



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

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| Name(s) Peter J. Chodas | Project Number J1605 |
| Project Title Do Denser Liquids Always Refract More? | |
| <p style="text-align: center;">Abstract</p> <p>Objectives/Goals Since water refracts more than air, and water is denser than air, it would appear that denser substances generally refract more. Is this always true? My hypothesis is that denser liquids always have a greater index of refraction than less dense liquids.</p> <p>Methods/Materials To test my hypothesis, I measured the index of refraction and density of water and three other clear liquids, isopropyl alcohol (91% concentration), mineral oil, and liquid hand soap. To measure the index of refraction, I poured each liquid into a glass container with parallel sides and shone a laser at five fixed angles through a fixed spot into the container. For each of the angles, I marked the spots where the laser hit a piece of paper on the opposite side of the container. I measured the distance of each spot from the line perpendicular to the glass, transferred the points to my working paper, and measured the angles of refraction. I then calculated the sines of the angles, graphed the sines of the angles of incidence vs. the sines of the angles of refraction, and computed the average slope to get the index of refraction, according to Snell's Law. To find the densities of the liquids, I used a measuring cup to obtain a particular volume, and an accurate scale to determine the weights with and without the liquid.</p> <p>Results The refraction was much larger than I expected. All of the liquids I tested refracted the laser beam more than water even though two of them (isopropyl alcohol and mineral oil) were less dense than water. Only one liquid (the soap) was both denser than water and had a higher index of refraction.</p> <p>Conclusions/Discussion My hypothesis was contradicted: there was no correlation between the density of a liquid and its index of refraction.</p> | |
| Summary Statement I determined experimentally that there is no correlation between the density of a liquid and its index of refraction. | |
| Help Received My dad helped me understand Snell's Law and he also helped me mount my pages on the display board. | |