

The Not So Humble Boiled Potato!

Samantha Parker, Museum Educator
National Electronics Museum

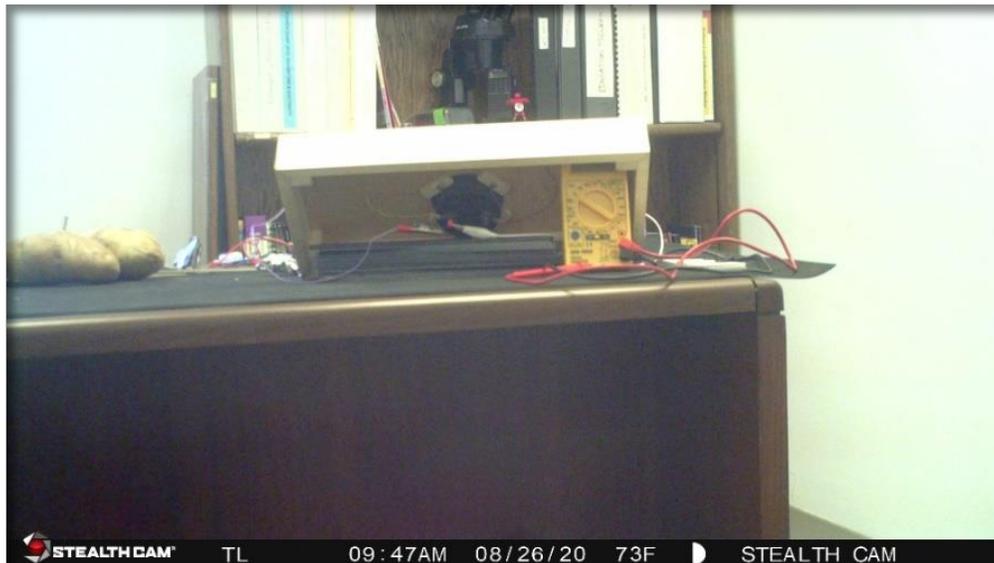
We recently came across an article¹ which claimed that boiled potatoes can make a battery that is ten times more powerful than raw potatoes. We wanted to try it for ourselves!

The first step was to boil the potatoes. We used two medium/large russet potatoes and boiled them until they were somewhat soft, about nine minutes. We then sliced each potato in half.

Next, we found four zinc nails and four pennies. We used pennies that were older, because pennies made prior to 2000 contain more copper. We set the potatoes cut side down on some foil and inserted one zinc nail and one penny into each of the potatoes, piercing the skin. Next, we attached alligator clips to each of the metals, making sure the penny and the nail were only about half an inch apart. Then we attached the outermost clips to an LED.

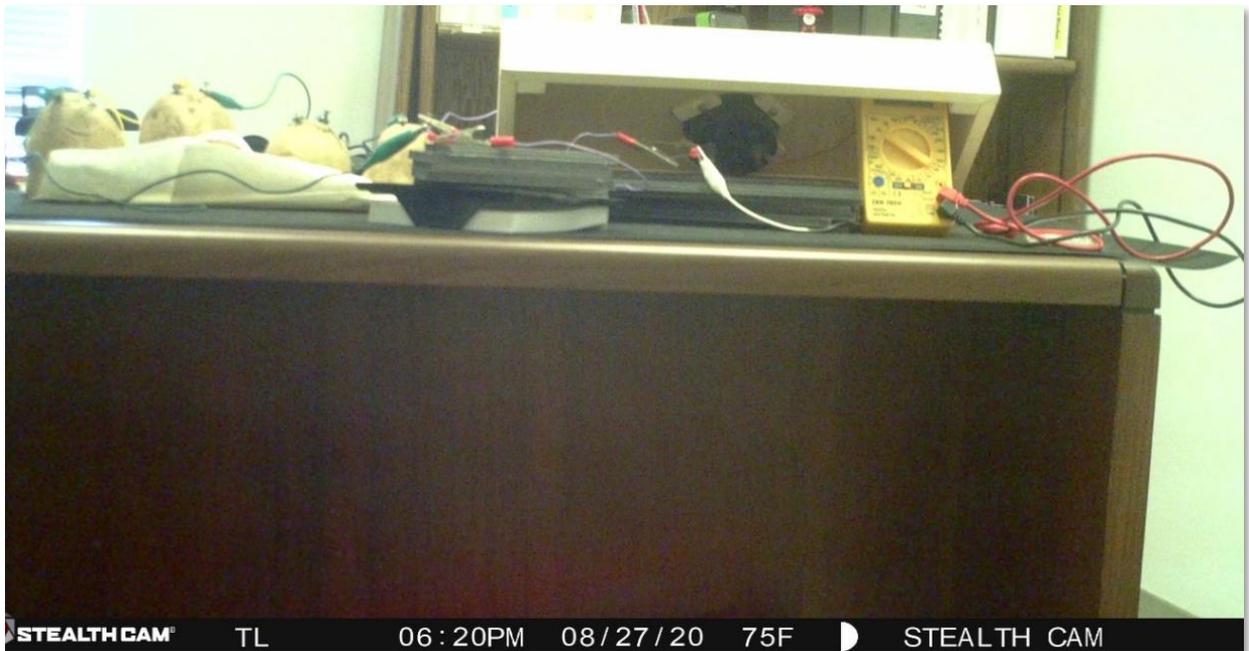
For the control group, we repeated the battery set-up using raw potatoes.

We set up a camera to take pictures of the potato battery, so we could document how long the battery kept the LED lit. We also used the camera and the multimeter to collect data and track how long the LEDs remained lit. Below are a few pictures of the setup.



This photo shows the lit LED attached to the cooked potatoes.

¹Tuan C. Nguyen, "A Potato Battery Can Light Up a Room For Over A Month," Smithsonian Magazine, December 2, 2013, <https://www.smithsonianmag.com/innovation/a-potato-battery-can-light-up-a-room-for-over-a-month-180948260/>



This photo shows the LED from both the raw and cooked potatoes.

The Data

Let's look at how the voltage from the two potato batteries changed over time.

Cooked Potato Voltage

Date	Volts
Tuesday, 8/25	1.89
Wednesday, 8/26	1.86
Thursday, 8/27	1.82
Friday, 8/28	1.66
Friday evening, 8/28	1.24

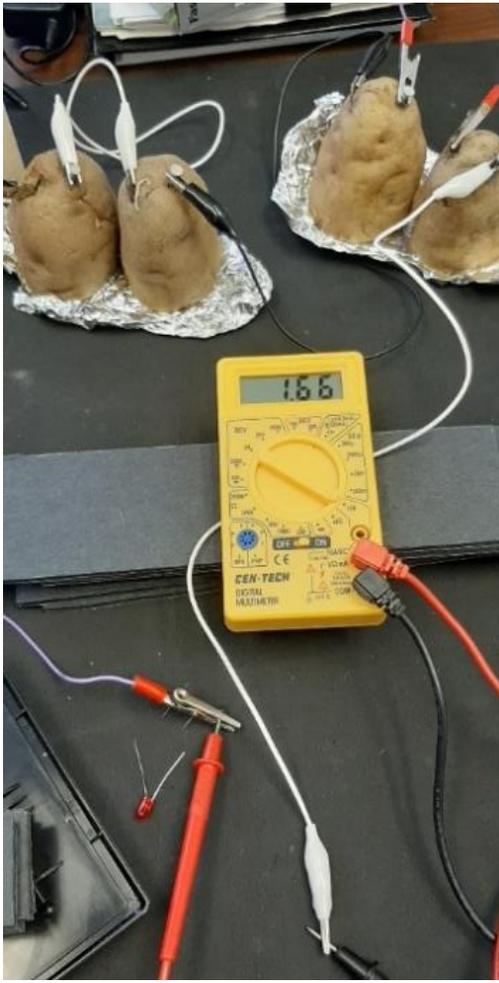
The photos below are time and date stamped and show the beginning and the end of the experiment with the cooked potatoes.



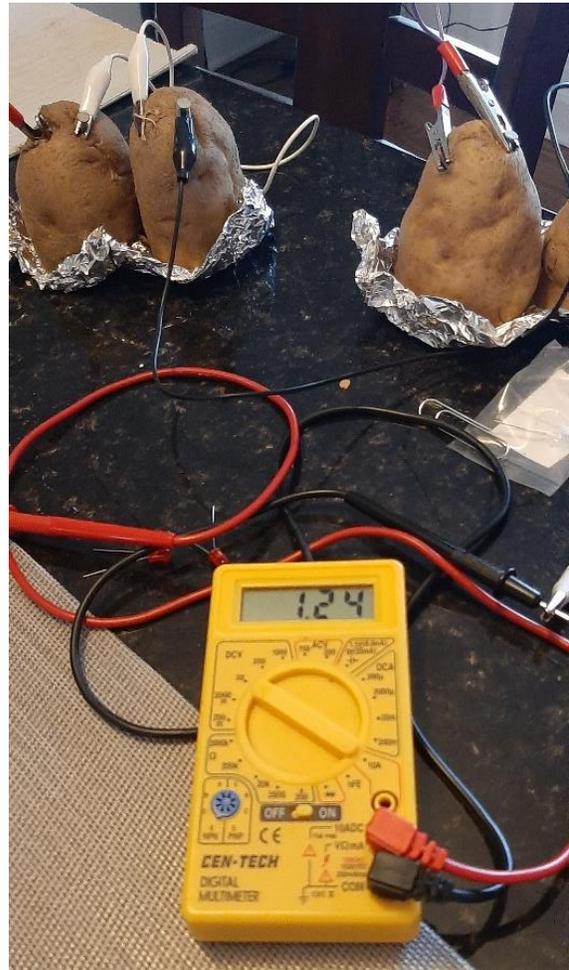
The beginning of the experiment on 8/25, with the cooked potatoes.



The end of the experiment on 8/28. You can see the purple wire sticking up is connected to the still lit LED.



Cooked potatoes still lighting the LED on Friday, 8/28.



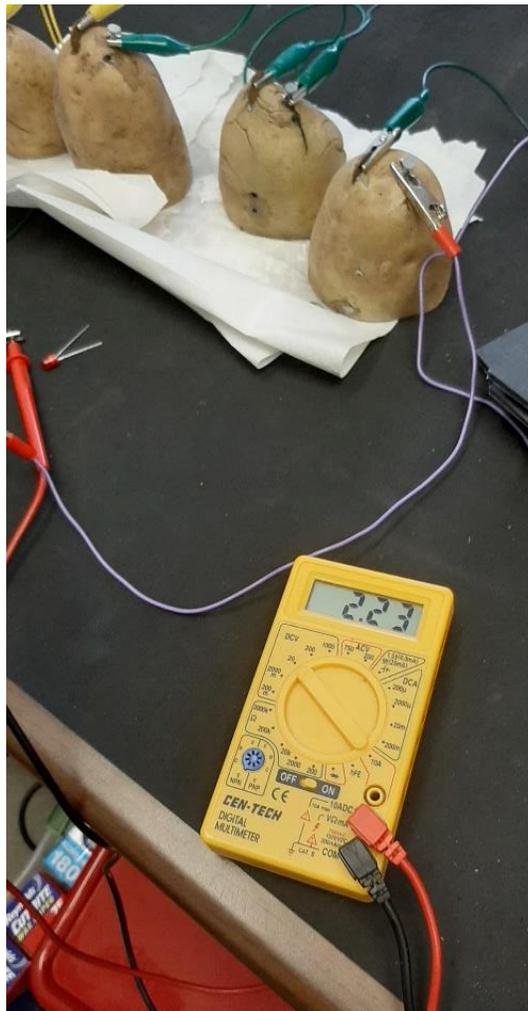
By Friday evening around 5:30pm, there was not enough voltage to light the LED

What were the results from the raw potatoes?

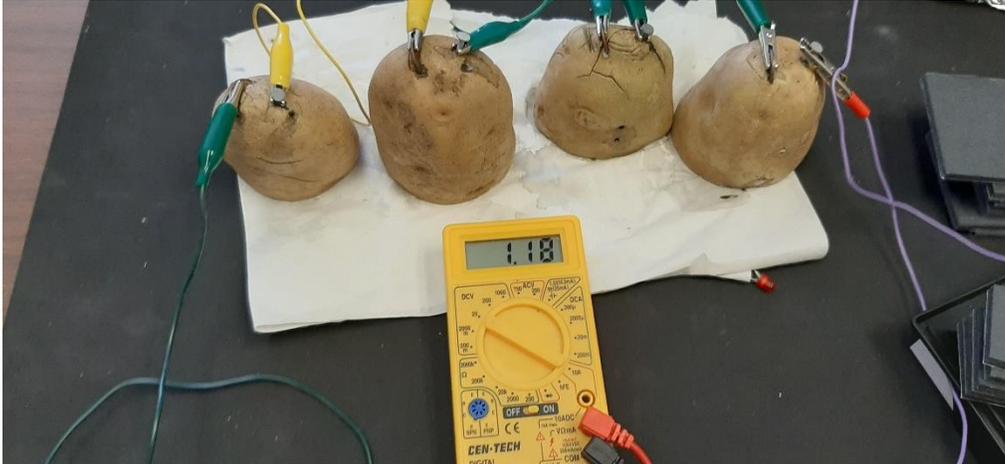
Raw Potato Voltage

Date	Volts
Thursday 8/27	2.23 Volts
Friday, 8/28	1.18 volts

By Friday 8/28, with only **1.18** volts the LED was no longer lit.



The raw potatoes began with an impressive 2.23 volts.
However, this did not last long...



The multimeter shows the voltage from the raw potatoes dropped significantly only after one day. 1.18 volts was not enough to light the LED.

Why do boiled potatoes work better?

From the experiment, it is clear that the boiled potatoes were much more effective than the raw potatoes. But what can account for this? It seems that it has to do with how the outer membrane or skin of the potato changed when it was cooked. When the potatoes were boiled, the skin became thinner, which allowed electrons to flow more easily. And not only the skin, but boiling the potatoes broke down the organic matter inside the potato, reducing resistance and allowing electrons to flow more freely. From this experiment it would seem, in part, that is why the LED attached to the cooked potato stayed lit significantly longer.

The control group- the raw potatoes-began with a high voltage, and then quickly declined, whereas the boiled potatoes helped light the LED from Tuesday all the way until Friday evening. Our experiment proved that the article was correct!

Conduct Your Own Experiment!

Feeling inspired from the experiment we conducted? We challenge you to try your own! And you don't have to use potatoes. Try connecting different fruits and vegetables to an LED and see how long it stays lit. Experiment and try using tomatoes, carrots, limes, grapefruit, or even pickles. The list goes on. Make sure to tag us on Facebook so we can see your experiments in action!