



**CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY**

Name(s) Sarah J. Adams	Project Number S1501
Project Title The Measurement and Isolation Analysis of Alpha, Beta, and Gamma Emissions from Uranium Decay and Its Daughter Nuclides	
Abstract Objectives/Goals The purpose of my project is to effectively isolate and independently measure the different radioactive emissions from the uranium oxide glaze on the bowl so that proper shielding can be analyzed. Methods/Materials After obtaining access to a radioactive source for Uranium decay found in the glaze of a pre-1940 Fiesta Ware bowl, I then acquired an alpha meter, gamma meter, and an activity count meter to measure the different types of radiation being emitted from the bowl. After recording a static number of particles being emitted in the forms of alpha, beta and gamma radiation, I then began to test various shielding materials to investigate which material reduced the number of particles that the meters received. As I measured emissions outside of the normal Uranium decay patterns, I then studied the Chart of the Nuclides and was able to determine that there were other daughter nuclides of Uranium present also emitting radiation. Results Due to the large size and low energy of an alpha particle, a simple sheet of cellophane will completely block all forms of alpha radiation. Beta radiation is much smaller, found in the form of an energized electron expelled from an atom that is atomically unstable. Through my testing I found that the most optimum shielding material against beta radiation was water and dense objects, primarily any material that is an efficient electron absorber. And gamma radiation was reduced the most by cement and other materials with similar densities. And my measuring the emissions, I was also able to determine that the bowl was also emitting high energy beta particles that was penetrating shielding that would normally stop low energy beta. This proved that there were other daughter nuclides of Uranium present in the glaze because Uranium is primarily an alpha emitter, whereas its daughter products emit higher levels of beta. Conclusions/Discussion In understanding the unique principles of radiation, one gains a certain insight into the benefits of harnessing nuclear energy, as well as the harmful side effects of the misuse of nuclear waste and weaponry. In today's society, the views on anything nuclear is so polarized that the only way to make an informed decision about the beneficial uses of nuclear physics is to have an in depth understanding about its exceptional properties.	
Summary Statement My project is about the study of the Uranium decay chain and its daughter nuclides.	
Help Received Radiation Safety Officer George Barnet, who is employed by a radioactive waste management company in Oak Ridge, TN helped provide the instrumentation; Bill Huchabee, Radiation Detection Equipment manager from Ludlum Measurements Inc. helped with the instrumentation set-up	