



**CALIFORNIA STATE SCIENCE FAIR  
2015 PROJECT SUMMARY**

|   |   |
|---|---|
| <b>Name(s)</b><br><p align="center"><b>Sean F. Duarte</b></p> | <b>Project Number</b><br><p align="center"><b>J1707</b></p> |
|---|---|

**Project Title**  

**Refraction and the Speed of Light**

**Abstract**

**Objectives/Goals**  
 The purpose of my project is to find out how fast light travels through different mediums.

**Methods/Materials**

**Materials**  
 5 Sheets of Paper; Pen; Ruler; Printer; Printable Radian Protractors; Scientific Calculator; Laser Pointer; 5 Square Plastic Containers; 200mL of Distilled Water ;200mL of Cooking Oil; 200mL of Dish Soap; 200mL of Surface Cleaner.

**Procedure**

1. Print out five radian protractors.
2. Fill the plastic container with 200mL of the test medium.
3. Fold a printed protractor in half.
4. Put a test medium on the center of the protractor.
5. Using the pen, make a dot about 4 centimeters from the fold on the paper of the protractor.
6. Put the laser down, and aim it at the dot. Aim the laser so it goes over the dot and enters the test medium at the fold on the protractor.
7. Using the pen, mark where the laser enters and exits the test medium.
8. Using the protractor, measure the angle of incidence and the angle of angle of refraction.
9. Use Snell's law to calculate the speed of light in the air and in the test material.
10. Repeat steps 2-8 with the different test mediums.

**Results**

| Test Medium        | Density (g/ml) | Speed of Light in Medium (m/s) | Weight in Grams | Angle of Refraction |
|--------------------|----------------|--------------------------------|-----------------|---------------------|
| Control            | 0              | 287,422,723                    | 0               | 0.85                |
| Surface Cleaner    | 0.8230         | 304,410,967                    | 164.6           | 0.92                |
| Distilled Water    | 0.8535         | 308,964,122                    | 170.7           | 0.94                |
| Cooking Oil        | 0.8775         | 302,076,996                    | 175.5           | 0.91                |
| Dishwashing Liquid | 0.9170         | 306,706,675                    | 183.4           | 0.93                |

**Conclusions/Discussion**

**Summary Statement**  
 My project is about finding out how light speed is affected as it travels through fluids with different densities.

**Help Received**  
 My parents bought materials for the project.