

## MSI Student Bursary Award Report (June 2016)

There were two workshops that I attended. One was held in the McMaster University - Toronto (**8<sup>th</sup> CCEM summer school 2016**) from 30<sup>th</sup> May to 3<sup>rd</sup> June and the **ED-XPD workshop** in Stockholm University from 6<sup>th</sup> to 10<sup>th</sup> of June. The CCEM workshop was mainly based on the aberration corrected TEM imaging and spectroscopic technique and the ED-XPD was on combining the electron and X-ray diffraction technique. The CCEM summer school was organized by Prof. Gianluigi Botton who's the Canada Research Chair in Electron Microscopy of Nanoscale Materials.

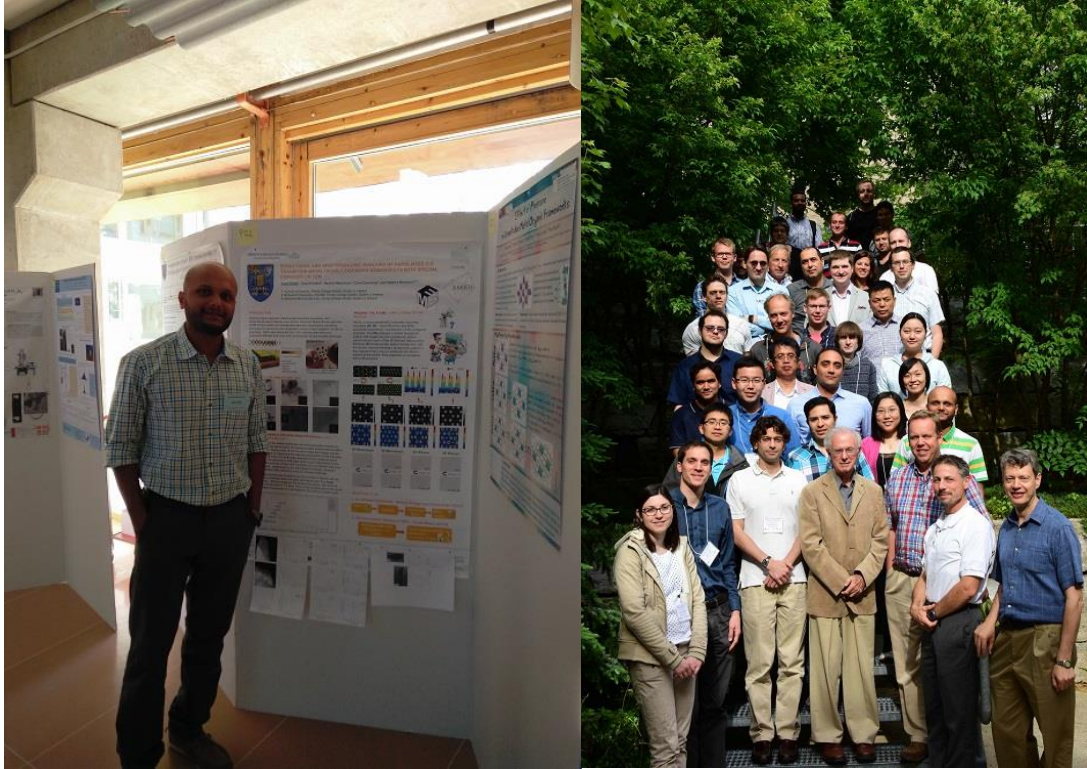
Both the workshops were a good combination of lectures and practical sessions. CCEM summer school covered the following topics;

- .1. Aberration-corrected TEM, STEM
- .2. Alignment of microscopes with correctors
- .3. EELS data processing and MLLS fitting
- .4. Independent Component Analysis
- .5. Compressed sensing imaging
- .6. Electron tomography
- .7. Fundamental limits from beam damage
- .8. Inelastic scattering and ultimate resolution
- .9. Monochromated EELS, EELS mapping
- .10. Operation of monochromators
- .11. Optimization of spectroscopy data acquisition
- .12. Simulation of images and diffraction patterns
- .13. STEM quantitative image analysis

Whereas the **ED-XPD** (Stockholm) workshop was about combining electron and X-ray diffraction technique to solve the crystal structure. Following topics were covered during the course;

1. Introduction to basic crystallography
2. Various 3D electron diffraction techniques
3. Initial electron diffraction data analysis (indexing, intensity extraction)
4. Structure solution and refinement with ED data
5. Initial XPD data analysis (indexing, profile fitting, intensity extraction)
6. Methods of structure solution from XPD data
7. Structure completion using XPD data
8. Structure refinement using the Rietveld method

This two workshops were of great help to me. The ED-XPD workshop was also attended by my colleague Ms. Megan Canavan. Thanks to the MSI travel bursary I could convince my Supervisor (Prof. Valeria Nicolosi) to allow me to attend them. I would strongly recommend the CCEM workshop which is held every year in McMaster University to other Electron Microscopist. It's a perfect way to learn new things in a friendly environment and meet some of the experts in this field.



*During my poster session (on left) and a group photo during the CCEM summer school in McMaster University (Hamilton)*