

## Report on the 3rd UK-Japan Frontiers of Science (UK-Japan FoS) Symposium

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The third UK-Japan Frontiers of Science Symposium had been held from 7 to 10 November at Tokyo Bay Tokyu Hotel. The hotel has a superb sea view which is faced the Tokyo Bay, and the duration of symposium was blessed with beautiful autumn weather.

Let me start with the history of my FoS symposia. I participated in Japanese-German Frontiers of Science (JGFoS) symposia for four times during which I was appointed as a PGM for two times. After a few years, I got suddenly offered to assume the role of this PGM Co-Chair. I knew very well that serving as a PGM Co-Chair means to bear a heavy responsibility. Despite that, I accepted the nomination because I was so grateful that I had enjoyed the every JGFoS symposium I attended and wanted to give back to this program.

The UK-Japan FoS Symposiums have not been held regularly. This was the third symposium after 2008 and 2016. Additionally, the given preparation duration is particularly shorter than that of JGFoS Symposium which used to be held annually. JGFoS's PGMs decide session topics at the meeting called PGMeeting which held at the same time as the previous year's symposium. Furthermore, PGMs of each field discussed on their topics several months ahead of the PGMeeting. In other words, they were provided with more than a year prior to the symposium for the preparation as PGMs in JGFoS.

On the contrary, the preparation for this UK-Japan FoS Symposium was a bit too rush. PGMs were appointed in April, then they held the PGMeeting to decide session topics in the U.K. in May (I ended up not being able to attend the meeting despite a PGM Co-Chair). After that, they even had to select session speakers before summer. With that said, it didn't really cause a serious problem. Actually, all PGMs were the former FoS Symposium attendees. Still, it was personally a thrilling experience.

In the end of August, the preparatory meeting (rehearsal attended by the Japanese participants) was held. I met the Japanese PGMs for the first time since I didn't attend a PGMeeting held in May. I felt quite uneasy about the fact that I had not yet met the PGM Co-Chair, the PGM and two speakers on the U.K. side of my research field's session. That being said, my experience of

participating in the FoS symposium, which adds up to four times, somehow convinced me that the symposium would be nonetheless exciting.

Finally, the third UK-Japan FoS Symposium started on the evening, Thursday, November 7. First of all, the Session Coordination Meeting was held prior to the Welcome Reception. It was my first encounter with the U.K. side's PGM Co-Chair, the PGM and the two speakers of Earth Science/Environment – Anthropocene Session. We made an arrangement for the order of presentations and gave a little moderation on some slides. After the meeting, the Welcome Reception was begun with an icebreaker to welcome the attendees. While we were still unfamiliar to each other, everyone seemed to gradually get comfortable.

The sessions, the main programs of the symposium, begun in the next morning, Friday, November 8. The topic of the first session was on “Computational Brain Modeling and Brain-computer Interfaces” in the field of Medical/Neuroscience. The remarkable development in this field to understand the systems in the brain and the ways to control them was vividly presented. It was surprising to me that the knowledge of the brain had been advanced to such extent, once conceived as being so mysterious to be investigated. It also made me realized that we may soon live in the world pictured in the films like “The Matrix” or “Avatar.” In the end, two hours (time allocated per session) passed by so quickly. The session was a promising start that raised the related issues, such as, “to what extent do we think that the methods of brain doping are allowed?”

After the presentation session to introduce JSPS & the Royal Society and the lunch break, the second session was on Physics/Astrophysics of which session topic was “Black Holes”. Announced a few months ago, it was really a momentous news that the first-ever image of black hole was captured. Moreover, it was a rare opportunity, even in the FoS Symposium, to be able to listen to the scientist who was involved in such a great achievement.

The Event Horizon Telescope is a network of telescopes, linking radio dishes across the globe that creates an Earth-sized interferometer. The data collected by the telescopes are visualized into pictures. The imaging process inevitably incurs ambiguity that results in many numbers of possible images. Consequently, four images by four research institutions were equalized to create that press-released image which showed a ring like a doughnut. The session was successful from which we learned the great depth of Physics that challenges a new research topic while interchangeably applying observational and simulating approaches.

After the second session, we had Poster Flash Talk I and Poster Session I. Later, we deepened our friendship between Japan and the U.K. while enjoying a nice dinner.

The next day, Saturday November 9, started with the session in the field of Biology/Life Science. On the topic of “Synthetic Biology,” the session was focused on the exploration for the possibilities of constructing artificial cells. As we are in the process of forming the knowledge of the specific DNA code that defines life, this is a frontline research aiming at, ultimately, the synthesis of artificial cells.

That being said, the tough question is how to develop the cell walls that can divide. It seems still difficult to create autonomously dividing artificial vessels. The research is usually conducted by taking the approach that imitates forms and functions of natural cells. One of the speakers said that the researchers often came to realize the excellent features of the model in nature and thereby overwhelmed. I share the same thoughts as a researcher of Earth Science in which we are consistently led to conclude that the “Earth is great.”

Then we had Poster Flash Talk II and Poster Session II before lunch. The fourth session in the afternoon was on the topic of “Smart Material” in the field of Chemistry/Material Science. The speaker of the session said that, though the clear definition of being ‘smart’ has not been given yet, most of smart materials were created artificially inspired by the useful functions that exist in nature in varieties of settings and diverse materials.

For instance, while using light ceramics to manufacture high-temperature components such as turbine blades in aircraft engines is cost-effective, still it should ensure the strength of the material as well. As one of exemplary measures, the human-like self-healing capability that fills cracks was presented.

The cultural tour was scheduled in the afternoon program. To encounter the Japanese culture, we did sightseeing tour in *Asakusa* and enjoyed *chanko nabe*. To my surprise, the astonishingly huge *dohyo* was built inside the restaurant. I had never been to such restaurant before. The participants from the U.K. also seemed to have a good time in many ways.

On the last day of the symposium, Sunday, November 10, the fifth session was on the topic titled “Signal from Noise” in the field of Math/Applied Math/Informatics. The ‘easy’ problems in the field of mathematics have been solved year after year. Therefore, the most advanced research today is to challenge (quantify) the remaining ‘complex’ problems along with various uncertainties they would bring. They seemed to range over a wide variety of fields, such as medical science, earth science and biology.

Currently, for example, huge data of DNA sequences can be obtained from a small sample. Such big data may enable us to make pre-diagnosis of the diseases such as colorectal cancer. It seems that researchers are working hard to develop a mathematical model based on the analysis of big data.

The final session of the symposium was on “Anthropocene” in the field of Earth Science/Environment to which I was assigned. Various theories have been proposed when it comes to define the commencement of the Anthropocene. But generally, it seems to relate to an epoch in which the humans give influence over the Earth’s environment. People are also concerned whether that of Anthropocene means the evolutionary development of humans or the beginning of the term is better described as the period in which the climate change caused by greenhouse gases has become quite visible. As for the micro-plastics of which problem has been recently drawn attention, even in the South Pole where the minimal impact of human activities has ever been made, some deep sea fish accumulate them in their bodies.

Besides, while the grand-scale water management technology such as man-made reservoirs and the use of groundwater has been developed as human activities, certain changes may occur, for instance, in temperature and precipitation in future climate. Under these circumstances, we are facing serious problems. Many participants asked these kind of questions that have no answers.

The third UK-Japan FoS Symposium was thus ended. I once got anxious for the short preparation period as I wrote in the beginning. Despite that, I had much fruitful days: the symposium was intellectually stimulated showing no difference with JGFoS Symposia I had attended in the past. Most of other participants also said that they enjoyed greatly.

In closing, I would like to extend my sincere gratitude to the staff of JSPS and the Royal Society who supported the operation of this UK-Japan FoS Symposium, the members of JSPS FoS Symposium Advisory Board who gave helpful advice and offered words of encouragement, all PGMs who worked hard on planning the sessions together, and above all, all speakers and participating researchers. Though my capacity as PGM Co-Chair was limited in some cases, it was a great symposium as many participants offered me valuable assistances. More than anybody, I really enjoyed the symposium. I heartily appreciate that I was given such an excellent opportunity.



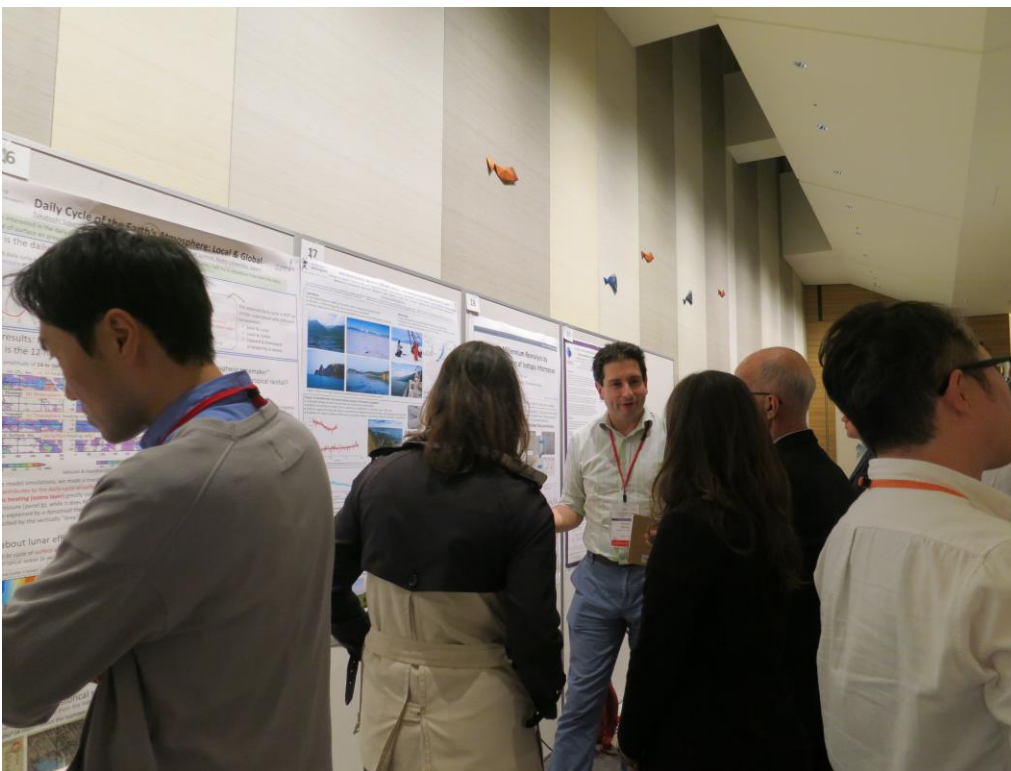
Cultural excursion to *Kaminarimon*



Medical/Neuroscience session on the first day



The next session held on the first day in the field of Physics/Astrophysics



Poster Session I on the first day



Poster Session II on the second day



Biology/Life Science Session on the second day



Session in the field of Chemistry/Material Science on the second day

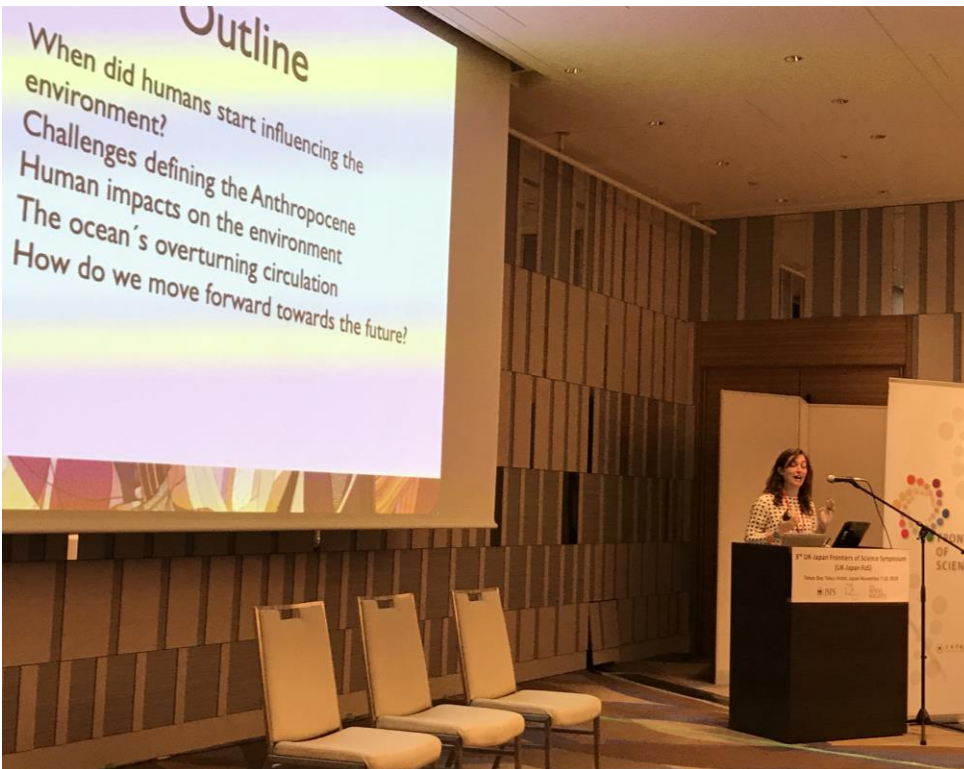


Tasting *Chanko Nabe* while going on the cultural excursion





Math/Applied Math/Informatics Session on the third day



The last session of the symposium in the field of Earth Science/Environment



Group photo in front of the Tokyo Bay