



**CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY**

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Project Title Falling for You: Calculating the Trajectory of a Falling Samara Seed	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals In this experiment, we hoped to create a mathematical model of the trajectory of a falling helicopter samara seed. By utilizing tracking programs like Tracker 4.95, as well as high speed cameras and basic kinematics equations, we believed that it would be possible to apply collected data to already existing helical equations to create the model.</p> <p>Methods/Materials Using a high speed camera filming at 240 fps, we filmed the fall of samara seeds from both the top and side view. We then uploaded the videos to the Tracker 4.95 program and tracked the seed at multiple points for each frame of every video. We subsequently uploaded the data into a Microsoft Excel file and applied physics principles and equations to calculate the translational angular velocity, terminal velocity, and acceleration, using such equations to derive a model for the helical fall of the samara seed.</p> <p>Results Unfortunately, we were unable to create a mathematical model for the helical trajectory of the seed's fall; however, we were able to calculate many different values to describe the movement of the seed both rotationally and translationally.</p> <p>Conclusions/Discussion There were indeed trends in the data, showing different relationships between the angular velocity and the translational velocity as well as the terminal velocity of both. Our inability to derive an equation for the fall is perhaps due to the lack of a z-dimension as well as external factors like air resistance.</p>	
Summary Statement We utilized tracking programs, high speed cameras, and basic physics principles to derive the trajectory of the helical fall of a samara seed.	
Help Received Over the summer, two fellow high school students at Stanford Pre-Collegiate Summer Program engaged with my partner in a discussion that built the fundamental idea of this project; however, the experiment design and data were all conducted separately, months later, at home. We received no assistance from	