FaSTRAC and GSRAC Visit Summary – Raymond Tu

Thank you so much for the opportunity to participate in the FaSTRAC program. We initially heard about the program in an email from our GSOE Dean of Research at CCNY, Dean Rosemarie Wesson. The email described an opportunity to work at NSF's ChemMatCARS (Sector 15, APS, ANL) as a faculty-student team, which was appealing for a number of reasons. First, the FaSTRAC award would allow our team to explore an industrially relevant problem that can be directly connected to the Chemical Engineering coursework at CCNY-CUNY at the undergraduate and graduate levels, and, second, the FaSTRAC award provided a chance to engage with new techniques, synchrotron x-ray reflectivity and grazing incidence x-ray diffraction from a fluid-fluid interface, that can answer fundamental questions deepening our ability to make an impact on the field.

This was my first visit to NSF's ChemMatCARS, or APS, and the experience of working on the beamline and with the scientists in Sector 15 exceeded my expectations. Our team came to NSF's ChemMatCARS to explore a problem in the pharmaceutical industry. Namely, when large molecule proteins compete with small molecule surfactants to adsorb to the interface, which species will win? I believe our team was successful in answering this question, finding that under most concentration ratios the surfactants will adsorb to the interface preventing the proteins from partitioning to the surface. Moreover, a number of observations regarding the dynamics of the adsorption and unfolding mechanism were made during the analysis of our data. We are excited to begin writing about our findings.

These successful results were only possible in such a short time with the focused assistance of the scientists at NSF's ChemMatCARS. I arrived at ANL on June 14th, 2018, joining Ankit who had been working at NSF's ChemMatCARS since May 31st. My visit ended after 2-weeks on June 27th . We interacted with a number of beamline scientists primarily learning the fundamentals of X-ray interrogation of fluid-fluid interfaces, the operation of the instrument, the fitting of the reflectivity data and the analysis of the electron densities from Drs. Wei Bu, Mrinal Kanti Bera and Binhua Lin. At each stage of the learning process, we had amazing support from everyone in the NSF's ChemMatCARS program. They were knowledgeable, patient and encouraging with our team. Their gracious and welcoming demeanor is ideal for interactions with X-Ray neophytes at the student and faculty level.

The most significant impact of our work at NSF's ChemMatCARS will be the ability to bring the science and tools learned back to CCNY. Our institution is >50% Hispanic and African-American, >50% women, >50% with annual household incomes at the NYC poverty line, and >50% first-in-family to attend college. The goal of access and excellence for the 'children of the whole people' is exemplified by the diversity of CCNY, with numerous 1st and 2nd generation students from 155 countries who speak 94 languages. The City College undergraduate profile is 36.9% Hispanic, 16.1% Black, 24.5% Asian, 14.7% White, and 0.3% Pacific Islander; 41.5% of first-time freshmen entering between 2013 and 2015 had household incomes less than $30,000. The knowledge that we gained from the FaSTRAC experience will be shared with other faculty at CCNY and CUNY, integrated into coursework, and written into new proposals for future students and faculty to engage with scientists in NSF's ChemMatCARS program.

Thanks so much!

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