



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

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| Name(s) Michael C. Binon | Project Number 31038 |
| Project Title Having a Hard Head Won't Save You | |
| Objectives/Goals My Goal is to test different combinations of shells and energy absorbing materials to find out which combination will absorb the most energy, and protect the head the best. Abstract Methods/Materials 1. Is anThe first step for this project was to select all the materials that I was going to use for the shells and liners. I chose carbon fiber and fiberglass for the shells, and closed-celled polystyrene and conformal foam for the energy absorbing materials. 2. My next step was to form the shells out of fiberglass and carbon fiber. I did this by making a helmet shaped mold and covered the material with a resin mixture to create a hard shell for the liners. 3. The third step was to make the liners so that they fit inside of the shells. For the polystyrene liners, I cut out rings of foam that approximately fit the measurements of the shell. I was then able to cut the straight edges of foam to make a spherical figure. To make the liner out of conformal foam, I cut out small pieces of the material and used Velcro to connect it to the shell. 4. I was then ready to take the completed helmets to be tested. I did this by taking the helmets to Snell Memorial Foundation to have them help me impact test them and to perform a penetration test. The impact test shows how much the brain accelerates and de-accelerates which tells me how severe the damage to the brain would be. 5. My next step was to analyze all the data I had gathered to see which combination of liners and shells protect the head the best. 6. Lastly, I created my backboard to show my project at the science fair. Conclusions/Discussion It turns out that my hypothesis was totally wrong. The carbon fiber and conformal foam had such a low density that Snell would not even test it in fear that it would break their machines. The carbon fiber and closed-celled expanded polystyrene ended up performing the best under the circumstances. We also noticed that the shells were not rigid enough to attempt a penetration test. After performing the tests on two of my helmets, we determined that it would be redundant to test the other helmets. My final conclusion was that none of the foams that I tested were dense enough to absorb the energy and none of the shells had enough rigidity when the impact hit. | |
| Summary Statement My project is about finding what materials will make a helmet to protect the head the best. | |
| Help Received Snell memorial Foundation helped me test my helmets, and My dad helped me trim the edges of the molds | |