



# CALIFORNIA STATE SCIENCE FAIR 2009 PROJECT SUMMARY

<b>Name(s)</b> <b>Paulomi Bhattacharya</b>	<b>Project Number</b> <b>J1502</b>
<b>Project Title</b> <b>The Effect of Biotite Content and Ventilation on Radioactive Emissions from Granite</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Because radioactive exposure leads to birth defects and other health hazards, this project determined whether biotite content and ventilation have an effect on radiation and radon emissions from various samples of granite.</p> <p><b>Methods/Materials</b> As a scale model for a room in my home, wooden boxes and granite samples were chosen so that the ratio of their volumes was 100:1. The high ventilation box had many large holes to provide sufficient airflow, while the low ventilation box was sealed with sealant and modeling clay. Samples of the commonly installed granite types Costa Esmeralda, Kashmir White, Baltic Brown, and Crema Bordeaux (in order of lowest to highest biotite concentrations) were obtained from granite stores and fabricated to the required size. A Geiger Counter and radon detector were used to measure radioactive and radon emissions respectively. The Geiger Counter sensor was securely taped to each granite sample, which was then placed in the low ventilation box for 6 hours and a measurement was taken every hour. This procedure was repeated with the high ventilation box. The radon detector was placed with each granite sample inside the low ventilation box for 48 hours and then a measurement was taken to obtain a long-term measurement. The same was done in the high ventilation box.</p> <p><b>Results</b> This experiment proved that under low ventilation, high biotite granites emitted more radiation and radon (<math>p &gt; 0.001</math>) than low biotite granites. However, under high ventilation, the radiation and radon counts of high biotite granites decreased significantly (<math>p &gt; 0.001</math>). Ventilation had no significant effect on low biotite granites. In fact, high biotite granites under high ventilation radiated the same amount as low biotite granites under low ventilation. Using statistical hypothesis testing methods, the results were found to be significant at levels 0.05 or below.</p> <p><b>Conclusions/Discussion</b> These results show that granites with low biotite are safer to use in a home. If granites with high biotite levels are installed, homeowners should provide sufficient ventilation in order to reduce the radiation concentration. The data obtained in this experiment has a statistical significance at levels 0.05 or below, explaining the accuracy and importance of these findings.</p>	
<b>Summary Statement</b> Using a scale model of a home, this project demonstrates that high biotite granites emit significantly more radiation and radon than low biotite granites, and ventilation reduces the radiation concentrations of the surrounding area.	
<b>Help Received</b> Ms. Lorna Claerbout provided general guidance. Geiger Counter borrowed from The Harker School. Parents bought Radon Detector. Carpenter helped build and seal boxes according to my directions. Granite fabricator helped to cut the granites to the required size.	