



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Travis S. Adams	Project Number J0801
Project Title Watts Up with Fuel Cells? The Effect of Extreme Temperatures on the Power Output of Direct Methanol Fuel Cells	
Abstract Objectives/Goals The objective of my project is to investigate the performance of a direct methanol fuel cell at three different temperatures. These three different temperatures have been chosen to stimulate the environment that applications such as an automobile and cell phones may be expected to operate in. These temperature extremes range from an icy snowstorm, to the heat of the desert. These fuel cells must be able to operate efficiently across this temperature range. Methods/Materials To calculate the power output of the fuel cell, I set up a circuit using a resistive load and a pair of multi-meters to simultaneously measure the voltage and the amps of the circuit. For safety the methanol was diluted down to three percent to power the fuel cell. The whole setup was run at the three different temperatures using an oven and a freezer for the extreme temperatures. Results The fuel cell showed dramatic changes over the temperature ranges. After thirty minutes, the power output at the cold temperature was 1.20 milliwatts, at the ambient temperature it was 2.61 milliwatts, and at the warm temperature it was 3.69 milliwatts. The power output was calculated by multiplying the volts by the milliamps. When the fuel cell was exposed to the ambient temperature (79° F), it stabilized almost immediately. At the hotter temperature, the power output rose surprisingly high. Although, at the colder temperature the power output dropped extremely low. After forty- five minutes of testing, the power output was still dropping. Conclusions/Discussion Although the results of the power output of the cold fuel cell dropping that low was very unexpected, it proved my hypothesis correct. The fuel cell did operate better at the hotter temperature. The experiment showed dramatic increases in power output across the temperature range. This experiment showed that this fuel cell would not effectively operate at extremely cold temperatures. Temperature has a surprisingly significant effect on the way a direct methanol fuel cell operates.	
Summary Statement The purpose of my project is to determine and compare the power output of a direct methanol fuel cell at three different temperatures.	
Help Received Dr. Novis Smith, Lithchem Energy Lab; Parents helped with the display	