Title of your research plan: *How the understanding of traditional Japanese joinery techniques can inspire Swedish modern architecture*

Reflecting purely on the research results of the experiments performed during my time at the laboratory I must come to the conclusion that the time have been extraordinary efficient and that the results that we have managed to produce are far beyond what I ever could have expected. For the concrete results and for a number of Pa-values calculated for the tested joinery techniques, see the attached experiment report. A Pa-value is a calculated value describing how much load a structure can be expected to safely carry.

Even more important are the results found in the interpersonal connections made during the time frame of this research program. We have managed to cultivate and develop genuine relations between academics in two separate research fields, in two different academic contexts. this is an invaluable result which will continue to produce results even beyond the time frame of the JSPS Summer Program. The performed research project should not be seen or understood as an isolated entity but rather as the beginning of a body of research efforts and the start of a valuable exchange activity of future perspectives, knowledge and results.

The true result of this research program is the potential for future projects and international collaborations that the completion of the JSPS Summer Program have prepared for. Not only for me, but also for the members of the host laboratory, for which this program have in many cases provided a first chance to collaborate and work closely with a researcher not trained or usually active in Japan. This is exactly how new and crucial perspectives are created. It's obvious that new perspectives and a deeper understanding have been achieved on both sides of the exchange of this summer program.

Description of the research activities:

Chronological Diary
Week 1
The initial week consisted of numerous on-site visits and a thorough introduction to NIT's institutions, research departments and testing facilities. In parallel to this I was introduced to the staff at NIT, to potential key persons for my planned research and to the student members of the laboratory at which I intended to perform the planned research during the coming eight weeks.
   Already during the first week I had the chance to attend an experiment at the laboratory. A member of the laboratory demonstrated a load test for a wall construction.
Week 2
The introduction of the facilities and the introduction to the wide range of professors and researchers at NIT continued. Especially valuable was the introduction of the wood workshop. Here I could study an old machine for producing traditional Japanese joinery.
   I attended a second experiment arranged by a member of the laboratory. It was a comparison test with purpose to test a range of alternative joinery methods for a dome shaped structure.
Week 3
Research trip to Yatsugatake. I had the honour to visit Norito Sugiyama, owner of 建築工房 藁(わら) 株式会社. He operates and live in the area of

Yatsugatake. He kindly offered me to follow his work for a couple of days. The purpose for me was to have a closer experience of how the architectural and construction process works in Japan. Sugiyama-san's strong focus on quality and his genuine understanding for craftsmanship provided me with important and valuable experience of how craftsmanship still constitutes the backbone of architecture and construction techniques in Japan. Further was the experience of seeing how architecture and construction are discussed and performed in a more rural and less dense area valuable to me as it stood in clear contrast to the thinking and the approach to architecture and construction in extremely dense and urbanised areas such as Tokyo.
   Initial discussions about potential variations of my planned research projects.

Week 4

Further discussing and planning potential ways to carry out my planned research project took place. Professor Nasu-sensei and I could rapidly and efficiently form the outline of an experiment plan thanks to the extensive preparation that we had done beforehand. A brief schedule and a timeline was created.

I produced practical sketches and ideated proposals for how the tests and the experiments could be formed. The work with sketches and ideas intensified and moved toward finished drawings and decided plans.

Study visit at Mitsuihome Components Co. Ltd. The timber product producer Mitsuihome Components Co. Ltd was visited with two purposes in mind: the primary purpose was to gain a deeper understanding of how prefabricated timber products are manufactured and designed to fit both the conventional Japanese architectural tradition and other imported methods and systems. The second purpose was to gain knowledge from a real timber manufacturer before finalising and sending production drawings to the manufacturer of the planned test bodies.

An order of test bodies were sent to the company Shinoharashoten, and they were received the same week.

Week 5

Assembling of the test bodies and preparing them for the experiment. Investigating what sort of load application machine to use and how to mount test sensors in order to receive as good data as possible.

Performing planned experiments on the assembled test bodies and gathering data for later analysis.

I assisted various experiments performed by members of the laboratory, I found this experience to be one of the most valuable of the time at the laboratory, to exchange working methods and techniques with each other in real situations. This experience was also important for me in order to gain insights into how experiments and how research was planned and performed at, for me, a new research environment. From what I have understood by talking to the other members of the laboratory and by reflecting on the matter with the responsible professor Nasu-sensei I have understood that the members of the laboratory have appreciated having a correspondingly new perspective in the form of me present in the laboratory.

Study visit at Forestry and Forest Products Research Institute, FFPRI, in Tsukuba. The visit provided me with great insights of how research on wooden products and building components are being institutionally planned and performed in Japan.

Week 6

Study visit to Nikkō with the purpose of experiencing traditional building techniques and craftsmanship in the form of temples and culturally important buildings and structures.

Analysing data and calculating the results of the performed experiments. Composing presentations, visual imagery and graphs for a planned presentation for the professors at the architectural department at NIT.

Study visit at a construction site in Ōme related to Mitsuihome Components Co. Ltd (the manufacturer of timber products, which I visited during week 4)

Follow-up research trip to Yatsugatake to see how Suguyama-san's projects have developed.

Week 7

Gather photos, data and information related to the performed research. Finalising the analysis and the presentation material.

Presentation for the architectural department of NIT. The presentation focused of my background, my practice and my research performed at NIT during the JSPS Summer Program.

Week 8

Making conclusions, establishing contacts and exchanging means of contacts in order to maintain a long term relationship with the responsible professor of the laboratory, the members of the laboratory and other key persons that I've worked together with during my time at NIT.

Leaving for Sweden.

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

The situation of performing research in an entirely new cultural and academic context have been incredible valuable to me. To have the chance of comparing different attitudes toward working hours, expectations and other practical details of the daily work have been interesting to experience and to reflect upon.

There is an expression in Sweden (which I interestingly have understood also exists in japan, but reversed) that somewhat jokingly describes Sweden as the Japan of the Scandinavian countries. I believe this expression to hold some truth after having experiencing daily work in Japan. The idea of genuine ambition is often shared, even though slight variations occur and different manifestations of the same ambition exist, the general idea of work ethics is the same. In a similar manner there's a strong mutual appreciation of beauty derived from natural materials and a clear preference to describe beautiful phenomenas with parables to nature.

9. Adviser's remarks (*Professor Hideyuki Nasu*):

Mr John Andersson have impressed on both me and on the members of the laboratory by his strong sense for experimental work and by demonstrating a clear understanding for the research procedure. Mr John Andersson has performed structural experiments, analysed its results and made clear and effective conclusions in an excellent manner. His ambitious nature, clear intellect and strong sense of work ethics are aspects that I would like to be noticed by future collaborators and employers.

The social and competent manner makes John a natural team worker,. This fact has showed obvious to me by observing him work in collaboration with the members of the staff. Regardless of and unaffected by the difficulties of language barriers, work and results have not been suffering. John have, besides his own research, assisted in various research projects at the laboratory with impressive ambition and accuracy. He has not only been an important part of the team but have also contributed crucial perspectives on experimental method and results.

Even though John only had little experience from structural engineering and structural analysis, however he has impressed by his incredibly rapid learning pace and his clear understanding for structural and material properties. Further have his background in Architecture and Design provided the laboratory with important new perspectives on the research performed in this laboratory at NIT. This specific aspect has proved to be one of the most valued qualities of John's expertise.

Besides the successful collaboration on various research projects have the presence and efforts of John been a valuable experience for my laboratory student members and me. John has in a welcoming and open manner presented himself as a generous introduction to the world outside of Japan. I hope that the opportunity that John has provided to the staff members, to work practically with someone from another cultural background and from another academic field will be the important first step toward a multitude of future international collaborations. To conclude: the JSPS Summer Program has, by the help of Mr John Andersson, been an excellent experience for NIT and the laboratory for which I'm responsible.