Bell Inequalities describe statistical constraints placed on certain types of measurements within classical physics. It turns out that quantum mechanics can violate Bell Inequalities, thus suggesting that quantum mechanics describes the world in a very counter-intuitive way. This REU research will involve learning about Bell Inequalities and exploring what additional resources must added to classical models so that they simulate the predictions of quantum mechanics. One potential project considers how much classical communication is needed to replicate the measurement statistics on a three-level maximally entangled state. Another potential project involves computing Bell Inequalities under scenarios where measurement choices are not independent. The results of a previous REU project on this subject can be found at http://arxiv.org/abs/1405.3211. As this research is purely theoretical, the interested student should have good experience with linear algebra as well as some familiarity with programming in MATLAB.