

<b>TITLE OF REPORT : Visit to JAXA as a JSPS Bridge Fellow</b>
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The JSPS Bridge visit to the Japanese Aerospace Exploration Agency (JAXA) in Tsukuba, Japan took place between February 14 2020 and March 7 2020. During this visit two major activities took place. The first activity was to collect data in collaboration with Japanese scientists at JAXA. The goal of this project is to investigate a novel means of measuring surface tension in high temperature levitated liquid metals. The application of this work is to 3D printing and other additive manufacturing methods in Space. The JSPS project is of interest to JAXA and NASA. In the study, periodic electrostatic forcing causes pattern formation on the surface of a levitated fluid sphere when the frequency of the forcing resonates with one of the sphere's natural frequencies. These patterns, upon excitation, are expressed as oscillating modal structures which deviate from the otherwise spherical shape of the levitated droplet. Several experiments with several samples from four different metals were conducted. The experiments took place in a very sophisticated furnace that had an electrostatic capability.



Photograph of the US visiting team at JAXA in front of the Electrostatic Furnace Facility.

This experimental facility is a close copy of another furnace that is on the Japanese laboratory, KIBO, aboard the International Space Station. The experimental results obtained at JAXA will be analyzed and submitted as a journal article. The next step is to conduct the same experiments aboard the International Space Station. I was accompanied on my visit to Japan via the Bridge program with a Doctoral student, Nevin Brosius. He helped to conduct the experiments at JAXA.

In addition to research at JAXA the visit also included the delivery of 10 lectures at the Tokyo University of Science in the Department of Mechanical Engineering with the coordination of Professor Ichiro Ueno. These lectures covered a large range of topics within the general heading of "Interfacial Instability". Several students were in attendance. The grand outcomes of the Bridge visit are four fold. They are:

- a) Prototype experiments that will be run on the International Space Station

- b) Collaboration with NASA and JAXA in the near-term and long term on Materials in Space
- c) Long term collaboration on Chemical Engineering with JAXA
- d) Student involvement with JAXA and the Tokyo University of Science and the University of Florida.

Non-Academic Activity: The visitor (R. Narayanan) and student (Nevin Brosius) were very kindly treated by the host Prof. S. Matsumoto to an Okinomiyaki traditional dinner with many students from Tsukuba University (see Photo). A visit to an onsen near Mount Fuji was also organized and Japanese culture was beautifully experienced (see Photo). JSPS is thanked and acknowledged for the academic and cultural experience.



Dr. Matsumoto with JSPS Fellow and Students



JSPS Fellow in front of  
Mt.Fuji