



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

Name(s) Lena K. Egbert	Project Number J0206
Project Title Leveraging Light: A Method for Measuring Minute Masses	
Abstract Objectives/Goals My project combines the principle of the lever and interference of light to measure very tiny weights. I hoped to measure small weights and compare them to known weights to see how accurate it was. Methods/Materials First, I built a balance with a rigid rod and knife edge. Tiny weights added to one end of the lever caused it to move down by very small distances. I measured these tiny movements of the lever using a Michelson interferometer that I built with a laser pointer and small mirrors. One of the mirrors of the interferometer is attached to one end of the lever to measure its movement. This device is able to measure movements of the mirror close to the wavelength of the laser used (650 nm). I can even measure weights less than a microgram. In my device, the laser beam is split in two by the half-silvered mirror (beam splitter). The beam is reflected back so the two beams end up on the screen. These combine to make interference patterns. By measuring the change in the pattern, I can measure how much the end of the lever moves. Results I tested my device with various small objects such as a grain of salt and a mustard seed. I compared my results to known values. They were fairly accurate. I measured grains of salt, sugar, and sand and various cooking ingredients such as cream of wheat. I measured the change in the interference pattern by counting the number of rings that moved over. If one ring moved and a new one formed in the middle, that meant the lever moved one wavelength. Conclusions/Discussion This is a very inexpensive, easy way to measure small masses accurately without expensive equipment. If I had a more accurate way of measuring changes in the interference pattern, my results would have been even more accurate.	
Summary Statement Measuring minute masses using the principle of the lever and interference of light.	
Help Received Dad helped cut wood and metal with table saw.	