



**CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY**

Name(s) Vivien Y. Fang	Project Number S0206
Project Title Controlling the Dynamic Behavior of Structures with Active Dampers	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this experiment was to determine the dynamic behavior of a structure when excited at its natural frequency, and how active damping could be used to control the vibrations.</p> <p>Methods/Materials A structure was first constructed out of plexiglass, and its natural frequency was experimentally determined. Then the structure was excited under different excitation frequencies, which were close to the natural frequency, to observe the responding magnitude of the structure at these frequencies. The active damper was then applied to the structure and the structure was excited at the same excitation frequencies to find the responding magnitudes. Then the ratio between the damped and un-damped magnitude was found to view the efficiency of the damper at each tested frequencies.</p> <p>Results The ratio of the response magnitude of the natural frequency, 9.3Hz was 0.421660. The ratios of responding magnitudes for 8.3Hz, 8.8Hz, 9.8Hz, and 10.3Hz were 0.814891, 0.593268, 0.485263, and 0.532439 respectively. These results were relatively precise with 2.00% deviation. The ratio of the response vibration magnitude for 9.3 Hz was the lowest.</p> <p>Conclusions/Discussion The hypothesis, the damper should be most efficient when the structure was vibrated at its natural frequency was supported. Since the responding magnitude was the lowest at the structure's natural frequency and hence the less stress and possible damages. These results occurred because when the damper was added to the structure, it increased the degree of freedom to the structure and shifted the natural frequency of the structure; therefore, the structure no longer experienced the same resonant effect.</p>	
Summary Statement This experiment was conducted in order to determine the dynamic behavior of a structure when vibrated at the natural frequency, and how active damping could be used to control the vibrations.	
Help Received Dad helped during the construction of the structures, and provided the apparatuses and materials	