Report on the 4th UK-Japan Frontiers of Science (UK-Japan FoS) Symposium

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From June 16 to 19, 2025, under clear blue skies and in a touch of summer heat in London, the 4th UK–Japan Frontiers of Science (FoS) Symposium took place at the Royal Society. Organized at irregular intervals, this was the fourth gathering of the symposium, following previous events in 2008, 2016, and 2019. The 2025 meeting also marked the end of a six-year hiatus brought on by the COVID-19 pandemic.

My experience with FoS symposia includes one participation in the Japanese–German Frontiers of Science (JGFoS) Symposium and two in the Japanese–American–German Frontiers of Science (JAGFOS) Symposium. I first joined as an Introductory Speaker (IS), and in the following two symposia, I served as a Planning Group Member (PGM). I felt a touch of uncertainty, as this year's FoS was both my first time attending a UK–Japan edition and my first time serving as a PGM Co-chair. However, I chose to participate, genuinely looking forward to the intellectually stimulating discussions that are the hallmark of FoS symposia.

My participation in the UK–Japan FoS was confirmed in February 2024. That July, the PGMs met online to select session topics. Based on those discussions, the ISs, Speakers, and participants were finalized. In May 2025, a preparatory meeting was held exclusively for the Japanese participants. Conducting the discussion in Japanese allowed us to deepen our understanding of each topic. Language barriers in global scientific communication have long been a significant challenge, and in recent years, the issue has regained attention (e.g., Amano et al., 2023). The preparatory meetings play a vital role in helping to address that challenge since the FoS symposium involves cross-disciplinary discussions. Moreover, strengthening connections among the Japanese participants helped us mentally prepare for the UK–Japan FoS Symposium held in the following month in London.

Due to airspace restrictions caused by the ongoing war in Ukraine, our flight took a lengthy detour—passing near Alaska and over the Arctic—and stretched to 14 hours before arriving

in London on Monday, June 16. I checked into our hotel in Westminster and then participated in a session coordination meeting held in one of the guest rooms that evening. During the meeting, PGMs, ISs, and Speakers reviewed the structure of each session and discussed presentation content. It was then that I introduced myself to Tom—Professor Thomas Gorochowski, Bristol University—the PGM Co-chair from the UK side, and we confirmed how we would share responsibilities during the symposium. That night, a welcome dinner took place in a banquet room on the hotel's second floor, where lively exchanges were already underway between the Japanese and UK participants.

The first day of the UK–Japan FoS, Tuesday, June 17, marked my first visit to the venue—the Royal Society. The walk from the hotel to the Royal Society took about 25 minutes, following a fascinating path through London's magnificent cultural heritage, passing iconic landmarks such as Big Ben and Westminster Abbey. Inside the Royal Society, portraits of renowned scientists—including Isaac Newton—lined the walls, evoking a powerful sense of the rich scientific legacy built up in London over centuries. The symposium opened with welcome remarks from Sir Mark Walport, Vice President of the Royal Society, and Dr. Tetsuya Mizumoto, Executive Director of JSPS, followed by an introduction from the PGM Co-chairs.

The first session focused on Math/Applied Math/Informatics, with the theme of Singular Learning Theory (Photo 1). To be honest, I was momentarily taken aback, thinking, "we're starting with a tough theme." However, I was quickly struck by the impressive breadth of the topic—from the widely applicable (Watanabe–Akaike) Information Criterion (WAIC), an extension of the Akaike Information Criterion (AIC) used in statistical data analysis, to its relevance in machine learning, AI, algebraic geometry, and even tropical geometry. I found myself completely absorbed in the session (Photo 2).

After presentations on research funding and related topics by JSPS and the Royal Society, participants gathered on the staircase for a group photo (Photo 3). Following lunch, the Medical/Neuroscience session commenced. The research introduced in this session focused on so-called "non-model organisms"—a notable contrast to traditional model organisms like mice and zebrafish. Featured studies highlighted unique creatures such as the naked mole-rat, turquoise killifish, and fungus gnat. The amazing life strategies of these unusual organisms—along with the remarkable biological phenomena they display, including aging,

dormancy, and sexual reproduction—sparked lively and thought-provoking discussions (Photo 4).

Following the poster flash talks and presentations (Photo 5), we moved upstairs for a formal networking dinner, where animated conversations unfolded at every table (Photo 6). On the wall of the poster session venue, a quote from Charles Darwin's *On the Origin of Species* was engraved, and a bust of Darwin stood prominently in the dining hall. As an evolutionary biologist, I found the experience especially moving.

The second day of the symposium, Wednesday, June 18, began with a session on Earth Science/Environment (Photo 7). The distribution of rare metals remains a pressing global concern—particularly for Japan, a country with limited natural resources. This session showcased research on extracting rare metals from unconventional sources and innovative approaches, including volcanoes, the deep sea, and microorganisms. Beyond its strategic relevance in the society, the long-term geological and biological processes through which these metals accumulate proved profoundly fascinating.

After the poster flash talks and presentations, followed by lunch, the Physics/Astrophysics session took place. Quantum—a recurring theme at FoS symposia—was featured once again, this time with a focus on quantum information. Highlights included the establishment of a quantum biology center at one university and the launch of a quantum computing startup by a researcher still active in academia. These examples reflected the growing momentum across the quantum field, which continues to draw attention from both industry and academia (Photo 8).

On the evening of the second day, we boarded a boat and continued our discussions while taking in views of iconic landmarks such as Big Ben, Tower Bridge, and other sights along the Thames (Photo 9). We later moved to a riverside restaurant, where the conversation flowed seamlessly over dinner.

The final day of the symposium, June 19, began with a session on Chemistry/Material Science (Photo 10). As shown by the 2024 Nobel Prize in Chemistry awarded to the developers of AlphaFold, research into the three-dimensional structures of proteins produced

by living organisms has gained remarkable momentum in recent years. The session offered a well-balanced mix of computational approaches—such as AlphaFold—and advanced experimental techniques. The cutting-edge topics and lively discussions quickly swept away any lingering fatigue from the night before.

The final session focused on Biology/Life Science (Photo 11). It was in this very city—London—that Charles Darwin first presented his theory of evolution. More than 160 years later, biological evolution can now be explored through experimental investigation. This session featured reports on microbial evolution in laboratories to reveal detailed evolutionary processes, as well as presentations on the search for life's origins using RNA. Cutting-edge technologies—including experimental automation—were also introduced. The content was both fascinating and thought-provoking.

Following closing remarks by Professor Kenji Tanaka, Keio University, a member of the organizing committee, and Mr. Ian Wiggins, Director of International Affairs at the Royal Society, the 4th UK–Japan FoS Symposium officially came to a close. Unlike the JAGFOS symposia, preparations for this event were conducted entirely online, and a considerable gap had passed since the previous UK–Japan FoS. Understandably, there were many uncertainties leading up to it. Yet in the end, it proved to be a quintessential FoS experience—intellectually stimulating and deeply engaging. Moreover, the symposium sparked lively conversations throughout the venue about initiating new collaborative research projects.

Amid the recent stagnation trend of research activities in Japan, what is the significance of bringing together active scientists for a retreat-style FoS symposium? While there may be many possible answers to this question, this year's UK–Japan FoS offered a clear reminder of one fundamental truth: the sheer joy of scientific discussion.

Last but not least, I would like to express my heartfelt gratitude to the staff of JSPS and the Royal Society for their support of the UK–Japan FoS, to the members of the organizing committee for their advice and encouragement, to my fellow PGM colleagues for their collaboration in planning the sessions, and to all the speakers and participants who made the symposium truly memorable.

Reference

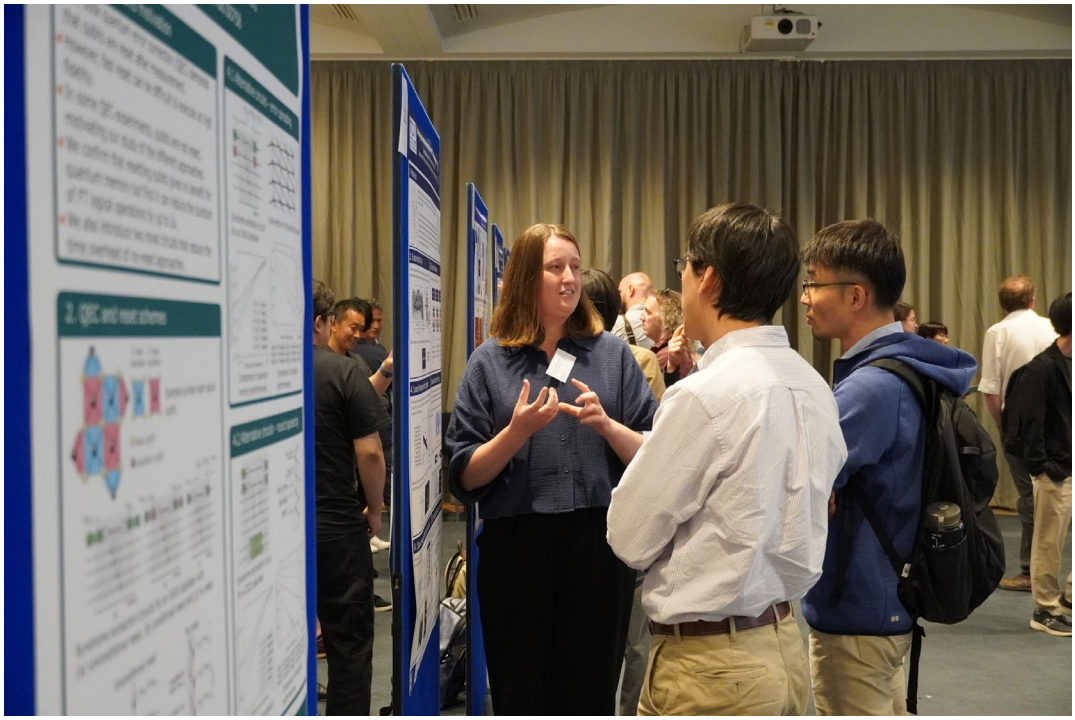
Amano T, Ramírez-Castañeda V, Berdejo-Espinola V, Borokini I, Chowdhury S, Golivets M, González-Trujillo JD, Montaño-Centellas F, Paudel K, White RL, Veríssimo D (2023). *The manifold costs of being a non-native English speaker in science.* PLOS Biology, 21(7), e3002184.

[Photo 1] Session 1 of Day 1: Math/Applied Math/Informatics

[Photo 2] Participants listening attentively to presentations in a venue surrounded by portraits.

[Photo 3] Group photo on the staircase of the Royal Society.

[Photo 4] Medical/Neuroscience session, also held on Day 1.



[Photo 5] Poster sessions on Day 1.

[Photo 6] Dinner on Day 1, surrounded by the Royal Society's treasured collection of books.

[Photo 7] Earth Science/Environment session on Day 2

[Photo 8] Physics/Astrophysics session, also part of Day 2

[Photo 9] Engaged in discussion aboard a boat on the Thames.

[Photo 10] Chemistry/Material Science session on Day 3.

[Photo 11] Final session of the symposium: Biology/Life Science.