# Developing a Wearable Triboelectric Nanogenerator to Sustainably Power Biosensors

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My project aims to create a wearable triboelectric nanogenerator (TENG) to sustainably power a temperature sensor to prevent heat emergencies. I hypothesized that the triboelectricity produced by the friction between one's skin and a negatively charged material inside a shirt can sufficiently power a temperature sensor. Summer temperatures in Texas regularly rise over 100° F, often coinciding with summer activities and camps. Heat exhaustion is a common occurrence I have personally experienced with my peers. Left unchecked, this can lead to serious consequences, including heatstroke. During 2004-2018, there were 702 heat-related deaths reported annually, with Texas being one of three states accounting for approximately ⅓ of these deaths (CDC, 2020). I designed my prototype generator with silicone and copper, as my tests indicated them to be the most efficient material combination to maximize power generation. I used an “HH” shape to maximize surface area and flexibility. My temperature sensor circuit used a switch that lit an LED when the body temperature exceeded 93.2°F. My results revealed silicone to produce on average 14.1% more voltage than Teflon, and 233% more than cellophane. Copper produced over 50% more voltage than aluminum. The prototype generator produced an average of 3.6 V while running, enough to power the temperature sensor. My project is novel due to its usage of skin as the positively charged material in a hybrid contact-separation/sliding mode TENG. Future applications of my prototype include extending it to bioimpedance, fall, and heart rate sensors. Triboelectricity is an underutilized energy source for wearable technology and energy scavenging applications, reducing conventional power source issues such as weight, cost, and environmental waste.

**Awards Won:**

Fourth Award of $500