



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Rachel N. McKinnon	Project Number S0213
Project Title The Effect of Environmental Factors on the Tensile Strength of Kevlar	
Abstract Objectives/Goals The purpose was to determine what effect (if any) different variables had on Kevlar, the thread used in bulletproof vests. The bulletproof vest is the most important article of clothing a police officer wears, and it is vital to know how strong the threads in the vest are. I selected the variables based on how likely it would be that a police officer would experience them. Methods/Materials I began my research in December by emailing companies for information and samples of Kevlar. I simulated environmental conditions comparable to those that vests would be exposed to in real life situations. I tested a total of fifty strands of thread, ten per variable. After a twenty-hour period I tested the tensile strength to measure the deviation. Results The variable that had the strongest effect on Kevlar was UV exposure. The second most potent variable was freezing temperatures (approximately 30 degrees Fahrenheit). I found this very interesting, because bulletproof vests come into contact with both of these conditions often. Conclusions/Discussion A bulletproof vest is not truly bulletproof, only bullet resistant. Kevlar has revolutionized the body armor industry, but it still carries many flaws. If a thread is going to suffer a notable loss in its tensile strength from common conditions like sunlight and freezing temperatures, how reliable is the vest? Yes, the new vests do provide an amazing second chance for life, but police departments cannot always afford to replace vests as frequently as needed. This raises the question, if a vest is not stored in the recommended conditions, can it last the 10 years it is meant to? Until future technology develops a thread better resistant to conditions such as sunlight and freezing temperatures, making police departments more aware of the risk their vests are at is the only alternative.	
Summary Statement To determine what effect environmental variables had on Kevlar.	
Help Received Borrowed Equipment from science teacher	