



**CALIFORNIA STATE SCIENCE FAIR  
2008 PROJECT SUMMARY**

<b>Name(s)</b> <b>Chris Kazanchyan</b>	<b>Project Number</b> <b>S0216</b>
<b>Project Title</b> <b>Adjustable Damper for Shock Absorbers</b>	
<b>Abstract</b> <b>Objectives/Goals</b> I intend to use a fluid consisting of nano and micro magnetite particles, whose viscosity will react to a magnetic field. It was incorporated into a model automobile shock absorber. Since the viscosity of the fluid controls the stiffness of the shock absorber, the stiffness of the shock developed can be altered providing the driver with the drive sought instantly. <b>Methods/Materials</b> I synthesized nano and micro sized magnetite particles by mixing FeCl <sub>2</sub> and FeCl <sub>3</sub> with HCl and NH <sub>3</sub> . The size of the particles was controlled by adjusting the rate at which NH <sub>3</sub> was added. Then it was suspended in tramethyammonium hydroxide. I then poured it into two separate dampers and screwed on the top. The top of the damper was secured to a mounting device, and a set weight was hung from the rod. The time for the rod to go from completely depressed to extended was recorded. This was repeated thirteen times per damper. This recording process was repeated thirteen times again for three magnets of differing magnetic strength. A control was also done where water was used instead of the nano/micro particle solution to see if it was something beside the fluid which was reacting to the magnetic field. <b>Results</b> The times for the dampers with the strongest magnet was increased by over 50%. The two other magnets with less strength had faster times, but they were much slower than the time for the damper without a magnet. The results were consistent with both dampers, and the times for the control experiments were much closer. <b>Conclusions/Discussion</b> If this fluid were to be used in the damper of shock absorbers, the stiffness of the shock absorber can be changed by increasing or decreasing the strength of the magnetic field. This technology can also be applied in other materials where viscosity is a factor.	
<b>Summary Statement</b> Using magnets to change the viscosity of nanofluids in the damper of a shock absorber to alter the stiffness of the shock.	
<b>Help Received</b> mother helped put together board; teacher helped acquire materials	