Thermoelectric-Evaporative Cloud Chamber

Cuffe, Finlay

A cloud chamber is a scientific instrument used to observe ionising radiation. They are a key tool for both teaching the idea of radiation and analysing a radioactive source. However, these chambers are expensive and require cryogenic substance to reach the cold temperatures needed for operation. My project was to produce a low-cost cloud chamber that could run exclusively off water and electricity, which are readily available in schools unlike cryogenic substances like dry ice. I achieved this by using Peltier elements, which are thermoelectric cooling devices that use electricity to produce cold temperatures. For Peltiers to operate, their hot side must be cooled with either air or water, with water being the superior medium for heat dissipation. The unique way in which I dissipate heat from the coolant water is by evaporation; while some water cooling systems use radiators to dissipate heat, I am using an evaporation column to evaporate the coolant water, which has the potential to dissipate an incredible amount of energy. I built the column from scratch, using PVC pipe as the main body, a high-pressure pump to atomise the water and a blower fan to provide fresh air to the column. The chamber itself was also custom built to minimise heat leakage. The conclusion of my project was that this design was definitely viable as a lower-cost and safer alternative to using cryogenic substances for the chamber, hence can greatly improve the accessibility of these invaluable pieces of equipment.

Awards Won:

Third Award of $1,000