



**CALIFORNIA STATE SCIENCE FAIR  
2016 PROJECT SUMMARY**

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<b>Project Title</b> Effects of Pisum sativum and Rhizobia Bacteria on the Ammonium Concentration in Martian Regolith Simulant	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> To determine if nitrogen fixation can occur in simulated Martian regolith and if so, to quantify the ammonium added to the soil through this process.</p> <p><b>Methods/Materials</b> Planted Pisum sativum with Rhizobia bacteria in simulated Martian regolith. After plants had grown, soil was analyzed using High Performance Liquid Chromatography to detect and quantify ammonium in soil samples.</p> <p><b>Results</b> Results from HPLC analysis showed a presence of ammonium in soil samples based on chromatograms from standard ammonium samples and soil samples. Physical evidence of nitrogen fixation was observed in the form of the formation of root nodules on the test plants.</p> <p><b>Conclusions/Discussion</b> Nitrogen fixation using Pisum sativum and Rhizobia bacteria can occur in simulated Martian regolith. This process increased the ammonium concentration in the soil, making it more fertile for future generations of plants. Nitrogen fixation may provide a way to help fertilize soil on Mars and make it farmable for future settlements.</p>	
<b>Summary Statement</b> I planted organisms capable of nitrogen fixation in Martian regolith simulant in order to increase the ammonium concentration of the soil to show that farming on Mars may be possible in the near future.	
<b>Help Received</b> Dr. Greg Cauchon helped me learn the process and methods of High Performance Liquid Chromatography	