



**CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY**

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Project Title
The Cloud Chamber: A Device to Monitor the Tracks of Subatomic Space Particles

Abstract

Objectives/Goals
 The physics of elementary particles usually requires a location such as Fermi Laboratory located outside Chicago. Fermi has the world's most powerful particle accelerator, the "Tevatron." Experiments done at Fermi have produced the discovery of the smallest particles known to man and they are Quarks, Leptons and Force Carriers. My objective was to communicate with the scientists at Fermi to see if there was a simpler experiment to monitor the tracks of sub-atomic space particles and if there was, to built it! A further goal was to learn about the physical laws on nature.

Methods/Materials
 A cloud chamber can be constructed from parts available to non-scientists. I found out for the cloud chamber to work several criteria must be fulfilled including, being air tight, having extreme temperature change, a light source, viewing port and an optional radioactive source. The radioactive source available to ordinary citizens could a small piece of mantle off a Coleman lantern that would contain Cesium 137. My hypothesis was that adhering to the laws of physics that I could build a simple device that could monitor the tracks of sub-atomic particles some of which may have been hurling through space for eons.

Results
 Three attempts were made to build the chamber, the first two did not work. After modifications my third attempt did work and I was able to successfully complete the project and prove my hypothesis correct. Graphs were produced to demonstrate my results. Graphs include the chamber that worked and those that did not, the number of particles seen in different chamber environments and the kinds and number of particles seen. I saw alpha, beta and gamma particles. In my talks with Dr. Kurt at Fermi Lab he said th| gamma was probably the one from outer space. Results also included my learning about the structure of the atom and how ions once produced pass through a gas at high speed making the chamber work.

Conclusions/Discussion
 I conclude that the cloud chamber is an exciting experiment to do and by doing it I had to learn about t| fundamental building blocks of nature that help us understand where we came from and how we can use sub-atomic particles in the real world such as a linear accelerator to help cure cancer. In future experiments with my chamber I would like to add magnets and try to photograph the tracks. This would permit me to calculate the mass and velocity of an electron.

Summary Statement
 By utilizing the scientific method and communicating with scientists at Fermi National Accelerator Laboratory, I was able to prove my hypothesis correct, that I could devise a method to monitor sub-atomic space particles.

Help Received
 I received information from Dr. Kurt at Fermi Lab, the Nuclear Medicine Department at Eisenhower Hospital, and Dr. Mantik at Loma Linda and my Dad helped me type the report.