



**CALIFORNIA STATE SCIENCE FAIR  
2008 PROJECT SUMMARY**

<b>Name(s)</b> <b>Ranvir S. Bajwa</b>	<b>Project Number</b> <b>J0502</b>
<b>Project Title</b> <b>Analysis of Water for Mercury using Light</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> My project is to determine if it is possible to detect mercury in water using light and the electromagnetic spectrum. I hypothesize a red shift of the spectrum when light is passed through the mercury solution, with prominence of bright colors and waning of dark colors. I predict this because in experiments with mercury vapor a red shift has been seen. With the gold nanorod suspension there will be blue shift because the color of the suspension is blue.</p> <p><b>Methods/Materials</b> Wood, light, convex lens, prism, metal sheet, test tubes, pipettes, beaker, distilled water, scale, camera, gold nanorods, mercury chloride and sodium borohydride. An optical spectrometer was constructed. Solutions of Mercury Chloride and Sodium Borohydride were prepared in distilled water at 10(-5)M. A spectrum was obtained by passing light through distilled water. 10 drops of the gold nanorod suspension were poured into a test tube (A), light was passed through it and appearance of the spectrum was noted. 10 drops of the sodium borohydride solution were added to (A) and any change in spectrum was noted. 10 drops of the gold nanorod suspension and 10 drops of sodium borohydride were poured into test tube (B, control). Mercury solution was added to test tube A drop by drop and distilled water to test tube B observing the spectrum. Pictures were taken if the spectrum changed. Three trials were performed.</p> <p><b>Results</b> In my first two trials, a red shift of the light spectrum was observed after 4 drops of mercury solution were added to the gold nanorod suspension and in my third trial red shift appeared after adding 3 drops of mercury. In each trial the red shift remained with further addition of mercury. There was no blue shift observed with the gold nanorod suspension.</p> <p><b>Conclusions/Discussion</b> My data supports my hypothesis that if a certain amount of mercury is present in the solution, there will be red shift of the light spectrum. There was no blue shift seen with the gold nanorods suspension. I suspect I may not have seen a shift because the shift may be too subtle to observe with the naked eye but would be seen with a spectrophotometer. I would like to investigate this possibility. In this experiment I have shown that small amounts of mercury can be detected in water using light and gold nanorods. With development, I believe this testing has great potential in reclaiming contaminated water and in performing on site testing for tap water.</p>	
<b>Summary Statement</b> Is there a simple method for detecting mercury in water using light and the electromagnetic spectrum?	
<b>Help Received</b> My mentor, Professor Florencio E. Hernandez, Univ. of Central Florida provided me guidance and gold nanorods; Mr. Mark Hobbs, my teacher helped me with obtaining chemicals and equipment; my father helped me with project construction and preparation and safe use of chemicals.	