

A Trip to ELSI: An International Perspective

In Carl Sagan's grand vision of humanity's future in space famously published in 1994's *Pale Blue Dot*, Sagan designated Earth and space sciences as the field "with greatest international cooperation." "Almost always," he wrote about Earth and space scientists, "they discover work, complementary to their own, is being done by researchers in other nations; or that to solve a problem, you need data or perspective that is unavailable in your country." In other words, the answers to the profound questions put forth by Earth and space sciences will come from teams of diligent international researchers working in tandem. With that said, it is quite striking to see the physical manifestation of Sagan's idea of international scientific cooperation in the quiet neighborhood of Meguro-ku, Tokyo, Japan, at the new Earth-Life Science Institute (ELSI) at the Tokyo Institute of Technology.

The colossal mission of ELSI can be boiled down to obtaining a better understanding of what makes Earth a place where life can form, flourish, and evolve, and how we might go about extrapolating those findings out into the Cosmos in the search for extraterrestrial life. To accompany this mission, ELSI is home to state-of-the-art equipment and a mighty team of international biologists, astronomers, artificial life and machine learning experts, and, of course, geologists—all operating under the same roof. Consider also the revolving door of highly regarded visiting researchers and you'll realize that ELSI is a novel breeding ground for intellectual, interdisciplinary, cutting-edge inquiry. Indeed, it is Sagan's vision of scientists from all over the planet synchronously working together to solve extraordinarily complex scientific questions.

For two months, I was hosted at ELSI by PI, Vice Director, and Tokyo restaurant ambassador Dr. John Hernalund. I spent two weeks as a student at ELSI's origins of life winter school. One week of the winter school was spent in the field in Japan's Izu Peninsula and Mount Hakone, and the other was spent listening to ELSI's guest and local researchers (including SES Ph.D Cayman Unterborn) speak about topics including water worlds, habitable zones, viral genetics, macrogenomics, chondrites, information theory, oceanic biogeochemical cycles, self-organization in artificial life, and machine learning. Outside of the winter school, I worked with Dr. Hernalund to advance my research on the computational modeling of core formation in terrestrial magma oceans and on expanding ideas with regards to core-mantle chemical communication using OIB isotope geochemistry.

The international perspective on active science I received near the ELSI Agora chalkboards, over bowls of ramen with groups of researchers, or between songs during late night karaoke brought forth new ideas and a higher awareness of research occurring in parallel with my own. I now find myself with contacts and friends scattered all over the world, a better perception of where my own research fits in, an appreciation for the knife's edge our planet's habitability seemingly sits on, and a taste for good sake.



Scott D. Hull, SES Master's Student (Advisor: Dr. Wendy Panero). Photo courtesy of ELSI photographer Nerissa Escanlar.