CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
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Project Number
J1819

Project Title
UV Rays in Water

Abstract

Objectives/Goals
The objective is to determine whether ultraviolet absorption varies throughout water depth. I believe an object at greater depth would absorb less ultraviolet rays than an object at a lesser depth.

Methods/Materials
Four plastic UV beads were used. These UV beads contain pigments that intensify when exposed to UV radiation. Three UV beads were suspended at different depths in tap water. The beads were placed at 1 cm, 31 cm, and 60 cm below the water surface. The fourth bead was used as the control bead. After 5 minutes of UV exposure, photographs of the beads were taken and compared to the control bead intensity chart; the results of 17 trials were recorded and charted.

Results
The results indicate a decline in light intensity as it travels deeper through water. Hence, the bead placed closer to the water surface absorbed the most ultraviolet rays, whereas, the bead placed at a lower depth experienced less UV radiation. Various factors contribute to the decay in light intensity as it passes through water. The water#s extinction coefficient and scattering of ultraviolet waves cause a reduction of light energy through water.

Conclusions/Discussion
An object at a greater depth would absorb less ultraviolet rays than an object at a lesser depth. Because the extinction coefficient of pure water is 0.035 (1/m), UV rays do not travel straight through water. Rather, the UV light lost energy as it passes through water depth; the deeper the depth, the less energy available to absorb. Another contributing factor to the loss of light energy was through Raman scattering. Raman scattering occurs when light scatters, causing a reduction of light energy as it travels through water. This resulted in the highest levels of absorption in the bead closest to the water surface. The results supported the mathematical equation I(D) = I(0)e^-kD. Hence, the hypothesis stated is true; ultraviolet absorption varies throughout water depth.

Summary Statement
My project studies the absorption of ultraviolet rays as it travels through water.

Help Received
My father helped to take photographs. My mother helped to assemble the display board.