



CALIFORNIA STATE SCIENCE FAIR 2002 PROJECT SUMMARY

Name(s) Kelly Eaton	Project Number J1511
Project Title So What's the Rub? Stiction vs. Friction	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My project explores several aspects of mechanical friction and sets out to prove two of Coulomb's laws of sliding friction: 1) friction between two surfaces is greater just before motion begins (stiction) than when the surfaces are in steady relative motion, and 2) friction is proportional to the force (weight) pressing the surfaces together.</p> <p>Methods/Materials I conducted 2 experiments. In my first experiment ("weight test"), a small test bed sled was constructed to hold seven different weights. The sled was pulled across a fixed, relatively rough surface ten times for each weight, and the average pull force required (in grams) was recorded for both static and dynamic friction. The standard deviation of the 10 trials was calculated for each of the seven weights and the results were plotted on a line graph with error bars. A repeat of this weight test was conducted on a smooth table surface to get a second set of friction coefficients. In my second experiment ("materials test"), seven different materials were attached to the bottom of the test bed sled with equal weight. The sled was pulled across the table surface ten times for each material, and the avg pull force was calculated and plotted as a bar chart.</p> <p>Results In my first experiment the friction gradually increased as I added more weight. In the repeated version, the coefficient of friction was much lower for both static and dynamic because of the polished wood table being a smoother surface. I was able to confirm both of Coulomb's Laws in my weight test, with variations only due to an imprecise spring scale, and human reading inaccuracies. In my materials test, the surface with the greatest coefficient of friction was fine sandpaper; the least was plastic and paper towel (same friction). Although generally correct in my predictions of dynamic friction, I was inaccurate in 50% of my static friction predictions.</p> <p>Conclusions/Discussion I proved Coulomb's Laws that friction is proportional to force, and that static friction is greater than dynamic friction. Some of the surprising results in my materials test were due to unexpected causes of friction such as indentation of the softer surface by the harder body (as was the case with paper towel and tissue), interlocking of minute irregularities on the rubbing surfaces (with aluminum foil and fine sandpaper), and adhesion between surfaces (with the plastic bag).</p>	
Summary Statement My project is a study of dry static and dynamic friction, as a function of material surface types and pressing force.	
Help Received Parents bought supplies need for project; Mom drove me to libraries to get books for research and buy materials. Dad taught how to do standard dev and loaned his calculator, glue gun, postage scale, other tools. Brother taught me how to use Microsoft graph program.	