



**CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY**

Name(s) Alexa Canova-Parker	Project Number J1805
Project Title Mussel Bound	
Abstract Objectives/Goals To determine whether the addition of a form of Dopa (Nordihydroguaiaretic acid or NDGA) to man-made protein based glue (Elmers white) creates a stronger bond in both wet and dry conditions.	
Methods/Materials 1. I obtained quantities of Elmers glue and a form of Dopa. I acquired the form of Dopa from Dr. Herbert Waite of UCSB, who is researching the protein make-up of mussel adhesive 2. I purchased popsicle sticks at the craft store and prepared them. 3. I kept all variables except the differences in the glue the same. The sticks glued with Elmers glue were my control group. I glued these first. The first set of my control group was the dry popsicle sticks. The second set of my control group was wet popsicle sticks. 4. The sticks glued with Elmers glue enhanced with Dopa (I will call that Dopa Glue) were my experimental group. I repeated the exact same procedures using Dopa Glue instead of Elmers glue in both the dry and wet environments. 5. Next, I tested how effective the Elmers glue and the Dopa Glue were in the different environments. 6. To ensure accurate results, I repeated this cycle four more times (five times total) and averaged the results of each group. 7. By analyzing the results shown on the data chart, I was able to determine that my hypothesis was not correct.	
Results As tested by my experiment, my hypothesis was clearly wrong. The covalent bond I anticipated would be created by the addition of Dopa was not formed (Waite, Mussel Adhesion, 312). However, experimental science is a process, not an outcome. The analysis as to why the experiment failed is the next step in discussing the results. Many unanticipated variables could have affected the outcome. o First, is Elmers compatible with NDGA? o Second, does the chemical structure of wood prevent the formation of a covalent bond using Dopa. o Next, was NDGA the best substitute for Dopa proteins? (Waite, February 15, 1). The NDGA proteins are not exactly the same as the Dopa found in mussel proteins.	
Conclusions/Discussion Since my hypothesis, as tested, was rejected, I can vary the experiment. I would use an epoxy instead of Elmers; I would consider using glass, metal, or even mussel shell pieces for the surface; and I would change the Dopa equivalent, using another organic compound or catechol containing Dopa peptides.	
Summary Statement My project explored the contribution of Dopa to man-made adhesives, applying lessons learned from natural mussel adhesives.	
Help Received Dr. Herbert Waite, professor U.C.S.B., supplied me with the NGDA and ethanol.	