



CALIFORNIA STATE SCIENCE FAIR 2010 PROJECT SUMMARY

Name(s) Derek W. Curtis	Project Number J0206
Project Title Pulling Weight on... Mars?	
Objectives/Goals The objective was to determine which of four different types of tread would provide the best traction while pulling a weighted payload trailer on a model of the Martian landscape. I believed that the wide, rounded lugged wheels would provide the best traction, and the large, narrow lugged wheels would perform the worst because they cover the smallest surface area.	
Abstract This year's project was a continuation of last year's project. The project was extended by adding weight to the rover to see how the robot's performance was affected. A Lego RCX brick from the Lego Mindstorms System was used to build a small robot with interchangeable treads. The four treads tested were: 1) large, narrow wheels with lugged tread; 2) wide, flat wheels with smooth tread; 3) wide, rounded wheels with lugged tread; and 4) plastic tank tread. A payload trailer, weighing 400 grams, was built to match the 400-gram weight of the robot itself. The Martian terrain simulation board built for last year's project was utilized again. A Lego computer program was created to carry the robot across the surface of the terrain. Each set of tread was tested 50 times, and the results recorded.	
Methods/Materials This year's project was a continuation of last year's project. The project was extended by adding weight to the rover to see how the robot's performance was affected. A Lego RCX brick from the Lego Mindstorms System was used to build a small robot with interchangeable treads. The four treads tested were: 1) large, narrow wheels with lugged tread; 2) wide, flat wheels with smooth tread; 3) wide, rounded wheels with lugged tread; and 4) plastic tank tread. A payload trailer, weighing 400 grams, was built to match the 400-gram weight of the robot itself. The Martian terrain simulation board built for last year's project was utilized again. A Lego computer program was created to carry the robot across the surface of the terrain. Each set of tread was tested 50 times, and the results recorded.	
Results The results were that the plastic tank tread performed the best by far, with an average distance of 88.90 centimeters. The wide, rounded, lugged wheels averaged 10.77 centimeters, the wide, flat, smooth wheels averaged 3.05 centimeters, and the narrow lugged wheels averaged 0.81 centimeters.	
Conclusions/Discussion My conclusion is that because the tank tread covered more surface area than the wheels, it maintained better traction on the terrain. In observing the performance of the robot, I have to wonder if the performance of the wheels would improve if my design had utilized more than four wheels. I hope to test this in the future.	
Summary Statement I utilized Lego Robotics to build a small rover and a weighted payload trailer, and tested the performance of 4 different treads on a model of the Martian terrain to determine which tread performs the best while pulling weight.	
Help Received My mom helped me type and proofread my report, my dad helped me (last year) build the martian terrain board, and Ota Lutz at JPL helped me with questions I had regarding my project.	