



**CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY**

Name(s) Nicholas T. Rivelle	Project Number 35319
Project Title Relative Strength of Five Common Wood Joints	
Abstract Objectives/Goals My objective was to test the relative strength of the five most common wood joints (miter, butt, big box, little box, dovetail) to determine their ability to resist pressure. This kind of data had never before been collected in a controlled way. The results will help woodworkers determine which is the most suitable kind of joint for any given application. Methods/Materials I built examples of each type of joint using kiln-dried poplar and Titebond II adhesive. After curing, each joint was subjected to an increasing amount of pressure, in ten pound increments, and the angle of deformation measured with a protractor, until it failed. Three types of press were used: a purpose-built press, a commercial weight machine, and a 1500 lb. pressure clamp device. Results I had hypothesized that the amount of surface area in the joint would determine its strength. This proved to be true with one exception. The dovetail survived nearly 400 lbs of pressure before failing. Next came the little box joint, which failed at 300 lbs. There was then a large drop-off to the miter and butt joints, which both failed at around 130 lbs. The outlier was the big box joint which collapsed at 90 lbs of pressure. Conclusions/Discussion The results confirmed my hypothesis that surface area determines joint strength. The dovetail was by far the strongest, probably because of its interlocking, angled teeth, which tended to reinforce the joint under pressure. Next came the little box, with its six interlocking teeth. The butt and miter had the least surface area and both failed around 130 lbs. The anomaly was the big box. Its three interlocking teeth acted as a hinge, and it snapped on each trial at 90 lbs. My carpentry consultant, Mr. Hugens of Arroyo Hardwoods, has already shared my results with his customers.	
Summary Statement My experiment tested the relative strength of the five most common types of wood joints.	
Help Received Mr. Michael Hugens of Arroyo Hardwoods in Pasadena supervised the building of the joints.	