

Abstract Submitted  
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**Calculating Neutrino Oscillations with Sterile Neutrinos<sup>1</sup>** BRYAN LINEHAN, Saint John's University and the William and Mary 2014 REU program — In particle physics, it is currently known that three types of neutrinos exist that interact via the weak force. Referred to as “flavors,” they are distinguishable and named for the lepton they produce through charged current interactions: electron, muon, and tau. In a process called neutrino oscillation, one flavor of neutrino can change into another flavor as it propagates through space. At the moment, mild discrepancies between expected and measured neutrino oscillations suggest that more types of neutrinos that do not interact via the weak force exist: sterile neutrinos. The goal of this project was to calculate non-sterile flavor oscillation probabilities when 1, 2 or 3 sterile neutrinos were assumed to exist. An application has been written in Mathematica that calculates these probabilities with the neutrino masses, linear relationships between mass and flavor states, values of CP symmetry violating constants, and constant densities of media in which the neutrinos propagate set as parameters. The application was published online for researchers to use as a tool when considering the existence of sterile neutrinos. In the immediate future, the insights this application gives into neutrino oscillations will be studied and reported.

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