



**CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY**

Name(s) Rennie M. Lembo	Project Number J1810
Project Title Can Thermoacoustic Refrigeration Be a Functional Alternative to Conventional Refrigeration?	
Abstract	
Objectives/Goals My objective was to see if thermoacoustic refrigeration can be a functional alternative to conventional refrigeration.	
Methods/Materials The project was tested by building a primarily display function thermoacoustic refrigerator. This was done by taking a base design from several different sources and modifying it heavily. The first compartment of the refrigerator, and possibly the most important, was the stack. This was created by gluing fishing line to film in 5 mm intervals. The next part was the base of the refrigerator which was created by taking clear acrylic pipe, a high power commercial grade amplifier, a plastic box, and a standard speaker. Other smaller components were used. The stack was then placed in the tube 5 cm from the top, and was sealed off to prevent sound from escaping. The speaker was connected to the amplifier and sealed at the bottom of the pipe. Two micro thermoprobes were inserted directly above and below the stack, and then sealed in with clay.	
Results The refrigerator was tested by playing three different tones in 20 minute intervals and recording the temperatures of above the stack, below the stack, and the ambient room temperature before and after the 20 minute mark. In the case of the first frequency, 250 Hz, a somewhat stable temperature change was recorded. Currently, I am unsure if there would have been temperature crossover of the room temperature and below the stack. Nearly the same results were recorded for the frequency of 213 Hz. The frequency of 340 Hz hardly changed at all.	
Conclusions/Discussion In the end, it is somewhat hard to know. Due to the unfortunately rushed nature of the project, it was assembled with care, but not the care I would have liked to use. Also, this is a very small scale project asking a very big scale question. Can thermoacoustic refrigeration replace conventional refrigeration? It is hard to know at this point. Considering I did get a temperature change, I would believe that it will happen one day in the future. All I have proved is that this can be done, and it is a viable technology.	
Summary Statement My project is about the idea of using sound waves to expand and contract gases, effectively cooling and heating them.	
Help Received Father helped construction of refrigerator; Used micro thermoprobes and amplifier from Cyberdata Corp; Mother helped cut letters for board.	