Neutrinos are the least familiar fundamental particles in the Standard Model, and are currently the focus of many high-energy physics experiments. Most of these experiments are based at the Fermi National Accelerator Laboratory (FNAL) in the United States, and at the CERN facility in Europe. MINERvA is a collaboration of over 100 individuals at 27 universities and government institutions across the world. For more detailed information, please see the collaboration web site at http://minerva.fnal.gov/. The detector is located in the NuMI neutrino beam at FNAL.
The MINERvA collaboration has published its first analysis of the scattering of muon neutrinos and antineutrinos from a plastic scintillator target in the July issue of Physical Review Letters. Full paper texts are available at: "Measurement of Muon Antineutrino Quasielastic Scattering on a Hydrocarbon Target at $E_{\nu} \sim 3.5$ GeV" (http://prl.aps.org/abstract/PRL/v111/i2/e022501) and "Measurement of Muon Neutrino Quasielastic Scattering on a Hydrocarbon Target at $E_{\nu} \sim 3.5$ GeV" (http://prl.aps.org/abstract/PRL/v111/i2/e022502)

These results represent an important advance in the neutrino physics community's ability to accurately model these interactions in simulations used for experiments across the globe. The data suggest revisions will be needed in the Relativistic Fermi Gas model of the nuclear environment. They also point to a higher rate of multiple nucleons being released in the final state of these neutrino-nuclei interactions than is currently modeled in simulation.

Andrew Carley is a senior physics major (and computer science minor) who joined the MINERvA group this fall through Dr. Aaron McGowan's affiliation with the University of Rochester's experimental neutrino group. His senior capstone project is titled "Using an Elastic Tracking method to find steep tracks in the MINERvA neutrino detector". Andrew will develop a new implementation of the elastic tracking algorithm for the purpose of finding and fitting short and steep tracks left by the passage of charged particles through the detector. While other reconstruction algorithms are successful at finding long and shallow tracks in this neutrino detector, a novel approach is required to find short and steep tracks. A successful deployment of this tracking algorithm will benefit existing physics analyses in the MINERvA experiment and allow for other analyses to be developed.

Dr. McGowan has been a member of the collaboration since earning his doctorate in 2007. His primary physics interest lies in the neutral current elastic scattering of neutrinos from protons and neutrons in the detector. This analysis in particular requires a robust tracking scheme for finding and fitting short and steep particle tracks in the detector. Andrew's work will improve upon existing tracking schemes and extend the reach of other physics analyses that require short-tracking capabilities.