



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

Name(s) Daniel S. McDermott	Project Number J0117
Project Title Blade Testing for Best Windmill Performance	
Objectives/Goals The goal of my project was a to discover the best windmill blade angle which would create the fastest rotation speed. I also evaluated the width of the windmill blades and its effect on rotation speed.	
Abstract A windmill that spins the fastest will produce the most energy. I made the body of the windmill from a K-nex set and made the windmill blades from balsa wood, same in length (12") but at different widths. For a wind source, I used a floor fan placed 2 feet and 6 inches away from the actual windmill. The fan was operated at various speeds. I measured the blade angles using a protractor. I measured the blade speed using the cadence feature from a bicycle cyclometer and attached that to the body of the mill. The blade rotation measurements were in RPM (Rotations Per Minute). My hypothesis is that the thin, 75-degree angle blade design will spin the fastest. My hypothesis was based upon my assumption that the 75-degree angle would push the blade more into the direction of the rotation creating a faster spin. The thin blade will be lighter so it would be easier to turn.	
Methods/Materials K-nex set for the windmill structure Sets of four balsa wood strips 12# long at different widths for the windmill blades 1 floor fan Cyclometer - cadence function (used for bikes) Washers (to counterweigh the cadence meter weight)	
Results The 5-degree thin blade produced the fastest spin; however, under high wind conditions, the 5-degree wide blade toppled the entire windmill structure. Larger angles were able to withstand higher wind speeds without toppling over.	
Conclusions/Discussion I was way off! The 5-degree blade angle produced the fastest spin under low and moderate wind conditions. The 5-degree angle had the largest surface area to catch incoming wind and had the least wind resistance in the direction the blades were rotating. However, the 5-degree wide blade caught too much wind and caused the structure to fall. The thin blade spun slightly faster than the wider blade because it was lighter and had a smaller cross section for wind resistance. I recommend further study to testing see if a windmill could be invented which automatically adjust to the best blade angle for the wind speed at that time.	
Summary Statement To discover the best windmill blade angle which would create the fastest rotation speed.	
Help Received Mom and Dad for editing my papers, Dad for helping with display board, Dad for advanced computer help, Dad for help measuring blade angles, Mom for taking photos	