



**CALIFORNIA STATE SCIENCE FAIR  
2002 PROJECT SUMMARY**

<b>Name(s)</b> Amy F. Ng	<b>Project Number</b>  22443
<b>Project Title</b> <b>Development of a Portable Laser Spectrophotometer for Chlorophyll Measurement and Environmental Water Monitoring, Part 2</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The purpose of this project is (1) to refine the construction of the previous laser spectrophotometer by making the instrument more sensitive and more susceptible to environmental light; (2) to optimize the instrument performance based on Beer's Law; (3) to use the spectrophotometer for reliable field analysis of environmental waters; and (4) to obtain assurance of its performance. <b>Methods/Materials</b> A laser pointer emits 670 nm light was used for absorption spectroscopy of chlorophyll. The laser intensity was measured by using a pocket power meter. A neutral density filter was employed to reduce the laser intensity in an attempt to increase the instrument sensitivity. A 1-cm tube and a 2.5-cm container were compared as the sample cuvette. A light-block wrap was constructed with block-out cloth and used for minimizing the background environmental light. Environmental waters were collected and analyzed with this field-assembled portable laser spectrophotometer. Finally, the performance of this instrument was compared to that of a commercial, desk-top spectrophotometer. <b>Results</b> It was found the intensity of the source laser did not affect the absorbance sensitivity. The larger sample cuvette gave higher absorbance signals. The light block wrap used to enclose the instrument was able to reduce environmental light readings to a negligible level. The measurements obtained were consistent with the cleanliness of the water sample. Finally, this portable laser spectrophotometer gave a similar sensitivity to that of the commercial spectrophotometer. <b>Conclusions/Discussion</b> A hand-held laser spectrophotometer has been designed and constructed with pocket components, and evaluated theoretically (Beer's Law) and practically for chlorophyll measurement and water quality analysis. The sensitivity of the laser spectrometer is found to be comparable to that of a commercial unit. Finally, the laser spectrometer is proven useful and is ready for practical field-analysis.	
<b>Summary Statement</b> A hand-held laser spectrophotometer has been designed and constructed with pocket components, and evaluated theoretically (Beer's Law) and practically for chlorophyll measurement and water quality analysis	
<b>Help Received</b> Science teacher provided the knowledge. Parents helped with suggestions for board lay-out.	