ASPIRE Young Researcher Tour (Oxford/Nantes/Bordeaux)

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Sponsored by the Mixed-Anion ASPIRE program, I had the opportunity to visit the Inorganic Chemistry Laboratory at the University of Oxford (3/6-3/10), the IMN at the University of Nantes (3/11-3/13), and the ICMCB at the University of Bordeaux (3/14-3/17). The objectives of this trip were to collect feedback from our foreign ASPIRE collaborators on the first group of visiting Japanese students, to discuss preliminary research plans for future exchanges between Japan and our partner institutions, and to deliver my young lecture tour, entitled "*Coupled Degrees of Freedom in Functional Layered Perovskites and Mixed-Anion Compounds.*"

The first leg of my journey took place at Oxford, where I completed my doctoral degree under Professor Michael Hayward, who is also one of the ASPIRE project's foreign Principal Investigators. We discussed our shared interests in novel ferroelectric and multiferroic materials. My conversations with



students in the Hayward group were equally productive, as many expressed considerable enthusiasms for visiting Kyoto and Japan. I also met with Professor Simon Clarke, who hosted Shohei Kawanishi's one-month ASPIRE stay, and received encouraging feedback regarding our joint research on oxide-nitride-sulfide materials. We then discussed an eight-month Oxford Part-II (fourth-year undergraduate) student visit scheduled for the end of this year, which will likely become a regular exchange between Oxford and Kyoto University during the ASPIRE period. My final discussion in Oxford was with Professor Andrew Goodwin FRS, head of the ASPIRE scattering/structure team. We explored topics relating to short-range ordering in solids, noting that a doctorate student from the Goodwin group will visit Kyoto in April to pursue this line of research. Furthermore, we examined how complex solid systems with coupled structural order parameters can give rise to exotic physical properties-an area of mutual interest. Following Oxford, I travelled to the IMN at the University of Nantes, hosted by Dr Shunsuke Sasaki, a permanent researcher in Nantes, and Dr Laurent Cario, a CNRS research director. My lecture, which covered solid-state chemistry and crystallography, elicited valuable comments and questions from a physics perspective, unexpected yet extremely insightful. Afterwards, Dr Sasaki, Dr Cario, and I discussed projects on solids containing molecular anions, with further input from Dr Stéphane Jobic, IMN's deputy director, concerning the research that Kyoto D1 student Shumma Kozaki will undertake in



Nantes and that Nantes doctorate student Hajar Echate will conduct in Kyoto later this year. An additional conversation with Dr Houria Kabbour, a team leader in Nantes, revealed her strong interest in sending students to collaborate on mixed-anion photocatalysts and multiferroics with the Kageyama Group and the Abe Ryu Group, both of which are part of the ASPIRE Japan teams. We also discussed upcoming visits by Dr Olivier Hernandez and Dr Florent Pawula.

My final destination was the ICMCB at the University of Bordeaux, hosted by Professor Cédric Tassel, formerly of the Kageyama Group. Under the guidance of Professor Tassel and Dr Weill François, I received an impressive tour of the institute's diverse synthetic



apparatus and characterisation facilities, including variable-temperature X-ray diffractometers, TEMs, and various spectrometers. My lecture in Bordeaux prompted productive discussions on prospective high-pressure investigations of multiferroics and the development of next-generation mixed-anion negative thermal expansion materials, particularly in dialogue with Dr Alain Demourgues and other attendees. We also considered possible visits by researchers from Bordeaux later this year.

This ASPIRE trip proved exceptionally fruitful, allowing us to hear from foreign collaborators about both past and upcoming visits while generating fresh research ideas.

I am sincerely grateful to the ASPIRE program for supporting early-career researchers like myself in undertaking such tours, and I am confident that similar opportunities will benefit other young researchers in Japan, helping them to advance their careers on the global stage.