**Jui-Teng Hsu**

My independent research, carried out at Muhlenberg College for eight weeks this summer, consisted of modeling the rate of atmospheric muons observed at sea-level computationally. At first, the model only included muon decay and relativistic effects, but as the model became more elaborate, the geometric acceptance of the detector, change in atmospheric density with altitude, distribution of muons with altitude, and energy distribution of muons are all incorporated.

Each step of the project included extensive research on past progress and publications, writing the codes from scratch in C++, visualization of data using the CERN Root library, and verification of the legitimacy of each component through comparisons with previous published results and discussions with my research advisor, Dr. Brett Fadem.

Another time-consuming task was the optimization of the compiled program. Extensive effort was put into determining the best optimized implementation of the C++ code without losing physical accuracy.

These efforts allowed the research project to achieve its goal: determining the primary factors contributing to the $\cos^2(\theta)$ trend of atmospheric muon rates as a function of angle from zenith.

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