ISCOM 2017 Report

The 12th International Symposium on Crystalline Organic Metals, Superconductors and Magnets (ISCOM 2017) was a forum for discussion of the latest developments and future of chemistry, physics, and engineering of crystalline molecular materials. The subject of my poster that I presented studied the effect structure and composition has on the magnetic parameters of low-dimensional quantum magnets. I enjoyed fruitful discussions with a variety of academics who raised a few questions about my project for further thought.

The first two sessions of the conference included a plenary lecture by Leon Balents (University of California, Santa Barbara) and numerous talks on quantum spin liquids (QSL) which gave a broad overview of current research in this area. I found this of interest as I've studied other topological phases of matter, for example the Haldane phase in spin-1 chains. QSL contain quantum disordered ground states where fluctuations are so strong that they break conventional long-range order. This lack of long-range order is also seen in the Haldane phase of the spin-1 chains that I have been studying and is of great use, for example when probing the Mott transition between a conducting and insulating phase. Martin Dressel, from the University of Stuttgart, explained that the ground state of nearly all Mott insulators order antiferromagnetically, which adds extra and unwanted physical processes. This makes it difficult to study the Mott transition. By using a QSL Mott insulator, this issue is removed and allows a much more precise investigation of the transition. QSL are a topic of great interest and relevance in the condensed matter community, and an area I wish to study further as I continue my career in academia.

Whilst presenting my poster, Harald Jeschke, a theorist at Okayama University in Japan, offered to make Density Functional Theory (DFT) calculations on the compounds that I characterised. This will help with the analysis of the samples I am studying and to validate the techniques that our group have developed for characterising them. There was also another offer by a group at the University of Queensland for a collaboration. They have a large amount of available computing power to run DFT calculations that would be of great use to the research group I currently belong to. They would also like experimental validation that a sample that they have theoretically characterised is indeed a one-dimensional spin chain in the Haldane phase. Our group has experience in measuring such compounds.

I found that ISCOM 2017 was a success. I met a diverse group of scientists that increased my knowledge of the physics and chemistry of crystalline molecular materials. I also garnered interest in possible future research topics and helped create new collaborations for me and my research group.

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