



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Adam G Mussell	Project Number J0614
Project Title Liquefaction In Action: An Investigation of How Earthquakes Affect Soil Stability	
Abstract Objectives/Goals The objective is to explore the susceptibility of certain soils in Santa Cruz to liquefaction, a process by which soils that are shaken, most often by earthquakes, liquefy and lose their stability. The goal is to determine which soils are the least safe to build on. I believe that the soils nearest the San Lorenzo River in Santa Cruz will be the least safe and stable when shaken by earthquakes. Methods/Materials Five soils samples were taken from around downtown Santa Cruz, from near sea level to 200 feet elevation. They were subjected to three tests; a shake test using a shake table, a grain uniformity test, and a permeability test. I constructed my own shake table, using materials from the hardware store, such as plywood, dowells, and a motor. Soils were shaken for one minute, and I measured the depth a weight sank in wet and dry soils. For the uniformity test, I filled vials with soil, and added vinegar and shook them. When the contents settled, I measured the percentage of different grain sizes. For the permeability test I measured how long it took for water to reach the bottom of a glass jar filled with soil. Results The sand from Natural Bridges beach was the most unstable under all three tests. The second most susceptible to liquefaction was silt from the San Lorenzo River. Conclusions/Discussion I conclude that sand is the most susceptible to liquefaction, but other silty soil types may be close in instability during an earthquake. During the Loma Prieta earthquake in 1989, structures failed downtown, many because of liquefaction. Engineers rebuilding today may want to take these results into consideration when designing buildings to withstand a similar quake in the future. For my next project, I may use the shake table to test structural integrity of various building types. I may also revise it to test different depths of soil or amounts of water.	
Summary Statement My project explores the susceptibility of soils in Santa Cruz to liquefaction during earthquakes.	
Help Received Mother helped type report, an engineer, Aaron Bierman, from Weber and Associates helped design uniformity test.	