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TALENT Exit Report

I attended the TALENT course in Caen, France at GANIL from July 5 – July 25, 2015. My time there was funded by the FUSTIPEN grant. The three-week course focused on the theory and application of many-body methods, specifically Green's functions and Couple Cluster Theory. The course consisted of morning lectures and afternoon sessions for computational projects. There were five lecturers who lectured throughout the three weeks, as well as offering guidance for the projects. We learned about how these many-body methods can be applied to various nuclear systems. We were shown current research interests, and discussed open questions.

I chose to implement coupled cluster theory (doubles only) for my numerical project. We first started with a simple pairing model on a four-level system with four particles. This was a very helpful starting point, because it allowed me to set a benchmark for my code. Once I got correct results using the pairing model, I could begin the main task of solving infinite matter using the Minnesota potential as the two-body interaction. The problem was set up using periodic boundary conditions, so the basis consisted of plane waves. We solved the problem in Cartesian coordinates, which made the basis size very large for two-particles states. I learned to use various symmetries in the Hamiltonian in order to efficiently store only non-zero matrix elements. I finished my CCD code on infinite matter, and I plan on implementing Green's functions on infinite matter to compare the two methods.

I learned a lot in this TALENT course. The pairing model is a nice tool, since I can use this to benchmark future codes that I will write. I have a better understanding of many-body methods, and I feel more motivated to learn more.