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Form 7／様式 7

外国人特別研究員作成／By Fellow

2022 /11 /18
(YYYY)(MM)(DD)

JSPS Fellow's Signature (Handwritten only):

Research Report (by Fellow)
(Cover Page)

I hereby submit the research report of my fellowship.

1. Name： Thomas E. Johnson

2. Nationality： USA

3. Host Institution： Fukushima University

4. Host Researcher： Kenji Nanba

5. Title of Research in Japan： Re-establishment of Research and Education Collaborative Activities

6. Fellowship Tenure： From 2022/10/16 To 2022/11/14
(YYYY) (MM) DD) (YYYY)(MM) (DD)

7. Background of Research

The goal for this BRIDGE grant was to further secure collaboration and to start new environmental radioactivity research opportunities with Fukushima University after the missed opportunities from COVID-19 and expand the research collaborations to other Japanese universities. The secondary goal was to collect agricultural samples and analyze them for traces of radioactivity from the Fukushima Dai-ichi accident. The agricultural sampled collected were wine samples from impacted regions as well as giant hornets near Fukushima University. Wine was selected based on news media reports spreading fear of radioactivity in wine, (New York Times, July 20, 2018, Forbes Magazine, July 21, 2018). Several vineyards operate in areas that were previously contaminated, and we took this opportunity to purchase 8 different wines to assess for radionuclide content.

Additionally, the Fukushima University Institute of Environmental Radioactivity (IER) is performing research on honey and has established a hive on the roof of the IER. The hive is attracting giant hornets, which are known to consume honey. Traps were placed around the hives and multiple giant hornets captured. Since giant hornets approximate the next trophic level from honeybees, we collected multiple trapped specimens to ascertain if they were concentrating radiocesium.

8. Research methodology

Wine was purchased at an Aizu winery and a wine festival. Wine was identified for use in the study by proximity to contaminated areas. The wine will be taken to Colorado State University and analyzed for Cs-137 and other nuclides.

Figure 1 Ensuring wine is produced from an impacted area.

Figure 2 Giant Hornets in an adhesive trap. Keys for scale.

Giant hornets were collected from the rooftop of the IER using adhesive traps, and will be homogenized and counted for Cs-137.

9. **Results/impacts**

Our working hypothesis is that both the wine and giant hornets will only exhibit trace amounts of radiocesium, consistent with global fallout, and minimal impact from the reactor accident.

We plant to publish both studies as soon as results are obtained. As this was only a 30 day visit, analysis of samples has not been completed except for Giant Hornet counting. A draft of the Giant Hornet paper has been created and we plan to submit it within the next two months.

Re-establishiment of Research and Education Collaborative Activities

The goal of re-establishing research relationships was realized during this trip. Overall, commitments for exchange of students for research or samples was secured for Fukushima University and the Institute of Environmental Radioactivity, Tsukuba University, Tokyo University, and Hirosaki University. Details are provided below.

Fukushima University Collaborations

Dr. Takagai has agreed to have two CSU radiochemistry students visit Fukushima University between 02 and 10 February 2023 (tentative dates) to collaborate on a research project. This trip would include a trip to Fukushima Dai-ichi nuclear power plant, and a tour of laboratories, the decommissioning museum in Tomioka Town and other information regarding the accident. We will coordinate the CSU students with He Min in international programs at Fukushima University and they will report on their research.

Dr. Yoshitaka Takagai (Fukushima University) has already been scheduled to come to CSU for 8 to ten days in March 2023 to conduct radiochemistry experiments with three of his students. We plan to have these students stay with our graduate students while conducting radiochemistry experiments (expected to be Sr, Pu and other actinides). Dr Takagai's students may also need to perform some neutron activation experiments. CSU has some neutron sources to facilitate the research, but should a higher neutron flux be needed, the TRIGA reactor in Denver should be available. I will make reservations for the TRIGA reactor time during the TRIGA board of directors meeting on 17 NOV (note that I am on the board). Additionally, one of Dr. Takagai's students is interested in doing a post doc in the USA to gain experience before returning. The student would graduate in 2024.

Drs. Yamaguchi and Takagai are able to host 5-7 Colorado State University students at Fukushima University for a 10 day short course starting approximately 1 August 2023. Colorado State University would host 5-7 students from Fukushima University from approximately 1-10 September 2023. This exchange would be facilitated by Ms. He Min.

Figure 3 Lecture on Graduate School admissions in the USA at Fukushima

William McMichael in international programs noted that our Memorandum of Understanding is expired and offered to revise and reprocess it for future collaborations. He also noted that in addition to the exchange programs with Drs. Yamaguchi and Takagai, he may be offering the Fukushima University Ambassador Program in February or March 2023. The number of students that could attend from CSU is not clear at this time, but he will notify us in the next two months of the dates and positions available for CSU students. CSU students may need to provide some funding for this class.

Fukushima University Institute for Environmental Radioactivity
Drs. Toshihiro Wada and Alexei Konoplev were very excited to have CSU students participate in research projects in the summer of 2023. CSU faculty will identify interested students and arrange for the students to do research over the summer with either professor at the Institute for Environmental Radioactivity (IER) based on mutual interests. Dr. Vasyl Yoschenko is also interested in taking on a summer research student but is awaiting the results of a grant prior to committing to taking any students.

Figure 4 Radioecology Lecture at Institute of Environmental Radioactivity

Drs. Maksym Gusyev, Konoplev and Yoschenko agreed that we should collaborate more on our radioecology classes, which resulted in multiple presentations and lectures during this visit (see listing in section 10). The CSU class materials from ERHS 570 Radioecology were shared with all the professors. We agreed to try to have joint presentations of well known scientists and would share links to the presentations in the future. One common theme was the lack of a suitable textbook for the materials.

Dr. Wada (IER) may also be able to provide some samples of fish that we could utilize to examine Sr-90 in bones, and also compare to a JAEA analysis that is going on. He will notify us later this month of the sampling progress.

Dr. Nanba facilitated a visit to Tomioka town TEPCO disaster museum and the Tomioka history museum. Both would be included in any student visit. The disaster museum in Tomioka is excellent and provides a lot of background as well as an excellent explanation of the disaster. The exhibits can be switched from Japanese to English, and the presentations are clear, concise and scientifically accurate. When our students visit Japan, they really must visit this museum. An additional visit to Okuma Town's museum was also excellent and demonstrates the social aspects of the earthquake, tsunami and accident. There is an elementary school that survived the tsunami and is available for tour that should also be seen by all CSU students.

Dr. Nanba also invited me to watch presentations of IER students. IER Student presentations were all in Japanese, but I found a translation program (DeepL) that will translate the slides via a photo. The presentations were on a range of topics, all of which would be relevant to

our program at CSU. The only lacking area was radiation dosimetry. There were no presentations on radiation dosimetry, although some of the projects would have benefited form good radiation dosimetry. Radiation dosimetry is an area of research where CSU can be of assistance to the IER. We will explore joint presentations of students from the IER and CSU in the future. A joint presentation would greatly facilitate understanding all the research performed at each institution and should facilitate more collaboration.

A calculation of radiation dose was performed for Dr. Ishiniwa and her student, Olena Burdo. The radiation dose to mice exposed to Sr-90 was calculated as an example.

Tsukuba University

Dr. Onda requested I provide 3 seminars to Tsukuba University, and these seminars were hosted by Dr Takahashi. Dr. Onda and his team are currently in the last stages of negotiations on a very large funding opportunity, where they will be able to pay stipend and tuition to international students interested in working with Tsukuba University faculty. The funding would encompass CSU, MIT, Portsmouth University (England), Fukushima University, Hirosaki University, the Japan Atomic Energy Agency, the IAEA and at least one other university. The stipend may be as high as 40,0000 yen per month, but that is still in negotiation.

Figure 5 Tsukuba University Students after seminar completion

Early in 2022 CSU began negotiations (Sarah Olsen from CSU international programs was a key part) to put a memorandum of understanding in place with Tsukuba University and should be in place at this time. The MOU was general in nature, but will still suit our needs, as we can be included in the funding, which I was not aware of until this trip. The funding would be for the next 10 years, and would fund students and possibly a small amount of travel for researchers. The goal of Dr. Onda's team is to be a truly international group!

Dr. Onda's area of research is soils and movement or nuclides in soils. He typically publishes in Nature and is well known throughout Japan. He is very interested in taking on at least one or more CSU students this summer, and for perhaps longer. Donovan Anderson (CSU alum) did his post doc at Tsukuba University and made a very good impression on Dr Onda and his team. Tsukuba University has international student housing that is adequate, and the campus is approximately 1 to 1.5 hours by bus from Tokyo. Tsukuba University has a large building where they train on the use of radioisotopes, including hoods and other equipment. Typically, P-32 is used in their training. Radiation sources at Tsukuba are all uCi quantities of Ra-226 (quite old), I-129, Co-60Am-241, C-252, C-14, U3O8, and Ba-133. I am uncertain if the Cf-252 is actually usable, as it seems very old, as do all of the sources. CSU can be of assistance to Tsukuba University research with our ability to use multiple sources and higher activities.

Another theme I noticed at Tsukuba as well as Fukushima University is that few researchers perform radiation dose calculations and limited coverage of radiation detector theory classes. There does not seem to be any (so far) faculty I have met investigating that area in Japan.

CSU will identify at least one student that is interested in doing research over the summer, and perhaps beyond, at Tsukuba University. Besides work in soil erosion, Tsukuba University also has research in sediment, as well as an ocean sampling program from (now deceased) Dr Aoyama.
As an aside note, Dr Onda invited me to his home, where he personally (!) prepared okonomiyaki, which are cabbage pancakes for dinner!

Tokyo University
Dr. Shozagowa has found that in some fish (approximately 1% or less) he has sampled are abnormally high in radiocesium. He hypothesizes that the lagoon outside Fukushima Dai-ichi is contaminated with radiocesium, but he is not allowed to sample in that area. He has multiple samples still to process, and has found very high levels of radiocesium in freshwater fish in the "Difficult to Return Zone" but no abonormally high measurements outside the zone. Additionally, he has sampled multiple marine, freshwater and terrestrial plants and not found any abnormal readings. He has agreed to ship some split samples to CSU for comparative analysis and analysis of Sr-90. He would be included on any publications resulting from these samples.

Additionally, Dr. Shozagowa was invited give a seminar in late March or early April of 2023 at CSU to increase our collaborations. He has been a great mentor of students in the past and may be able to take on a research student in the summer of 2023, depending on the results of his grant application.

Japan Atomic Energy Agency
JAEA Chairman Dr. Mitsuru Uesaka met to discuss expanding collaborations with CSU, as he is already collaborating with Dr. Takamitsu Kato in the department of ERHS. The JAEA is creating a new facility in Namie Town (near the Fukushima Dai-ichi) the "Fukushima International Research and Education Organization". The Fukushima International Research and Education Organization will focus on five areas:

1. Robotics
2. Agriculture, forestry and fisheries
3. Energy (hydrogen and others)
4. Radiation science, drug discovery and industrial applications of radiation (accelerator)
5. Accumulation and dissemination of data and insights on nuclear disasters

He sees our collaborations as a good fit in area 5. He would like to continue discussion on collaboration as the facility is built, and have CSU collaborate through the new facility. CSU is already a part of the consortium of universities participating through our MOU with Tsukuba University.

Hiroshima University
Dr. Gonzales at Hiroshima University met to discuss continuing our collaborations in the Phoenix Program. Unfortunately, the Phoenix Program was not selected for continuing funding, and they do

not anticipate any additional funding in this area. Their main focus is now more towards radiobiology rather than health physics, radioecology or radiation chemistry at this time. Collaboration at this time "would be difficult" but we will continue to seek common ground on potential collaborative efforts.

Hirosaki University

A former CSU MS student, Dr. Donovan Anderson (I was his MS advisor) arranged for a seminar and meetings with Dr. Tokonami at Hirosaki University. Dr. Anderson is in the process of preparing a Memorandum of Understanding (MOU) with CSU to allow students to perform research during the summer with Hirosaki University researchers and also to institute an exchange program similar to Fukushima University. The exchange program would have CSU students visit Hirosaki University for 10 days to learn about the Fukushima Dai-ichi accident. The exchange would then have Hirosaki University students visit CSU and learn about radiation and especially the use and handling of liquid and solid radioactive materials, including visits to the TRIGA reactor and use of neutron emitting radioactive materials. We hope to have the MOU in place before the end of 2022. Dr. Tomisato Miura has interest in biodosimetry, and was trained in Dr. William Blakely's laboratory at the Armed Forces Radiobiology Research Institute (AFFRI). He was very interested in collaborating on research, and is Dr. Anderson's supervisor. A very promising discussion was had with Dr. Naofumi Akata, who is conducting radiochemistry research on the Fukushima Dai-ichi releases, especially low levels of H-3. He has captured multiple fish with very high Cs-137 concentrations, and is looking at low levels of Sr-90 in seawater. Dr Akata is very interested in collaborating, as he already collaborates with Dr. Takagai at Fukushima University. Typically, Dr. Takagai will analyze samples for high levels of Sr-90, and Dr. Akata will analyze for low levels of Sr-90. Dr. Tazoe was very interested in the CSU ability to use Po-209 as a tracer, as well as neutron activation and americium and plutonium tracers in samples. The person in charge of international cooperation and collaboration is Dr. Hirofumi Tazoe, and he is very interested in collaborating. It was noted the Hirosaki University has multiple MOU's in place, but none in the USA as yet.

10. Research Presentations during the period of the fellowship

Name of Conference or Class	**Title**	**Place**	**Date**
International Programs	How to Gain Admission to USA Graduate Schools	Fukushima University	18OCT
Radioecology Master's Course on Terrestrial Radioecology	Movement of radionuclides in the environment	Fukushima University, Institute of Environmental Radioactivity	19OCT
Radioecology Master's Course, Nuclear Accidents	Radioactive Contamination at the Hanford Site	Fukushima University, Institute of Environmental Radioactivity	24OCT
Radioecology Master's Course on Terrestrial Radioecology	History of Radioecology	Fukushima University, Institute of	24OCT

		Environmental Radioactivity	
Radioecology Master's Course	Background radiation	Tsukuba University	26OCT
Radioecology Master's Course	How radiation causes bioeffects	Tsukuba University	26OCT
Radioecology Master's Course	Radiation research at Colorado State University and potential collaborative activities	Tsukuba University	26OCT
Radioecology Master's Course on Atmospheric Dispersion	Atmospheric Dispersion Models	Fukushima University, Institute of Environmental Radioactivity	28OCT
Radioecology Master's Course on Terrestrial Radioecology	Terrestrial Radioecology	Fukushima University, Institute of Environmental Radioactivity	01NOV
Radioecology Master's Course, Nuclear Accidents	The SL-1 and Three Mile Island Accidents	Fukushima University, Institute of Environmental Radioactivity	07NOV
Department	How radiation causes bioeffects and research collaboration opportunities at Colorado State University	Hirosaki University (broadcast online)	11NOV

11. A list of paper published during or after the period of the fellowship, and the names of the journals in which they appeared (Please fill in the format below). Attach a copy of each article if available.

No articles written at this time, as data collection was completed withing the last two weeks. I will notify JSPS when articles have been accepted for peer review publication. We expect at least one article, possibly two, from this 30 day Bridge Award.

12. Awards during the period of the fellowship (Name of the award, Institution, date etc.)

None at this time.

13.Future Contact Information

JSPS would like to keep in touch with all of you and provide with our English newsletter, "JSPS Quarterly". It contains the latest information on JSPS programs. In addition, the existing JSPS Alumni Associations and those in the process of being established would like to welcome you as a new member. If you are interested in being involved in the JSPS alumni activities, please check the following boxes. JSPS will provide the information to the alumni association in your country or region.

[✓] Yes, JSPS may forward my contact information to the relevant alumni association.

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Welcome to the JSPS Alumni Follow-Up Activities

Considering JSPS former Fellows to be valuable assets in advancing research between Japan and its counterpart countries, JSPS places great importance on follow-up activities aimed at retaining contact and communication with and among them. Since 1995, JSPS has supported to organize JSPS Alumni Associations and so far 18 associations are officially established. Among 24,000 JSPS former Fellows in total, 7,400 Fellows are now members of alumni associations in their countries or areas. In cooperation with JSPS, they actively hold academic symposium, general assemblies among members annually, maintain website and publish useful newsletters regularly. Please visit our homepage and check which association is suitable for you!

URL: https://www.jsps.go.jp/english/e-plaza/20_alumni.html

Note: This form must be submitted along with your Host's Form 8 within one month of the end of your fellowship.