



CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

Name(s) Victoria V. Lennon	Project Number 34205
Project Title Unplugged	
Objectives/Goals My objective was to determine if solids can flow like liquids using granular materials. My hypothesis is that I believe that the smaller the granular material the faster it will flow. Abstract Methods/Materials Using a funnel I poured 250 grams of granular material, my independent variable, and then proceeded to time how fast all of my material emptied the funnel, this was the mass flow rate, my dependent variable. I repeated this process 3 times with no variations, using 5 different materials which were salt, flour, granola, peanut M&M#s, and Skittles. Results Only one of my materials, salt, had a recorded average mass flow rate which was 30.64 seconds. Peanut M&M#s, Skittles, and granola all had the effect of jamming transition. Jamming transition is when the solids become rigid with increasing density as they are being poured into the funnel and/or hopper. As all the material made its way down to the bottom of the funnel (where a stopper was put in place to keep the material from flowing before calculating the mass flow rate) it quickly formed cages within itself leaving no room for the material to flow and causing an arch formation at the bottom of the funnel. All three of these materials were inconclusive in having a mass flow rate because of this physical process. The flour however did not have a case of jamming transition. Flour being a powder is put in a separate class of granular materials from the others. Because of its powdery like characteristics and small particle size, it is more cohesive and easily suspended in gas, therefore making it extremely dense and compact when exposed to the moisture in the air. This effect happened when performing the trials for flour. These factors that I have listed are not the only derivatives that factored into the results of my experiment. The fact that the diameter of the end of the funnel was only 1-inch made it harder for the material to flow and therefore not having mass flow rates. So the diameter of the pipe effected the mass flow rate substantially. Conclusions/Discussion My conclusion is that my hypothesis was proved incorrect because my smallest material was flour which had an average dimension of .005 and did not have a recorded mass flow rate. The characteristics of my materials played a big role in the results as well as the physical process of jamming transition.	
Summary Statement The purpose of this science project is to prove that solids can flow like liquids, and by doing that I test the mass flow rate of granular materials.	
Help Received Sister helped hold a piece of cardboard at the end of my funnel as I was pouring my granular material in the funnel to prevent the material from flowing before I could time the mass flow rate.	