CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Mina R. Bionta

Project Number
S1502

Project Title
Is Sunlight as Dangerous as Laser Light?

Abstract

Objectives/Goals
My objective was to determine if sunlight is as dangerous to the human eye as laser light.

Methods/Materials
I used a lens that is similar to that of the human eye, it has a diameter of 12mm and a focal length of. The pupil diameter was simulated by using a precision iris that changed the aperture. I used a class IIIa laser pointer. Using a photodiode power meter, I compared the power delivered to the focal point at different iris apertures for the laser and the sun.

Results
At an aperture of 2mm, the aperture that the human eye would be when looking at the sun, the sun and the laser deliver the same amount of power to the human eye retina. At apertures greater than this, the sun delivered more power but the power delivered by the laser pointer stayed the same.

Conclusions/Discussion
Sunlight and laser light are equally dangerous to the human eye since they deliver the same power level when collected by a 2mm aperture. The human eye can shrink no smaller than this. Bigger apertures can collect more sunlight since sunlight falls uniformly on the day-lit surface of the earth. This is why the sun delivers more power with the bigger apertures. The laser pointer's spot size had a diameter of about 2mm, so the power level stayed the same for bigger apertures since no more light was being collected. I also compared my laser to different classes of lasers including the world's biggest laser National Ignition Facility (NIF) in LLNL. This laser is far more dangerous than the class IIIa laser pointer that I used in terms of total energy delivered in a short amount of time.

Summary Statement
By measuring power levels at the focus point of a lens similar to the human eye, my project shows the sun can deliver more power than the average laser pointer.

Help Received
Mrs. Susan Edgar-Lee supported entering the project in the Regional Science Fair. Mr. Richard Combs lent me equipment. My parents supervised experiment and proofread my report.