



**CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY**

Name(s) Claire C. Hsu	Project Number J0310
Project Title Give Me a Brake: A Study of How Various Brake Pad Patterns and Other Factors Affect the Braking Performance of a Bike	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals This project is a study of how different factors such as brake pad patterns and weather conditions affect the braking performance of a bike.</p> <p>Methods/Materials Methods: 1)Put bike upside down so that the rear wheel can rotate freely. 2)Put brake pads on the bike and a weight on the brake wire to provide load. 3)Attach the luggage scale tangentially to the wheel rim to measure frictional force. 4)Divide frictional force by load to get frictional coefficient. 5)Repeat test for different loads, water/sand, temperature, tire pressure, and different brake pads.</p> <p>Materials: Columbia Trailhead Bike, Aztec Rim Brake Pads, Diatech Hombre Black Threaded Brake Pads, Low Noise Water and Sand Repellent V-Cut Brake Pads, luggage scale, water, sand, weights, cardboard box for drag test</p> <p>Results During the bike test, the 4 ridged pads had the most friction (0.29), followed by the flat pads (0.17), the wide ridged pads (0.1), and the slanted dotted pads (0.09). In the water/sand test, frictional coefficients were approximately 0.05 lower than those at the normal condition for all the pads. In the temperature test, the 4 ridged pad#s frictional coefficient was 0.18 while hot and 0.31 while cold. The trend is less clear for the flat pads, the frictional coefficient was 0.14 while hot and 0.15 while cold.</p> <p>During the drag test, the trend for the different brake pad patterns was the same as in the bike test. The frictional coefficient for the 4 ridged pad was the highest (0.67), followed by the flat pads (0.55), the slanted dotted pads (0.39), and the wide ridged pads (0.51). The trends for weather conditions were again consistent with those of the bike test.</p> <p>Conclusions/Discussion The results showed that the 4 ridged pads had the most friction and also the most contact area with the rim of the wheel. The trend that the more contact area between the rim of the wheel and the brake pad, the more friction there is, can be seen with the other three pads as well. Water/sand did act as a lubricant, which lowers the friction. For temperature, the hotter pads exhibited lower friction.</p>	
Summary Statement This study identifies the effect of contact area and weather conditions on friction in different bike brake pads.	
Help Received Father helped perform experiment. Mother and Teacher helped edit report.	