



Colorado Science and Engineering Fair

2024 Individual Project Abstract Form

Please print 2 copies of the completed form. Sign both copies, keep 1 for your notebook and submit 1 copy to your Regional Fair Director with your other paperwork.

Title of Project: At My Breaking Point

Finalist's Name: Dillon Curtis

School and City: Brush Secondary Campus, Brush

Sponsor's Name: Emily Curtis

Category: Physics & Astronomy (PHYS)

Division: Senior (9th - 12th grades)

Abstract (250 words or less):

Abstract

My project investigates the relationship between force required to break materials and the angle at which they break. This relationship is essential in construction and material science in understanding the stresses materials can take. I used mechanical pencil lead in my experiments due to the variety of lead types, consistency in production and fast breaking for measuring angles. Before starting my project I believed that angle of breakage would decrease linearly as force increased. This was proved wrong when I examined my data. I clamped pieces of lead to a level table and used a straightedge to mark the starting location of the lead. I recorded the breaking process and measured force with a force meter marking down the highest recorded force. Then I analyzed the videos in an editing software to see specific frames before the lead broke. I believe based on the data that the relationship can be described as an exponential function of $f(x) = \frac{2}{3}^x$. If force increases then angle will decrease exponentially. Knowing this I could be able to predict the behavior of trees under stress from the wind.

I hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I also attest that the above properly reflects my own work.

Finalist's Signature: *Dillon Curtis*

Date: *2-28-24*

In addition, all students must complete the ISEF Student Checklist (1A), Research Plan, Approval Form (1B), and Checklist for Adult Sponsor (1), and any other ISEF forms required for this type of project. See the International Rules and Guidelines for form requirements. Return COPIES of all of these forms to your Regional Fair Director with you Finalist Verification/Permission Form. A signed copy of this form must be included in your notebook.