

## Report on the Japanese-American-German Frontiers of Science (JAGFoS) Symposium 2017

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The first Japanese-American-German Frontiers of Science (JAGFoS) Symposium was held from 21 - 24 September 2017 in Bad Neuenahr, Germany. I had participated three times in the Japanese-German Frontiers of Science (JGFoS) symposia from 2010 to 2012 as a general participant, a Planning Group Member (PGM) and a PGM Co-Chair in the session of Chemistry / Materials science. Since it was the first trilateral FoS symposium, I was fortunately given the chance to participate again in the FoS symposium for the first time in five years, unless otherwise it primarily sets the restriction with the number of opportunities for each participant to attend the FoS symposia. And thus, unexpectedly, I have been writing my second report on FoS.

The Japanese participants of the symposium left from Haneda Airport on a midnight flight to Germany. We arrived at Frankfurt Airport at the dark dawn of September 21. It was foggy out there, as we had heard from the announcement by the airline captain before the landing. Ms. Kawakami and Mr. Ishida of JSPS picked us up and we got on the shuttle bus they had arranged for us. After a two-hour-drive on the foggy Autobahn, we arrived in Bad Neuenahr, the little spa town near the Rhine River. As I got off the bus, I could see the signboard of the Steigenberger Hotel. The hotel, booked as the JAGFoS venue, was relatively large for the city's size.

First and foremost, let me explain the objective of the FoS symposium. As described on the website of the Japan Society for the Promotion of Science (JSPS), it is the “international symposium that provides a platform for talented young researchers in Japan and counterpart countries to engage in cross-disciplinary discussions on cutting edge scientific topics while lodging together”. It aims to foster the future generations of leaders and build networks for leading researchers in the world. JAGFoS symposium is programmed in the six sessions such as “Biology / Life Sciences”, “Chemistry / Materials Science”, “Earth Science/ Geosciences / Environmental Sciences”, “(Applied) Mathematics / Computer Science / Engineering”, “Physics / Astrophysics” and “Social Sciences”. The number of participants in each session is limited to five including speakers and PGM. The JAGFoS symposium is held with 90 members in total. The breakdown is 30 people each from Japan, the US and Germany. The eligible participants are young frontline researchers of each

field up to 45 years of age or up to 15 years after their Ph.D. FoS symposia are hosted by the major funding agencies that offer support for their countries' academic research infrastructure, including the Japan Society for the Promotion of Science (JSPS) in Japan, the Alexander von Humboldt Foundation in Germany and the National Academy of Sciences in the United States. The FoS participants chosen by the elaborate selection process are the researchers who are regarded as their countries' future leaders in the field of science. Therefore, they shall be proud of themselves as they are selected as representatives of their countries.

Participants of the FoS symposium attend closed sessions to discuss cutting edge scientific topics and lodge together for the duration. In fact, the Gordon Research Conference (GRC) is also run by the similar format. In the FoS symposium, however, cross-disciplinary discussions are taken place on topics from all fields of science including social science. In a two-hour session at the symposium, 20 minutes each are allocated to a talk on the background of its research topic by an introductory speaker and two speakers' presentations on their research. The remaining one hour is used for a discussion session joined by all participants. Every participant is encouraged to join as a main player in this way.

The PGMs and the speakers of the sessions assembled in a small conference room to have a session coordination meeting just before the reception in the evening of 21 September. It was the first meeting joined by the speakers though I had met with the counterpart PGMs at the planning group meeting held in Berlin last year for selecting topics. In FoS, unlike ordinary academic societies of specialized fields, the important task of a presenter is to effectively communicate the cutting-edge topics to the researchers in other fields while avoiding the use of technical terms and jargons. Making presentation at this symposium is particularly difficult because the cross-disciplinary approach is primarily sought. When I participated in JGFoS symposium five years ago, I was seriously concerned whether the session speakers could really deliver accessible presentations to the audience. However, on the occasion of the first trilateral symposium, the former PGMs of JGFoS symposium and Japanese-American Frontiers of Science (JAFoS) symposium were invited again as Japanese PGMs. They were the 'FoS experts' such as Dr. Doi (JGFoS), Dr. Takeda (JGFoS), Prof. Kawaguchi (JAFoS) including the former PGM Co-chairs, Dr. Tanimoto (JGFoS) and Prof. Ukita



(JGFoS). As Prof. Horikawa (JGFoS) wrote in his essay (Please refer to the ‘FoS Alumni Messages No. 16’ (in Japanese only): <https://www.jsps.go.jp/j-bilat/fos/messages/16.html>), they are the living ‘legend’ of FoS. Therefore, there was no more worry about managing sessions. I even felt a sense of security. It is the usual practice for Japanese participants to conduct pre-meeting prior to the symposium to get fully prepared for sessions. Meanwhile, the preparation for this symposium was continued even after the pre-meeting held in May with the modifications on the speakers’ presentations that were proposed among the PGMs. In the case of my session, I was rather concerned about the counterpart countries’ speakers who came up with 60 or more slides with the extensive use of technical terms produced for the specialized academic conference. After I had briefly talked to each speaker about the key requirements, they managed to produce the new slides within a short time period (by the start of the session) that seemed perfect for the presentation at the cross disciplinary symposium. Unquestionably, they are the top-class scientists.

At the reception, I delivered a welcome speech following the greetings by Dr. Enno Aufderheide, Secretary General of the Alexander von Humboldt Foundation. My first task as a PGM Co-Chair was finished at a very early stage of the symposium. While introducing each other at the dinner tables in the reception hall, the participants gradually engaged in conversations. It seemed that they got a nice warm-up prior to the sessions from next day.

In the next morning on 22 September, the session was begun after the opening remarks by Mr. Edward Patte of the National Academy of Sciences and Prof. Dariusz Zifonun, the German PGM Co-Chair.



The first session was on “Earth Science”. Its topic was “Deep-Time Insights into Rapid Climate Change”. It was such a fascinating topic that aimed to solve the puzzle of climate change by placing a focus on a slight change in the isotopic ratio of the ancient ice that occurred in Antarctica. The introductory speaker explained the difference in isotopic ratios by showing a cute cartoon of fat  $^{13}\text{C}$  and thin  $^{12}\text{C}$  to make his talk accessible to the audience in other fields. The performance exhibits the unique characteristics of FoS symposium as well. The Q&A session was started immediately after the presentations. The PGM chaired the Q&A session while the three speakers sat on chairs placed next to the screen. Generally, many hands were raised swiftly from every corner of the room as soon as the session was open to the floor. There always seemed a key phrase which was often heard at each session of this symposium. In this time, it was “dumb question”. When a researcher of other fields asked and said, “This may be a dumb question, but ...”, it is often turned out to be a very fundamental question that could stun even an expert in the field.

The next was Physics session. Its topic was “Gravitational Waves and Their Discovery”. It was the most opportune and current issue selected by attracting a lot of interest from the members at the last year’s PGM meeting that was held only 6 months since the first gravitational waves had been detected. It is still fresh in our memory that the Noble Prize in Physics 2017 was awarded for the discovery of gravitational waves just 10 days after the symposium had finished. It is a rule of thumb in the physics session at FoS symposium that a presenter should minimize the use of complex equations. With beautiful graphics, the speakers clearly and visually explained the transmission of the gravitational wave. Further, physicists are very good at explaining basic principles by using handy tools. When talking about a pendulum, one of the presenters took out the cable of the laptop computer to describe the phenomenon. Several large gravitational wave observatories have been built around the world such as LIGO (USA), VIRGO (France, Italy), GEO 600 (Germany, UK), KAGRA (Japan) and so forth with the aim of detecting a slight signal of the gravitational wave. While the competition for the discovery of the gravitational wave between the major observatories gets intensified, the facilities around the world, once one of them detects the sign of the waves, promptly share the acquired data, such as those on locations, and initiate the multilateral observation. It is indeed a monumental research project on a global scale.

On 23 September, the second day was started with the Chemistry session. Its topic was “Materials and Chemistry to Developed Alternative Energy Resources”. Our question was: How we can apply chemistry to combat the pressing problem of depletion of energy resources? The speakers

introduced the current technology such as photovoltaics (solar cells), batteries and a hydrogen production by water photolysis and its future research topics. Most participants who were eager to ask questions had to raise hands endlessly at the Q&A sessions on the first day. Once given a chance, questioners usually rushed to put two or three questions. But only a few tough-minded people could keep on raising a hand for an hour and wait their turns. Most of them gave up questioning during the last 30 minutes of a session. Then I proposed to limit the number of questions to one per person, starting from this chemistry session, because I thought that the opportunities to ask question should be given to as many participants as possible. I chaired sessions in the past several FoS symposia but it had been always difficult.



The fourth session was started in the afternoon on Biology. The topic was “Sleep Brain: Why Do We Need Sleep?” Since the theme mattered directly to our daily lives, the participants got very curious and attentively listened. While every one of us lived in an each individual social life environment, the latest research results including the statistical approaches using big data on the questions such as, “When do people sleep and feel like waking up?” and “sleep time and memory consolidation” were introduced in the session. We spend nearly a third of our life for getting sleep to lead the remaining 2/3 more efficiently and meaningfully. It always remains an important research topic because everyone wants to have a really good sleep.



On 24 September, the last day of the symposium was started with the Computer Science session on “Machine Learning & Computational Modeling”. The development of artificial intelligence (AI) has been accelerated in recent years as it was typically seen in the news about the computer program “Alpha Go” that had defeated the world champion of Go. We researchers also felt unsafe while the news media was reporting that some jobs would be replaced by AI in the future. During the Q&A session, one of the participants stood saying, “Which academic field where machine learning does not work well for conducting research? If I am able to find such area, I will change my subject to study it” and it drew laughter, but the participants were all relieved when the speaker answered and said, “The current level of AI does not pose the immediate threat on the job of researchers.”

The last session was on Social Science and its topic was about “Social and Socioeconomic Inequality”. We discussed various “inequalities” in society such as the “obesity and health”, “regional disparity measured in terms of the minimum wage” and “family environment, educational opportunity and income”. Though the discussion took place based on the analyzed data collected from various viewpoints, it was difficult to choose the appropriate talking points. Further, the session was interrupted when one of the American participant pointed out that the analysis carried out on the educational opportunities in the US was not enough considerate for the difference between black and white people. The incident reminded me of the deep-rooted race matter that was still persisted in the country.

Finally, the symposium was successfully ended with the closing remarks by Dr. David Fike, the US Co-Chair and Dr. Shigeo Koyasu, Chair of the FoS Advisory Board, on behalf of the Japan Society for the Promotion of Science.

I had not been sure whether the first trilateral FoS symposium could be managed well. The number of participants was increased from 60 to 90 compared to the JGFoS symposia in which I had participated in the past. Despite that, there seemed to be no problem in terms of the discussions in sessions and the procedures



of the symposium in general. The unique characters and warm personalities of the past PGMs of JGFoS including Drs. Tanimoto, Doi and Ukita have nurtured a close relationship between PGMs

and a friendly atmosphere. I think we had a good mixture with the intelligent essence of JAFoS while maintaining the warm atmosphere of JGFoS. I also felt that it was a more international symposium because our discussions and standpoints contained more multilateral elements with the participation of three countries rather than two. I hope that the JAGFoS symposium will be organized again building upon this symposium that set a good example.

As seen from the above, a wide range of topics in the fields of science are discussed cross disciplinarily at the FoS symposium. It is a perfect opportunity to widen the scope of one's research. It also offers a rare opportunity to get acquainted with leading scientists of other fields. The most attractive point of FoS to me is that I get connected to the excellent researchers of other fields. Every top researcher in each field is exceptionally intelligent and often has a unique character. They share the common traits of those people who attract people's attention. The network formed between such talented people will certainly be an invaluable asset in your research career path. It seemed that some participants had been reluctant to attend despite receiving invitations several times in the past. For your information, please refer to the following link to read Dr. Hayashi's report on the symposium. (<http://medical-neuro.imcr.gunma-u.ac.jp/message03.html>) While I had a chance to converse with her on the cruise on the Rhine River, she was really an interesting person and a perfect participant of the FoS symposium as well as being an excellent researcher. I highly recommend all young talented researchers to participate in the symposium. I hope you enjoy it to the full as a representative of Japan.

Finally, I really hoped to take the group photo with the JSPS FoS advisory board members, the JSPS staff and the PGMs. Dr. Iye, Executive Director of JSPS, Dr. Koyasu of Riken, Chair of the JSPS FoS Advisory Board, the Advisory Board Members including Prof. Kakegawa of Tohoku University, Dr. Iriki of Riken and Prof. Sato of Tohoku University gave us the useful advice on how to organize sessions. To honor the members of the FoS advisory board even after participating in FoS, our PGM colleagues invite them to drink on every occasion of the FoS symposium held in Japan. I sincerely hope that they keep in touch with us as the FoS alumni. In addition, Ms. Kawakami and Mr. Ishida of JSPS had made almost all preparations and offered total support for organizing the symposium, including handling correspondences between the Humboldt Foundation and the National Academy of Sciences. I would like to express my deepest gratitude to their excellent job, for the symposium could not have been possible without such excellent support.

Moreover, I thank my fellow PGMs, Drs. Tanimoto, Doi, Ukita, Takeda and Kawaguchi. Thanks to their support, we had the very successful first JAGFoS as a pinnacle of our FoS symposia. I will always treasure the memories of the FoS symposia in which I met all of you and had a great time together.

