

## Report on the 5th Japanese-American-German Frontiers of Science (JAGFOS) Symposium

SUZUKI Taiji, Dr., Japanese PGM Co-chair  
Graduate School of Information Science and Technology  
The University of Tokyo

This is a report of the 5th Japanese-American-German Frontiers of Science (JAGFOS) Symposium held at the Kyoto Brighton Hotel from October 24 to 27, 2024. The Frontiers of Science (FoS) Symposium is described as a camp-style international symposium where up-and-coming young researchers from Japan and other countries engage in cross-disciplinary discussions on cutting-edge scientific topics with the aim of fostering leaders for the next generation and creating networks connecting world-leading human resources. It is expected that up-and-coming researchers selected from participating countries will gain a broad scientific perspective and contribute to the development of new scientific fields by further developing their free ideas and without being restricted by existing academic disciplines. Within the FoS, JAGFOS is held by Japan, US, and Germany, and is hosted and run by the Japan Society for the Promotion of Science (JSPS) from Japan, the National Academy of Sciences (NAS) from the United States, and the Humboldt Foundation (AvH) from Germany.

The first JAGFOS was held in Dresden, Germany in 2018, the second in Kyoto, Japan in 2019, and the third in Irvine, USA in 2022 after being postponed due to COVID-19. Since then, it has been held in the same rotation, making this the fifth time. The JAGFOS symposium broadly covers six different scientific fields, which are: Biology/Life Sciences, Chemistry/Materials Science, Earth Science/Geosciences/Environmental Sciences, (Applied) Mathematics/Computer Science/Engineering, Physics/Astrophysics, and Social Sciences. Selected up-and-coming young researchers from each field gather to exchange information on cutting-edge research topics and engage in intensive discussions in a camp format.

The total number of participants are 72, consisting of 24 young researchers selected from each country. The participants are one PGM, one speaker, and two participating researchers from each of the six fields, for a total of 24 researchers from each country (4 researchers x 6 fields). Young researchers are top scientists in their respective fields who are under the age of 45 and have a Ph.D. or are less than 15 years postdoctoral. The PGMs are responsible for organizing the sessions for each research topic, selecting the speakers, and chairing the sessions. The speakers present their cutting-edge research results according to the research topics determined by the PGMs, and the participating researchers actively take part in the discussions to make the symposium as lively as possible. I first attended JAGFOS in the US in 2022 as a General Participant, and this will be my third time attending JAGFOS, having served as a PGM in 2023 and as a PGM Co-chair in 2024.

In the symposium, researchers from each field organize their own sessions, each of which is allotted a two-hour slot. Each session consists of oral presentations by three speakers, one from each country. First, one of the three introductory speakers gives a 20-minute talk on the background of the session topic, followed by two 20-minute talks by the other two speakers on more in-depth details of their own research. The most unique feature of the FoS is that after the three speakers' presentations, the remaining hour is devoted to a question-and-answer session. Since many of the participants are from outside the relevant scientific fields, the speakers are asked unexpected questions from all angles. This question-and-answer session of long duration greatly deepens the participants' understanding of the field and highlights the challenges that lie ahead. An interesting phenomenon is that although the participants come from completely different backgrounds, they all share some common

awareness of the issues, and this is brought to light through the discussions. In this regard, "no question is worthless" is emphasized throughout the symposium. I have seen many times how verbalizing the questions that all members had in mind clarifies the issues and how the discussions converge on some sort of common viewpoint that is consistent with those of the experts in the field. Since participants often need to engage in discussions at a high conceptual level rather than at a detailed technical level, they need to be able to engage in such discussions in English with confidence. Fortunately, FoS participants are always open to discussions, and I feel that it is a good culture of FoS that even Japanese participants who have language disadvantages can be accepted into discussions without any difficulty.

Having said that, it is customary for the Japanese side to hold a pre-conference meeting prior to the symposium (this year it was held in June), which allows Japanese participants to obtain prior knowledge of the topics of each session in Japanese and to go into the symposium having already become acquainted with the other Japanese participants, making it easier to be involved in in-depth discussions than those from the other countries. I consider this to be an advantageous point for Japanese participants.

In this way, JAGFOS provides a valuable opportunity for participants to develop skills in communicating their research in an accessible way to researchers in other fields, and in facilitating discussions on topics outside their area of expertise. This takes place both at the pre-conference meeting and at the symposium itself, where participants must find themselves in discussions with researchers from different fields. On the other hand, it is also an opportunity to get a bird's eye view of one's own field of research, which leads not only to networking, but also to taking one's own research to a higher level. In this way, participants are privileged to have the opportunity to enjoy four productive days.

In fact, before the symposium, I had dinner in Kanda, Tokyo, with Sebastian from my research area and Matthew from the chemistry area, who arrived in Japan early, to become better acquainted. We walked through the streets of Kanda looking for a restaurant and finally settled on a gibier restaurant. I feel that such interactions, different from the scientific discussions at the symposium, were invaluable because they provided an opportunity to learn more about each other's background culture and the situation in our home countries.

From here I would like to report how the four days of JAGFOS proceeded.

#### **Thursday, October 24, 2024 Session Coordination Meeting and Welcome Reception**

In the afternoon of October 24, a preparatory meeting for the sessions that started the next day was held. First, a Planning Group Meeting was held, where next year's PGMs gathered to decide on the configuration of next year's sessions. At the Planning Group Meeting, PGMs from each session present several potential session themes and explain the purpose and significance of each theme in their presentations. All PGMs then vote on their preferred themes to determine the next year's session themes. Participating PGMs eloquently express their candid opinions, and session PGMs are asked to respond appropriately to these questions and summarize the discussions.



**Planning Group Meeting for JAGFOS2024 (photo from JAGFOS2023)**

This was followed by a Session Coordination Meeting, where this year's PGMs and speakers gathered to make the final arrangements for their presentations. Because the PGMs have met several times since last year, including the PGM Meeting, they meet in a relatively relaxed atmosphere, in a state of mutual familiarity. On the other hand, many of the speakers are first-timers and feel nervous about speaking in front of leading researchers in the fields other than their own. At the Session Coordination Meeting, PGMs propose revisions to the content of the presentations and adjusted the presentation materials to ensure consistency in the sessions. Prior to the Session Coordination Meeting, some sessions had already conducted their own online rehearsals for each session and had incorporated the results into the revision of their presentation slides. For example, in (Applied) Mathematics/Computer Science/Engineering, the session I was in charge of, we shared presentation materials about two weeks before the symposium. We then roughly rehearsed the presentation, went over revisions for parts that might be difficult for the audience to understand, discussed possible questions and how to respond to them, and so on.



**Session Coordination Meeting**

A standing Welcome Reception was held after the Session Coordination Meeting. The reception began with a speech by Dr. Misawa, JSPS FoS Symposium Advisory Board Chairperson from Japan, followed by a speech by Dr. Sandra Kurfürst, PGM Co-chair from Germany, and a toast by Mr. Edward Patte, FoS Director from NAS, USA. All three speakers spoke with wit and humor about the importance of scientific exchange, which inspired the participants and thrilled them to attend this symposium.

### **Friday, October 25, 2025 – Day 1 –**

The first day of the symposium began with the opening ceremony. Dr. Mizumoto, who is a member of the JSPS Board of Directors, gave the opening remarks. Then, Dr. Mónica Muñoz Torres, the PGM Co-chair from the U.S., made a speech to open the symposium, and Ms. Emily Lines from AvH, Germany, made an opening speech with an introduction of AvH. I followed them and gave an overview of JAGFOS as the Japanese PGM Co-chair. Dr. Yasunari, who served as PGM Co-chair last year, drew a lot of laughter by using his hobby of powerlifting in his overview speech, so I also tried to add an element of laughter by incorporating a slide referring to our hobby into the slides introducing the PGM co-chairs' profiles. I hope it was a nice icebreaker.

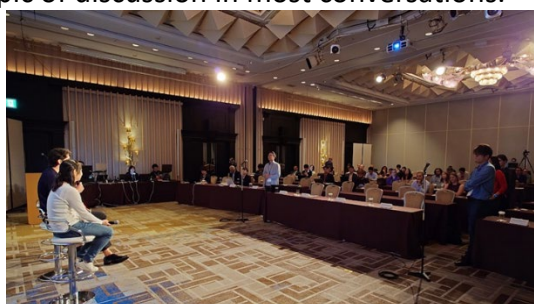


**A PGM Co-chair explaining JAGFOS overview**

Then, after the Opening Ceremony, we went straight into the first session. The first session is on (Applied) Mathematics/Computer Science/Engineering, in which I am also participating as a PGM. The theme of this session is "Foundation Models", a topic that has attracted a lot of attention in the AI research of our times, such as generative models and large-scale language models. First, after the general explanation of JAGFOS, I provided an overview of the session. During the session, participants engaged in a discussion on the foundational model, the challenges associated with foundational models in society, the interpretation of behaviors, and the implementation of deep learning while ensuring personal privacy. As mentioned above, after the three speakers finished their presentations, a one-hour Q&A session began. The three speakers sat in chairs set up in front of the screen and answered questions one by one. Two microphones were set up in the conference room, and so many people lined up in front of them to ask questions one after another. AI is applicable to all scientific disciplines and was found to be of interest to all participants. Of particular note was the discussion on the application of AI in the development of science and technology in the scientific field. During the breaks, I had the opportunity to speak with various participants and found that AI was a topic of discussion in most conversations.



**Lecture by Dr. Isogawa on (Applied) Mathematics/Computer Science/Engineering**



**Q&A discussion**



After a group photo and a coffee break, the first Poster Session began. First, all poster presenters were given the opportunity to present the content of their posters in a one-minute Poster Flash Talk. By having the presenters give short but to the point presentations, the participants can decide which posters they want to go and listen to. The Poster Flash Talks were very informative because participants were able to learn details and basic background knowledge that they could not obtain from the oral presentations. It was also a valuable opportunity to learn about the research of participants who were not presenting this time. The content of the posters was the starting point for lively discussions throughout the venue.

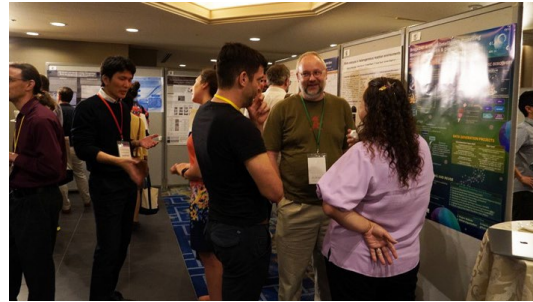


**Poster Flash Talk by Dr. Inoue on Biology / Life Sciences**





**A queuer for a Poster Flash Talk**



**Conversation at a Poster Session**

In the afternoon, the Biology/Life Sciences session was held. The theme of the session was "Evolution of Life on Earth - Where do we come from?". This subject matter is of paramount importance, as it pertains to the origin of life on Earth. While it is understood that living organisms possess DNA, the precise origin of life with DNA remains to be fully elucidated. This session presented the latest research outcomes of some of the most distinct possibilities. Particularly striking was the point that life on earth today originated from a single LUCA species, and it is unclear why other possibilities have become extinct. During the Q&A session, questions were raised about other possibilities, and whether the same route could be followed on other planets, or whether completely different life forms were possible.

Afterwards, AvH and JSPS presented the activities of their respective organizations: Ms. Mirjam Hamana and Ms. Anke Teubner from AvH and Ms. Makiko Segawa from JSPS. The research exchange programs of the two countries and the follow-up programs of the FoS were explained. Many programs to promote collaborative research were also presented. This was followed by the second Poster Session, which was again a lively discussion.

The dinner was positioned as a "workshop" where participants from the same session sat at the same table and shared ideas with an aim for networking. The arrangement of having participants from the same session at the same table was intentional, as it should facilitate collaboration among researchers in similar research fields. Last year in Germany, a similar workshop session was held, but this year it was combined with dinner. It appeared that the participants at all the tables thoroughly enjoyed themselves. In my opinion, holding such an event on the first day of the symposium was a worthwhile trial that contributed to enhancing the participants' connections.



**Fun time at the "Workshop" dinner**

## **Saturday, October 26, 2025 – Day 2 –**

The morning of the second day began with a session on Social Sciences. The session theme was "Conceptions of Place and Space: The Politics and Social Dynamics of Contemporary Place-making and Spatial Negotiation." At the session participants discussed the influence of policies, cultures, and races on the formation of space in human settlements such as urban areas. I found it novel that in a topic close to urban planning, factors such as the relationship between natives and settlers as well as the history of immigration and race were discussed as strong influencers. We live in an urban environment, albeit often unconsciously. However, it has come to my attention that the dynamics of urban formation vary significantly from region to region.

Moreover, I realized that problems that are not immediately apparent may exist in the background.

The second session in the morning was Earth Science/Geosciences/Environmental Sciences and the session theme was "Points of no return? Ice-Ocean-Land interactions in the past and future Earth system." As global warming progresses, the polar ice caps are melting at an accelerated rate, significantly impacting the world's oceans. These effects extend beyond the marine environment, affecting the entire global ecosystem, including the El Niño phenomenon. In relation to such a significant topic for the future of humankind, research on predictive modeling, simulation modeling, and analysis of oceanic components using foraminifera was explained. The advancements in science and technology have resulted in rapid and significant changes to the global environment, and it will take millennia to reverse these changes. It is my hope that the research presented and discussed at this year's JAGFOS will contribute to finding solutions to the significant and challenging debts that are left in the future.

Following a series of high-quality research presentations and intensive discussions, the participants were given time to unwind and enjoy the city of Kyoto in the afternoon of the second day. First, they experienced Zen meditation at Shorinji Temple. The foreign participants, who were not familiar with zazen, made a serious attempt and experienced the Japanese spirituality. Since the use of the Kyosaku (a type of wooden sword) for blackmail could be interpreted as physical punishment, the head priest carefully explained the philosophy behind the practice and emphasized that the participants could choose to use the sword of their own free will. As a result, most of the participants seemed to let the priest tap them on the shoulder spontaneously. Next, they walked to Nishiki Shijo Market and enjoyed shopping at the market. At the end of the day, they enjoyed Kaiseki cuisine at Ganko Takasegawa Nijoen. They all enjoyed the dinner to the fullest and we reaffirmed the popularity of Japanese food. It was a very good cultural exchange.



**Experiencing Zazen (1)**



**Experiencing Zazen (2)**



**Japanese Kaiseki-style dinner**

### **Sunday, October 27, 2025 – Day 3 –**

The morning of the third and final day began with the Chemistry/Materials Science session. The theme of the session was "Artificial Photosynthesis – Solar Energy Conversion into Chemicals", where various technologies for artificial photosynthesis were presented. Global warming, presented in the Earth Sciences/Geosciences/Environmental Sciences session, is closely related to the issue of energy resources. Artificial photosynthesis from sunlight is an important direction in which to pursue. As a personal connection, I felt a one-way affinity with the Japanese speaker, Dr. Hisatomi, whose research on powder photocatalysts for water

splitting by sunlight is being conducted in collaboration with the group of Dr. Domen, a senior member of the karate club I used to belong to when I was in university. It was an awakening to learn that many challenges remain, such as the difference between biological and artificial photosynthesis, and the gap between the energy efficiency required for industrial application and that of artificial photosynthesis.

The final session was Physics/Astrophysics with the topic "Nuclear Fusion - The Future of Clean Energy?" As in the Chemistry/Materials Science session, this topic is related to the energy issue, with state-of-the-art efforts presented on various initiatives to realize nuclear fusion. As in the Chemistry/Materials Science session, this topic is also related to the issue of energy, and cutting-edge efforts on initiatives to realize nuclear fusion, an important technology for the future of mankind, were presented. I had the opportunity to speak with Dr. Athina Kappatou, an Introductory Speaker from Germany, during a meal. I was impressed by her emphasis on the safety of nuclear fusion and the need for additional human resources. As expected, the issue of safety was raised during the session, and it was suggested that the current terminology of "nuclear fusion" be changed. Japan is demonstrating its global presence in this field, and we expect to see progress in this area in the future.

Following the final session, the "Exchange on Potential Cooperation" session was held. This session was a new initiative introduced this year. The session allows participants to talk freely with researchers who could potentially collaborate on research and explore the possibility of future collaborations. Even if it did not lead to the realization of collaborative research, I believe that the interdisciplinary discussions held here were a good opportunity for the participants to broaden their scope of research.



**Scenes from Exchange on Potential Cooperation**

Finally, Dr. Sarah King, next year's US PGM Co-chair, presented a closing address that included an outlook for the coming year. This was followed by closing remarks from Dr. Mizumoto, JSPS Executive Director from Japan. After the closing remarks, a farewell luncheon was held, where participants enjoyed conversation in their own way as JAGFOS went to closing. At the farewell luncheon, Dr. Tajima, Vice Chair of the FoS Symposium Committee, presented a speech, and JAGFOS was closed with great success. However, next year's PGMs continued to participate in the Planning Group Meeting to determine next year's session configuration, thus completing the work of this year's PGMs.

Reflecting on this year's JAGFOS, it appeared to be better received by participants than in previous years, creating a festival-like atmosphere. This observation may be attributed to the host city of Kyoto. In fact, many of the visiting researchers who participated in JAGFOS made plans to stay in Japan for a longer duration before and/or after JAGFOS, and visited not only Kyoto, but also Tokyo, Tohoku, and other parts of Japan for sightseeing. Not a few were accompanied by their families. This year, the Japanese side had the advantage of having no time difference and being able to return home on the day after the symposium. However, I also think that it is desirable for Japanese academia to create an environment that allows scheduling with ample time, as is the case with international participants. True innovation is derived from a state of physical and mental well-being. This is a challenge that needs to be



addressed in Japanese academia.

I have had the privilege of attending JAGFOS already on three occasions. These experiences have been invaluable for me because it has given me the opportunity to network not only with researchers in the same session but with researchers in other fields through JAGFOS. All the researchers had deep insights into their fields, and the discussions were always informative. Each researcher had deep insights into what they specialized in, and I always found something new to learn from talking to them. I cannot mention all of them by name, but all of them, including Dr. Yasunari, who served as PGM Co-chair before me, and Dr. Inoue, who will assume the role next year, exuded an atmosphere that suggests that they will continue to be active in their respective fields in the future. I am sure I will have the opportunity to meet them again at future events. Overall, JAGFOS provides an invaluable opportunity for participants to grow as researchers, make new connections, and expand the scope of their research. Should any of the young researchers reading this report be inspired to participate in a FoS, I strongly encourage them.



**Group photo of all participants**