



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Sarah K. Flynn	Project Number 22244
Project Title The Effect of Air on Heat Conduction in an Insulator	
Abstract Objectives/Goals The purpose of this project was to test if the amount of air present in an insulator has an effect on its ability to conduct heat. My hypothesis was that if gases are poor conductors of heat, then air mixed with solids in an insulator will decrease the heat conductivity of that insulator. Methods/Materials Two substances of a similar material, sand and pebbles, were studied. The variable in this experiment was the amount of air in each insulator. Two controls were also measured: heat conduction in wood (sawdust) and in air alone. Hot water (45 degrees Celsius) was insulated with one of these materials and placed into a refrigerator. The water temperature was measured every half hour for three hours. This procedure was repeated three times for each material. Results The total average conduction of heat from the water insulated with pebbles was 30.4 degrees Celsius. The total average conduction of heat from the water insulated with sand was 34 degrees Celsius. Conclusions/Discussion Both pebbles and sawdust are good heat conductors due to their closely bound molecular structure and the presence of free electrons. In these solids, heat is transferred effectively by molecules vibrating against neighboring molecules. Air is a poor conductor of heat because it has little vibrational contact between its molecules due to the increased space between them. The results show that the solid with the most air present in the insulator (pebbles) conducted heat the most poorly. With all else held constant, it was found that the variable (air) slowed heat conduction. This result supports the hypothesis.	
Summary Statement My project investigated if the presence of air in an insulator has an effect on the amount of heat conduction.	
Help Received My dad helped me check the spelling and grammar in the written part of my project. My mom helped me make my display board.	