International Travel Report on the Imperial-Tokyo Tech Exchange 2024

-Vinayak Gupta
Doctoral student
Tokyo Institute of Technology, Japan
July 2024

I, Vinayak Gupta, a doctoral student at the Tokyo Institute of Technology in Japan, had the opportunity to visit the Imperial College of London in the UK to work on a short project involving the use of wine waste for useful products. I am grateful to IET and the panellists at IET for shortlisting me, which made my trip worry-free. This research visit had many positive outcomes, and IET played a significant role in its success. Please enjoy the report below.

Background of the Research Visit

The Imperial College of London is currently ranked number 2 worldwide (QSWR 2025). It has a collaboration with my parent university, the Tokyo Institute of Technology in Japan. As part of this collaboration, students from Tokyo Tech visit Imperial for short research projects aimed at finding solutions for global issues. I believe that these types of programs are essential for developing a student's personality, as they cultivate important skills such as leadership, interdisciplinary and intercultural awareness, as well as effective communication. Additionally, they help to build valuable networks that are necessary for successful collaborations.

Technical Focus of my exchange

I conducted my research at the Dyson School of Design Engineering at Imperial College London. My focus was on the circular bio-economy, specifically the conversion of waste materials into innovative products. I worked on utilizing winemaking residues to create vegan leather, addressing the environmental impact and offering sustainable alternatives to traditional leather.

Under the guidance of Dr. Elena Dieckmann, I was part of a team working on making leather from grape and wine waste. This field of study is significant as it addresses the issue of waste from grape and wine production, eliminates the need to use animal products for leather, and provides a cost-effective solution using waste materials.

I explored two experimental approaches to make vegan leather:

1. Experiment A: Converting yeast lees into bacterial nanocellulose (BNC) using Gluconacetobacter xylinus.

2. Experiment B: Blending and casting grape skins with biodegradable adhesives to create leather-like sheets.

We successfully developed a product, and a picture is attached below.

Picture 1: A sample of vegan leather made from wine wastes made in the laboratory

Academic visits and Future collaborative expansion of this work:

Thanks to the IET travel award, the DSDE research team and I were able to develop an innovative new product. This has created several new opportunities for our research, including:

1. **Studying Material Properties and Comparisons**: Comparing the properties of the vegan leather we developed with traditional animal leather and other vegan leathers.

2. **Potential Industrial Symbiosis**: Exploring the potential for creating an industrial symbiosis between the wine and fashion industries.

3. **Networking Opportunities**: We also had the opportunity to visit an award-winning kombucha factory, HOLOS Kombucha, and learn about the kombucha-making process. They were inspired by our work and even featured our visit on their website (https://holoskombucha.com/blogs/home/a-bubbly-adventure-at-holos-kombucha-by-vinayak-gupta).

Contribution of the IET Travel Award to my research

The opportunity to conduct research at ICL sponsored by IET has significantly contributed to my academic and professional development. Key contributions include:

1. Enhanced Research Skills: Working on the production of vegan leather from wine waste has broadened my research skills in material science, bio-economy, and sustainable development.

2. Interdisciplinary Collaboration: Collaborating with researchers from different disciplines has enriched my understanding of interdisciplinary approaches to solving global issues.

3. Sustainability Focus: The research visit reinforced the importance of sustainability in scientific research and its potential impact on various industries.

In conclusion, my research visit to ICL has been transformative. I am grateful to IET for providing me with resources to enhance valuable skills, knowledge, and networks that will undoubtedly contribute to my future research endeavours. I am equally grateful to Prof. Fumitake Takahashi (http://www.tf.depe.titech.ac.jp/Self_introduction_ENG.html) and Dr. Elena Dieckmann (https://profiles.imperial.ac.uk/elena.dieckmann13) for their support and guidance. I want to continue being a part of IET even after my graduation and contribute equally to its functioning. Thank you.