



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) John Ha	Project Number S1110
Project Title Generating Energy from Microbes: An Approach to Recycling Domestic Wastes	
Objectives/Goals The objective of this research is to find the best design for a small scale anaerobic digester which could effectively transform biomass into biofuel using the least amount of outside energy.	
Abstract Methods/Materials Measured the most efficient environment for anaerobic digesters to produce energy by setting up two batches of anaerobic digesters in cold and warm environments. The warm batch was heated up by an U.V lamp and the cold batch was placed in room temperature. The warmer temperature should be around 32 - 38 celsius while the colder temperature should be around 18 - 22 celsius. Each batch had 5 anaerobic digesters. Attach a balloon to the top of every digester to collect the biogas produced. Measure the circumference of every balloon every 12 hours and record the data. Use Sketchup afterwards to produce the most effective anaerobic digester based on the results.	
Results The results demonstrated that the warmer digester produced significantly more biogas than what the colder digester produced under a four day period. The warmer digesters produced a combined amount of 1168.8 ml biogas while the cold digesters produced a combined amount of 275.4 ml biogas. The graph shows an exponential trend throughout the warmer digesters while the colder digesters fluctuates in the amount of biogas produced per day. The results will therefore prove that anaerobic digesters function best under temperatures of 31 - 37 celsius as opposed to room temperatures of 18 - 22 celsius.	
Conclusions/Discussion This conclusion based on the results proved my hypothesis correct. The bacteria which are in charge of digesting foods in the anaerobic digesters are mesophiles and they are most suited to temperatures of 30 - 45 degrees. The apex of mesophilic reproduction and occurs around 31 - 37 celsius and they subside after that level is reached. Temperatures below that also decreases the productivity of mesophilic bacteria. Anaerobic digesters must therefore maintain their temperatures between 31 - 38 celsius to produce the most effective results. Therefore this justifies the need of warmer regions in the U.S to construct Anaerobic Digesters to harness the energy from organic wastes. Or else this biogas would be released into the atmosphere was wasteful and potentially harmful greenhouse gases.	
Summary Statement I used bacteria to harness energy from organic wastes in an attempt to decrease greenhouse gas emissions as well as to reduce the growing amount of landfills in the U.S.	
Help Received I received minimal help from my parents throughout my science fair project. Apart from driving me places such as Walmart and Home Depot to get materials. I finished the project on my own. I however must give credit to both my history as well as science teachers in inspiring me to work for the betterment	