



**CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY**

Name(s) Navjot Singh	Project Number S0325
Project Title Utilization of X-Ray Triboluminescence from Stick-Slip Friction in Peeling Tape	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of the project is to be able to utilize the X-ray triboluminescence, emission of radiation through friction, from peeling tape by making an X-ray machine. Once the X-rays have been detected, the secondary objective is to find the most efficient method of producing X-rays. The goal is to be able to produce 100 counts of X-ray radiation, which will be detected by a Geiger counter, and use that radiation to create an X-ray image.</p> <p>Methods/Materials To create the X-ray machine, a program was first made, using C++, that would allow a light sensor to be used as a switch to turn a motor on and off. One stand was then constructed to hold the motor and a roll of tape while another to hold a Geiger counter in front of the point of partition of the tape. The entire set-up was then placed in a vacuum chamber. Next, a hole was drilled in the lid of the vacuum chamber, and the wire connecting the Geiger counter to the computer was inserted. After the sealing glue was applied to close the hole, tests were conducted with various tapes. Also, a package of photographic paper was made to conduct X-ray scans by going into a completely dark room and placing two metal washers as targets in front of the photographic materials and wrapping them in dark paper.</p> <p>Results Peeling regular Scotch tape produced a maximum of 329 Counts per second (CPS) of X-ray radiation. Furthermore, in every test the slope of the line of best fit was at an average of positive 1. Scotch sealing tape produced an external radiation level of 30 CPS. Electrical tape produced a maximum of 3 CPS. Photographic paper was then used with an exposure time of 15 minutes with regular Scotch tape and 7 minutes for Scotch sealing tape, which is 3 centimeters wider than regular Scotch. Both of these test produced a clear X-ray scan of the two washers placed in each package of photographic paper.</p> <p>Conclusions/Discussion Not only was the goal attained but was far surpassed by producing over 300 counts of radiation per second. Regular scotch tape proved to be the most efficient method of producing X-rays. Furthermore, a direct correlation between speed of partition and X-ray production was discovered: a faster rotation speed resulted in a greater production of X-rays.</p>	
Summary Statement A portable, more cost-efficient X-ray machine was created through triboluminescence in peeling tape.	
Help Received Various materials were provided by science teacher, John Allen; assistance in developing the photographic material was provided by photography teacher, Jarrod Thompson	