

## Report of the 14th Japanese-German Frontiers of Science (JGFoS) Symposium

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The Frontiers of Science Symposium organized by the Japan Society for the Promotion of Science (JSPS) has six categories in total, including JG (Japan - Germany) and JA (Japan - the United States). Among them, the 14<sup>th</sup> Japanese-German Frontiers of Science (JGFoS) Symposium was held at Kyoto Brighton Hotel from September 6th to 9th, 2018.

In JGFoS symposiums, one of the preparation tasks is started by the steering committee members called Planning Group Members (PGMs) elected beforehand. They select cutting edge discussion topics on science from the following six fields: Biology / Life Science, Chemistry / Materials Science, Earth Science / Geosciences / Environment, Mathematics / Informatics / Engineering, Physics / Astrophysics, and Social Sciences.

The PGM meeting was held in Bad Neuenahr, Germany from 24th to 25th of September 2017, attended by six PGMs, each from Japan and from Germany. Every PGM made presentation on about four topics per session in front of other PGMs and the FoS Advisory Board members. Lastly, all PGMs casted the vote, discussed and selected topics for the 14<sup>th</sup> JGFoS symposium.

Some of the Japanese PGMs participated in the meeting despite jet lag they were quite exhausted from. That said, six topics were decided without any problems after the full two-days meeting.



PGM meeting held in Bad Neuenahr in 2017

After spending two years for preparation, during which the PGM meeting a year ago and the preparatory meeting at the JSPS Tokyo office with only Japanese members on June 11th, 2018 were held, the 14<sup>th</sup> Japanese-German Frontiers of Science (JGFoS) Symposium was started on September 6th, 2018. I want to write all went smoothly, but unfortunately, the first day of the symposium did not start without troubles.

First of all, the flights scheduled to arrive at Kansai International Airport from Germany were all canceled due to Typhoon Jebi that landed in the Kansai region on September 4th, two days before the opening day, causing major damage to the airport.

Though four of the German participants had to withdraw their attendance at the symposium, the rest of the German participants eventually arrived in Kyoto via Chubu International Airport and Narita Airport, thanks to the support offered by many who worked for the successful holding of JGFoS symposium.

Furthermore, the 2018 Hokkaido Eastern Iwate Earthquake occurred in the early morning of September 6th. It was uncertain to us on the first day of the symposium whether Dr. Osada (Hokkaido Univ.), the Japanese PGM of the session Biology / Life Science, could arrive.

While we dealt with these problems, all participants got together for the opening of welcome reception at 7:00 pm on September 6th. At first, Professor Fujigaki (the University of Tokyo), chairperson of the FoS Symposium Advisory Board, delivered her speech about the significance of JGFoS symposium to all participants and gave them some tips to enjoy it.

Then, Dr. Katja Hartmann (the Alexander von Humboldt Foundation: AvH) made her speech on behalf of the German side. In her speech, she mentioned that she met some new members, needless to say, but she was also joined by some old members again at this 14<sup>th</sup> symposium in Kyoto, two years after the 13<sup>th</sup> JGFoS symposium held in Potsdam, Germany. After the speech, Professor Fujigaki made a toast.



Toast at the reception



Conversation starts with self-introduction

The opening ceremony started at 9 am the next morning on September 7th, where Mr. Norifumi Ushio (JSPS) and Dr. Thomas Hesse (AvH) gave remarks. The two PGM Co-Chairs, Dr. Michael Schmiedeberg and I (Dr. Yasuhiro Hasegawa from Saitama Univ.) who had also worked together as PGMs at the previous symposium' session, gave introductory talk. We outlined the JGFoS symposium, the topics of six fields and their selection process, and made some points to enjoy the symposium.

There were the social phase (including the reception and meals), the researcher phase (flash talks and poster sessions) and the FoS Phase (discussions focused on each session topic) in the symposium. With these three phases in mind, the participants prepared themselves and entered the FoS Phase without complaining about fatigue they had had until the previous day.



Dr. Schmiederberg, PGM Co-Chair, outlines the JGFoS symposium  
I am standing beside him and getting relaxed after finishing my speech

The first session of JGFoS symposium was started by two PGMs, Drs. Shohei Hidaka (JAIST) and Sanaz Mostaghim in the fields of Mathematics / Informatics / Engineering with the session topic “Programmable matter: The future of robotics”.

They raised the examples of self-driving cars and industrial robots to explain how machines called “robots” have been installed in various areas, from large-sized to small-sized. Then, Dr. Florian Röhrbein gave a talk as an introductory speaker.

Japan marks the highest number of workers engaging in robot industry among countries around the world. While the development of bio-inspired robot, which simulated living organisms, had been actively pursued some time ago, recent trends have shifted to advance the production of neuro robots that are modeled after the structure of human brain. The presenter reported that the rapid progress of the field was achieved through, among other efforts, making contrast between the brain's thinking structure of deep learning, which was one of the session topics for the 12<sup>th</sup> JGFoS symposium, and that of neuro robots.

Dr. Mariana Medina Sánchez introduced the successful use of miniaturized functional robots, especially in medical practices. Delivering medicine to a specific part in the human body was almost like SF fantasy until 50 years ago. However, her research team succeeded in transferring specific sperm to cancer cells. In their research, they combined micro-sized

coils using micro-fabrication and moving sperms applying magnetic field to them from outside. In this way, a real-time movement of sperms that took several tens of millimeters in size became controllable.

Also, Dr. Jun Nakanishi (Meijo Univ.) explained the problems occurred when robots worked on irregular shaped materials in the actual world, even though they were the latest models empowered by artificial intelligence (AI) and deep learning. He then introduced the study that sought the solution of these problems.

After the presentations, we moved on to discussion. Primary concerns of participants were the reliability of robots and the uncertainty over the responsibility (who should take it?) in case problems occurred. Considering that human beings were the sole users of robots, questions from social scientific points of view were raised.

While three speakers focused on robotics in their specific research areas, many questions on broader issues regarding current research, such as innovative applications of robots/AI to other fields and the Human Neuro-Robotics Project advanced in Europe were brought up.

Participants seemed to be simply curious about singularity that hypothesized robots producing itself. Additionally, discussion on wider topics (this is one of the unique features of FoS symposium), including robot-tax and a measure to introduce it into wage income, were held in response to the prospects of decrease in employment with the rise of capable robots that might take over human labors. We felt the ripeness of discussion already in our first session for this symposium.



A scene from Mathematics /Informatics /Engineering session

(From the left) Dr. Sanaz Mostaghim, Dr. Jun Nakanishi, Dr. Mariana Medina Sánchez and Dr. Florian Röhrbein

After the session, the participants, still high-spirited, moved to another room to take some group photos. It captured a cheerful smile on each participant's face.



Group photo

After that, the second session for the fields of Physics / Astrophysics was held. I, Dr. Yasuhiro Hasegawa (Saitama Univ.) was a PGM on the Japanese side and Dr. Michael Schmiedeberg was a PGM on the German side. The session topic was “New observations for cosmology”.

First, a lead-in talk was given. While Newton’s reflecting telescope continues to observe visible light, the latest telescopes in Astrophysics, including Kamiokande, was innovated to the degree that surpassed our imagination. Then, Dr. Kohei Yorida (Waseda University), an introductory speaker, began his talk by explaining about the areas covered by Cosmology, Astronomy, and Particle physics and described the differences in scale.

Sights are necessary, especially when making observation. Photons were basically observed with different wavelengths in outer space as well as on the surface of the earth. The existence of gravitational wave telescopes was also introduced that detected the “gravitational wave” and won the Nobel Prize in Physics in 2017. In addition, a newer exploratory Multi-Messenger Astronomy research that integrated various observations and experimental equipment was explained. One of such examples was the experiment on Higgs boson which was vigorously conducted on earth and won the Nobel Prize in Physics in 2013.

Next, Dr. Keiko Kokeyama (the Univ. of Tokyo) gave a detailed explanation and study report of the gravitational wave detectors, including LIGO and KAGRA. The existence of gravitational wave had been a ‘homework’ given to us by Albert Einstein that took over 100 years to be solved. She presented the methods to bring that solution, the ultimate detection technology and the features of gravitational wave detector KAGRA Observatory currently under development in Japan.

Dr. Nadine Neumayer spoke on topics related to black holes and galaxies. Showing the simulated video, she explained to the audience how black holes are formed at the center of galaxy and the gravitational waves are generated when black holes or galaxies merged. In particular, as I listened to her explaining how black holes are formed at the deaths of certain stars of certain masses, we were able to feel the dynamics of birth, breathing, and the end of universe that are unimaginable in relation to time, distance, and mass.

After the presentations, questions and discussions continued seamlessly. One of the participants asked about the view of the outer galaxy seen from inside of a black hole. It was surprising for me that an atmosphere that enabled a general participant to pose such a question directly to an expert was already created by the end of the second session.

Another one about how to handle data in response to the recent rise of Multi-Messenger Astronomy which focused on gravitational waves was a typical FoS question. For example, some participants asked how data sharing/examination was carried out and how gravitational wave signals were recognized to be authentic regarding the first observation of gravitational waves announced on February 11, 2016. I had a feeling that the reason why the participating researchers around the world wanted to pose these kinds of questions concerning their positioning in international joint research activities was largely influenced by the fact that they were studying different fields.

When space-related topics are discussed, political questions are frequently asked due to the huge amount of budget used for research. On the contrary, I noticed that in this session, we discussed the topic based on our genuinely academic interest, with much respect being paid toward physics and the universe.



A scene from Physics/Astrophysics session  
(From the left) Drs. Nadine Neumayer, Kohei Yorita and Keiko Kokeyama

Before the poster session in the evening, each participant made one-minute flash talk on his/her latest research results. Immediately after the Poster Flash Talk, the posters with odd numbers were presented at the Poster Session I. Posters with even numbers were scheduled to be presented on the following day. Every participant took a role of a presenter to explain his/her own research and that of a listener to listen to other people's talks on their researches. In addition to talking about their current research, discussions over new future collaborative research and ideas was held among them and continued over dinner.

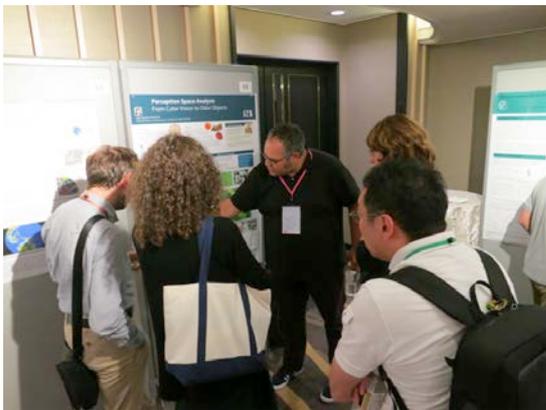


As the next presenter awaits, Michael (left) measures time during the flash talk that gives a presenter one minute to talk.



Poster Session begins

Serious looks of participants as researchers



Conversation continues in a small group



...and it also goes one-on-one.

The Session III in the fields of Earth Science/Geosciences/Environment titled “Astrobiology: Life in extreme conditions” was started in the morning of the third day, chaired by two PGMs, Drs. Tomohiro Usui (JAXA) and Thomas Laepple.

Both PGMs regrettably informed us at the beginning of this session that the introductory speaker Dr. Jean-Pierre de Vera could not make it to Japan due to his flight being cancelled by Typhoon Jebi and that he was unable to rebook his alternative flights.

Despite the inconvenience, the problem was solved with the very FoS-like manner. The two PGMs quickly selected Dr. Ralf Möller, one of the general participants from the Biology session, as a substitute introductory speaker for this Earth Science session.

The session started as if nothing has happened, with a brief precursory statement to mention that Dr. Möller has agreed to appear as an introductory speaker for this session, as he belongs to the German Aerospace Center and is familiar with the session topic to some extent. Starting with the issue on the origin of the life that questioned whether human beings alone are the only living beings in the whole universe, we were introduced to the study of Astrobiology and what it does.

Human beings had just taken their first step towards the exploration of universe through conducting experiments at the International Space Station and other projects for the purpose of understanding the Earth itself. It was also mentioned that in the solar system, Mars is inhabitable for life forms as well as the Earth.

Considering that the environment of desert on the Earth is similar to that of Mars, investigation into potential bio-signatures indicated by the existence of microorganisms and fossils was introduced as the “new Astrobiology”.

Then, Dr. Yoshihiro Furukawa (Tohoku University) covered the fundamental topic and explained how inorganic substances had been changed to organic compounds on the Earth and how biomolecules such as protein and deoxyribonucleic acid (DNA) had been formed into embodied life.

Electric discharge, asteroid collisions and deep sea hydrothermal deposits are listed as possible contributors to the formation of organic compounds on the Earth. Moreover, the accidental happening in the billions of years of long history of the Earth during which the primitive amino acid was brought about by the electric discharge and the high temperature in the atmosphere accompanied by asteroid collisions caused the formation of life. It is striking to me that we have come to discuss these issues today after such a vast scale of time had been passed.

At the same time, we have not yet reached a full understanding of the process of basic amino acid turning into protein and sugar that finally led to life.

Lastly, Dr. Sihane Merouane talked about organic materials existing in comets and asteroids. It is understood that a comet like Halley is mostly covered with ice that contains more organic materials than we could imagine. It has come to the point where we are able to launch explorers to asteroids and comets, take samples and bring them back to earth, or directly analyze them on explorers like Hayabusa Project in Japan.

Moreover, it was recently discovered that each comet is composed by more diverse organic materials than we expected. Along with astronomical observations conducted on the Earth, the technological innovation plays a major role in solving the questions that have come out of human beings' pure curiosity.

In the Q&A session, fundamental and typically-FoS questions such as the definition of life and the evolution process from organic materials to living organisms were asked. The presenters gave clear-cut answers to these questions as, nowadays, they are provided with clearer definition of life through ongoing development of gene analysis. I particularly noticed the shared fundamental curiosity about science among participants regardless of their disciplines.

Since a series of planetary exploration projects have been developed in countries around the world and the technological innovation has largely improved the accuracy of analyzers per ten years unit, some of the topics for which we could not have carried out observation in the past have become clarified. I felt that human beings are gradually advancing towards getting answers to the very fundamental questions.



A scene from Earth Science/Geosciences/Environment session  
(From the left) Dr. Yoshihiro Furukawa, Dr. Sihane Merouane and Dr. Ralf Möller

After the session III, the poster session II for posters with even numbers was held. As participants already got to remember and recognize each other's names, faces and personality on the third day of the symposium, the second poster session became more vibrant.

It was as if the time during the poster session, coffee break and lunch was melted into one. And that, I felt, was clearly the unique FoS symposium atmosphere.

The first session in the afternoon was the Session IV in the field of Social Sciences with the topic "Mechanism of sociocultural evolution". This session is one of the unique features of FoS symposiums to welcome some social scientists aboard, as the majority of participants are natural scientists.

Drs. Yui Arimatsu (Hiroshima Univ.) and Mandy Boehnke, the PGMs of the session, gave a lead-in talk and introduced some new methods grounded in the concept of social and cultural evolution proposed/adopted to the existing methods of classification and analysis. Citing the example of how cultures have changed in the course of human history, Dr. Hisashi Nakao (Nanzan Univ.), an introductory speaker, summarized the study of socio-cultural evolution.

He outlined the development of culture and civilization by adopting the methods of model theory and simulation that are mostly used by natural scientists and by making organic link between micro and macro that used to be separately argued.

To show an example of crossing over micro and macro, Dr. Anne Kandler introduced the process of accumulating social learning across generations and the approach towards the mechanism of cultural evolution taken through this process. Although a variety of approaches are developed by researchers to understand cultural changes, she reported that data examination has been sought these days without making hypothesis to gain understanding developed with the introduction of mathematical models.

Similarly, Dr. Kohei Tamura (Tohoku Univ.) explained the classification technique using mathematical models, such as Fourier transform. It classifies the different shapes of famous old mound tombs and bronze swords excavated from archaeological sites, which are difficult to recognize with an untrained eye. While archeological data used to be handled according to each researcher's own judgement, new efforts to quantify and qualify such data were introduced.

The individual characters of researchers often gave considerable influence over the outcomes of social sciences sessions I have participated in the past. However, powerful tools are needed to understand the phenomena in the study of socio-cultural evolution that aims to trace our history. Considering that humans are also a part of the great nature, utilization of mathematical models is a novel approach to the study of social sciences. Many of the natural scientists seem to have been very interested and enjoying the discussion.

In particular, our culture is a continuous process of imitating and learning. Our history shows that the cultural changes have gradually taken place in thousands of years through adapting to the environment. Nowadays, new ideas and cultures have been disseminated in the wake of the communication over the Internet. Amid in the circumstances, what we, humans, would gain among others was discussed.

Diversity is caused when more than two cultures merge. I felt my study areas were expanded through the FoS symposium. While culture and civilization are to learn from history, we received more mathematical questions such as, what kind of cultures would remain alive, if collecting ample data could make predictions, and how we could conduct the modeling of information analysis.



A scene from Social Science session

(From the left) Dr. Hisashi Nakao, Dr. Kohei Tamura and Dr. Anne Kandler

Later in the afternoon, participants were invited to join a cultural tour to visit Arashiyama area in Kyoto. To make the most of Kyoto in a few hours, they took pictures of traditional Kyoto scenery in front of Sogenchi Lake at Tenryu-ji Temple and tried to meditate like Japanese did.

After that, we were led to the famously photogenic bamboo grove and then given short free time to wander around the area. I invited my group to go to a footbath in the Randen Arashiyama station.

I learned that there is no culture of taking footbath in Germany. We took some memorable photos together while enjoying a quick 15-minute footbath and getting relaxed. As each participant seemed to enjoy the memorable experience in Arashiyama despite the short time spent there, the night fell.



In front of Sogenchi at Tenryuji Temple



Selfie taken at a footbath place

(Left) Dr. Hasegawa (myself) who gained two kg from overeating during the symposium

(Center) Dr. Sanaz Mostaghim

(Right) Dr. Sihane Merouane

On the fourth and the last day of the symposium, the session in Biology/Life Science with the topic “Speciation genomics: How new species are formed” started with an introductory talk from two PGMs, Dr. Naoki Osada (Hokkaido University) who arrived in one-day late from Hokkaido, and Dr. Tim Nicolai Siegel, about the evolution and speciation of living organisms explained on the example of *Drosophila*.

Dr. Masato Yamamichi (the University of Tokyo), an introductory speaker, began his talk by breaking their cutting-edge research down into terms that researchers from other fields can understand.

Regarding topics on the formation and differentiation of species, we may be able to go back to Charles Darwin’s “Origin of Species” in 1859. Now that humans have developed genomic technology, we are capable of investigating systematically how various organisms have differentiated.

When we think about the evolution of living organisms, there are questions posed from two standpoints; “why” and “how”. With an example of snails, he gave explanation for these two questions.

He started with an interesting example that shows the key to survival as a living creature which was hidden in seemingly subtle difference at first glance. While there are a right turn and a left turn in the shells of snails, the subtle difference between them can result in the significant difference in the predatory rate by natural enemies, such as snakes.

Next, Dr. Asano Ishikawa (National Institute of Genetics) explained how threespine sticklebacks expanded their range of population growth while adapting to new environment. It has become clear that the way they intake DHA (docosahexaenoic acid) is vital to such growth while it was also deeply related to its prey items. She presented that evolution and speciation actually took place in the circumstances where nobody had ever imagined.

In addition, Dr. Claudius Kratochwil reported the latest research results on how the secrets of shape, color and striped patterns of cichlids are found in genome. The color of fish is easy to perceive at a glance, but there are also significant differences that characterize the species in cichlids' striped patterns where vertical and horizontal patterns are recognized with respect to the direction of its travel. The secret of the evolution of at least 1,650 species of cichlid, as well as the reason why and how the diversification occurred, were uncovered through observing how the striped patterns were formed according to the differences in genome.

As the keyword 'genomics' given in the title of the session, it was easy to assume the importance of gene analysis technology. That said, it far exceeded the scope of biology I learned in high school thirty years ago, and I felt the dynamics of rapid advancement in biological research.

As expected, participants asked beyond the range of given topic in the succeeding Q&A session. One of such questions was that, how we could use genetic information to produce a phylogenetic chart and predict the future of evolution, assuming that there were some extinct species along the way. I was impressed by the significant development in the field when I learned that modern technology can actually predict evolution under certain conditions.

Many questions were raised by researchers from different fields before concluding the session. Among them were: whether information in the infrared/ultraviolet light region could be observed along with analyzing colors and shapes in the visible light region; why humans do not have striped patterns; and how we should formulate policies on sharing the information on genetic data.



A scene from Biology / Life Science session

(From left) Dr. Masato Yamamichi, Dr. Asano Ishikawa and Dr. Claudius Kratochwil

In the last session in the fields of Chemistry/Materials Science, Drs. Keiichi Inoue (the University of Tokyo) and Stefan Schiller, the PGMs of the session, explained the topic “Molecular encryption and processing of information”. Information processing has been grounded on solid state physics called computers so far. Recently however, they said, the latest chemical and material technologies enabled computation using molecular chemical reactions.

Then Dr. Alexander Schiller, an introductory speaker, performed some magic tricks to successfully draw attention from the audience who seemed to be slightly tired on the last day of the condensed symposium.

A substance ‘A’ becomes a substance ‘B’ in a simple chemical reaction. However, it is necessary to classify the conditions to perform calculation (operation). The three basic chemical operations are Input (Educt) -> Calculation (Reaction) -> Output (Product). The accurate combination of these operations forms a logic circuit.

Here, as an example, it was shown that the basic demonstration of principle was given by letting a bond formation (Reaction) occur through the use of hydrogen ion and sodium ion (Educt) to make us recognize an optical signal as an output (Product).

Next, Dr. Andreas Walther reported that material development inspired by biomolecules/cells called “Bio-inspired” have already been carried out successfully to provide the basis of chemical calculation. Additionally, the research to build a system that modeled a life itself, including completely new autonomous control called “Life-inspired” and energy supply was also reported to have been launched.

As an example, the unconventional research approach that was not restrained by conventional chemical materials and conducted by using chemical reaction by pH (A value is acid in the state ‘A’ or alkali in the state ‘B’, and so on) to gain autonomous controlling was presented.

Dr. Akihito Ishizaki (National Institutes of Natural Sciences) explained the study of photosynthesis that provides the source of energy for chemical reactions. The photosynthesis is considered to be the most sophisticated nano system. In order to understand its reaction mechanism, it is essential to learn about the boundary between the quantum mechanics that handle light as photon and the classical mechanics that govern the movement of proteins in supporting our lives. He introduced the efforts made by linking two basic dynamics of both extremes to understand and give description of photosynthesis.

The complexity in the process of producing sugar through photosynthesis is particularly well known. Currently, its reaction speed and energy state can be explained through the introduction of quantum mechanics. Upon gaining advantages of boundary areas (non-equilibrium state) in which the quantum mechanics and classical mechanics could maximize the reaction efficiency under the fine balance of nature, he introduced some international joint research projects based on greater cooperation among all humanity.

In the following Q&A session, discussion on how to set a threshold for the problem of binarization, the autonomy of information processing system using chemical reactions, and the relationship between complicated biological control system and evolution.



A scene from Chemistry/Materials Science session

(From the left) Dr. Andreas Walther, Dr. Akihito Ishizaki and Dr. Alexander Schiller

The Closing Session to conclude the JGFoS symposium was started by Drs. Hasegawa (Saitama Univ.) and Schmiedeberg, the PGM Co-Chairs, who gave a summary of the whole sessions.

The smiling faces of participants in the photos I took during the sessions were enough to make me feel that they had fruitful discussion in each session. I also noticed satisfaction in serious faces of each participant at the poster presentation and thought that it reflects his/her honest reaction.

When I look back, I come to realize that the participants became closer and cheerfully united in conversation with each other. We talked about studies, education, and even about our personal lives over breakfast, lunch and dinner.

In addition to the message from Dr. Katja Hartmann (AvH) who supervised the JGFoS symposium from the beginning, Dr. Iriki (RIKEN), a member of the FoS Advisory Board, celebrated the success of the symposium and talked about the important role of participants in acting consciously as leading scientists in their fields and passing on the experiences of the JGFoS symposium to the next generation. Since I had been working hard toward the success of the symposium, his speech was very encouraging and deeply moving.



The JGFoS participants attentively listen to the presentation during session.



Q&A session starts after presentations.



Twelve PGMs who contributed to organizing the JGFoS symposium.

Meanwhile, 30 researchers from Japan participated in this year's JGFoS symposium, which is an overwhelmingly small proportion of the entire Japanese researcher population.

On the one hand, the JGFoS symposium will get off to a new start as the Japanese-American-German Frontiers of Science (JAGFoS) symposium from the next fiscal year with Japan, the United States and Germany. However, the trilateral JAGFoS symposium will bring the number of Japanese participants down to 24. This raises a concern that fewer researchers (up to 45 years of age or up to 15 years of post-doc experience) will be given the opportunity to participate in and experience the symposium. At the same time, I am aware of my role, as a representative of participants, to pass my experience on to many more people. This goes hand in hand with the commitment to let the next generation know as much as possible the significance of having conversation with each other beyond gender, language, culture and border on science as a common language.

I am now being nostalgic over the time I spent with people whom I could not have met in my ordinary research life. Simultaneously, I wish that more researchers, especially younger ones, will be able to involve in such experiences.

I will be glad if this report can emphasize the fact that a precious human relationship is developed through a direct one-on-one dialogue, not via social media.

I would like to conclude by thanking the Japan Society for the Promotion of Science and the Alexander von Humboldt Foundation for offering us such a platform, the eleven fellow PGMs who organized the sessions together, the FoS Advisory Board members, and everyone who provided generous support for the 14<sup>th</sup> JGFoS symposium.