Cosmology and Astroparticle Student and Postdoc Exchange Network: exit report

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Through the Cosmology and Astroparticle Student and Postdoc Exchange program I had the outstanding opportunity to visit the Center for Cosmology and Astro-Particle Physics (CCAPP) at The Ohio State University from June 18th to 25th 2017. My hosts, Prof Amy Connolly and Ms Oindree Banerjee, made sure I could interact with the leading researchers in both theoretical and experimental Astro-Particle physics at CCAPP.

Prof Connolly is a pioneer in radio interferometry for astro-particle physics experiments (like the ANtartic Impulsive Transient Antenna, ANITA, and the Askaryan Radio Array, ARA, experiments) with unique expertise in analysis techniques and in theoretical models for ultra high energy neutrino production and interaction. During my week at CCAPP she introduced me to the nouvelle technique of Genetic Programming, whereby computer programs are encoded as a set of genes that can evolve following an evolutionary algorithm. This technique is used at CCAPP to study anomalous events found during the fourth ANITA flight, and also to find the optimum antenna design for future radio interferometry applications. Prof Connolly and Dr Mauricio Bustamante involved me in their research of very high energy neutrino cross-section models, inspired by recent measurements of the IceCube experiment. The three of us also discussed the possibility of detecting Fast Radio Bursts signals in the ANITA experiment. This work was presented a week later at the ANITA collaboration meeting at CalPoly (San Luis Obispo, CA) and is expected to become a publication next year.

Ms Banerjee, Mr Stafford and Mr Gordon are graduate students working on the ANITA experiment. Our collaboration involved both the simulation and the analysis of the second, third and fourth ANITA flight. Our collaborative work was also presented at the ANITA collaboration meeting. Together with Prof Connolly and Ms Banerjee, we are working on an ANITA simulation publication that should be ready by the end of the summer. The analyses of the third and fourth ANITA flight are also expected to become a publication within the next year.

Dr Carl Pfender introduced me to his work on the possible solar flare indication in the early ARA dataset. Dr Patrick Allison and Mr Brian Clark showed me their hardware work in finishing the ARA-5 station, that will be deployed in Antarctica this year, and the diagnostics of the failure modes for the ARA-1 and ARA-3 stations. Dr Michael Sunderland explained his work on modelling the Milky Way magnetic field using data from the Auger experiment, and his analysis of events going through Ice Top, the surface detectors of the IceCube experiment.

On Friday June 23rd I was invited to give a presentation at the Astro-Particle lunch event. My talk, "The secrets of oscillating neutrinos at the NOvA experiment", presented my work for the NOvA long baseline neutrino experiment and our recent results. The talk was extremely well received by the audience whose eager questions continued through the afternoon too.

In summary, my visit at CCAPP allowed me to meet World leading experts in Astro-Particle physics, broaden my knowledge in analysis techniques and theoretical models, and create connections that will result in at least four new publications in the next year.