



**CALIFORNIA STATE SCIENCE FAIR  
2002 PROJECT SUMMARY**

<b>Name(s)</b> <b>Stephanie T. Kokka</b>	<b>Project Number</b> <b>J1520</b>
<b>Project Title</b> <b>Sculpting with Light: Applying Photonics to Create a Three Dimensional Image</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The ability to utilize lasers to produce a three dimensional image often requires high power sources and thousands of dollars, but by utilizing a common inexpensive diode laser ("laser pointer"), and constructing my own experimental components, I will be able to successfully produce a three dimensional image in a safe, cost effective, manner.</p> <p><b>Methods/Materials</b> Using mostly common materials found in local hardware stores, a vibration isolation platform was constructed. In order to ensure a consistent power source, I modified a standard "D" cell battery holder to supply power to an inexpensive diode laser ("laser pointer"). Using silver halide gel emulsion plates, and photography darkroom materials, I experimented with different subject matter, subject orientations, exposure times, and developing times in an effort to produce a three dimensional image.</p> <p><b>Results</b> Through repeated trial and error experimentation, it was discovered that a common diode laser does indeed supply sufficient coherent light to record and reconstruct a three dimensional image in the form of a hologram. The "contact copy" method of object orientation (bringing the subject in direct physical contact with the emulsion in order to nullify vibrational distortion), in conjunction with an exposure time of eight seconds, proved to be effective in producing a consistently successful hologram.</p> <p><b>Conclusions/Discussion</b> I have concluded that photonics principles can be successfully applied in the use of a common laser pointer to create a three dimensional image. My experimental results validates the use of diode lasers for the purpose of recording objects as holograms, as opposed to coventional, flat, two dimensional photographs. This finding opens up the possibility that in the near future, we will be able to cost effectively produce holograms for a variety of applications, including: archiving, security identification, artistic, commercial advertising, medical imaging, etc.</p>	
<b>Summary Statement</b> I will prove that a common laser pointer produces sufficient coherent light to create a three dimensional image.	
<b>Help Received</b> Dr. Tung Jeong, set-up and supplies; Dr. Rich Chin, darkroom equipment; Frank DeFreitas, experimental design; Darren Boyajian, electronics advice; Dan Brown, presentation; parents, overall support	