



CALIFORNIA STATE SCIENCE FAIR 2006 PROJECT SUMMARY

Name(s) Lindsey K. Sweeney	Project Number J1537
Project Title The Mass Properties of Light	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My project objective was to determine if photons in sunlight exhibit detectable mass properties when striking a mechanical detector. This exercise would be accomplished by building an extremely sensitive detector with the ability to control many influencing variables.</p> <p>Methods/Materials To conduct this experiment, the materials needed were gathered: 1 can of flat black spray paint, 1 fine human hair, 1 sheet of aluminum foil - 20cm x 20cm, 1 pair of scissors, Scotch tape, 3 hand-mirrors, 1-20cm by 20cm piece of opaque cardboard, 5-20cm x 20cm panes of glass (standard windowpane thickness), 2-22cm x 22cm panes of glass (standard windowpane thickness), 1 tube of clear silicone, 3-5cm x 12cm x 2mm steel plates, 4-3mm x 12cm bolts with 4 nuts each, 1 tube of cyanoacrylate glue, and 1 drill and 4mm bit. A test environment was created that controls friction, torque, infrared light, convection, and the refraction and reflection of light to a minimum so that the radiated photons would be the only significant element affecting rotation. Three mirrors reflecting the sun's light were shone on the detector five times for twelve seconds and off for twelve seconds in each series of tests, while checking for movement or rotation. Next, a series of different variations of the test were done by blocking one of the two different colored sides, or putting another pane of glass in front of the environment to demonstrate that heat and/or convection was not a significant source of energy.</p> <p>Results According to the data and observations, the results that were acquired did support the hypothesis that the inertial properties of photons in sunlight would exhibit detectable mass properties when striking a mechanical detector. The evolution of the test apparatus from the original, nearly friction free detector, to the final detector - many times more sensitive due to it's reduced mass, along with a continual refinement of test procedures, assured the outcome.</p> <p>Conclusions/Discussion The hypothesis that the mass properties of light would be detectable when striking a mechanical detector was supported, but the experiment was much more than that. It was the realization of how minute the forces of photons were and the evolution of the detector from the nearly frictionless beginning, to the final detector, many times more sensitive to be able to detect these forces.</p>	
Summary Statement The goal of this project was to develop a detector capable of registering the photon's inertial properties in reflected natural sunlight.	
Help Received My dad helped me research information, drill holes in the metal used for the detector, and cut the glass of my environment for me. Mrs. White, my teacher, proofread my work for grammatical errors.	