

Log Book

Science fair 2025

Lauren Robinson

October 1st 2025

Today I thought I broke my toe so I went to the hospital to get it x-rayed. It took 6 hours and it wasn't even broken then my thought process went to making a portable x-ray without radiation.

October 5th 2025

Today I started to brainstorm ideas for the science fair. I know I want to do something involving a type of medical engineering, so I looked up different ideas to start. After looking up ideas I remembered about how long hospital wait times are and how I could help/fix it. I decided to mainly focus on X-rays and how they work to make a portable one at home without using any dangerous radiation since I'm not allowed to use it. So I could make a portable one that can be used in more of a field like situation that works without radiation and can still suspect a break in a bone/hand/foot.

October 6th 2025

Today I looked at different options to create a fake hand/foot for the project.

October 8th 2025

Completely scraping the fake hand I found a way to make it my own hand by using (NIR) **near infrared** to be used in real life and can be used for shallow things only like my hand which will show veins and bone structures and possibly break.

October 9th 2025

Today I worked on whether or not buying or making my camera was better and ended up going to buy since it was easier and less expensive in the end with more chances of working. Also look at how to improve my project for example showing my idea clearly and running lots of tests. At the end of the day I looked at a project from last year who won best overall.

October 14th, 2025

Today I chose what cameras would work best for my project and the average price. I'm still looking for a red light that works well and is not expensive. Overall I think that the

project will cost around 100-200. And i wont have to fully recreate the camera but will have to cad a light box.

<https://www.amazon.ca/ELP-Fisheye-Infrared-Housing-Windows/dp/B0BVFMN1Y1>
<https://www.amazon.ca/Infrared-Charging-Multifunctional-Portable-Handheld/dp/B0BRL5PMX8>
https://www.amazon.ca/Shyineyou-Light-180LEDs-Infrared-660nm%EF%BC%86850nm/dp/B0DJ2VVQF3/ref=sr_1_15?crid=1K0VT8BIUA9WQ&dib=eyJ2ljojMSJ9.phBUrS0SQQVa2jDLGgXwAeBX3f8bGRItRlyokzzFD3fQ9pQmj49Fo-JFU8H09baZdb0kxptkc7roNxb4zOggXPCo7Qf9urKOUHy1fIF2go4SH8tVXnYUMqzXWSf9tMq-2tZFc1NxiEWZSoM3YSEZgsDy06CQ3B81tANx2q6P0MJLoKgh02GHkKfsCTaaO6aUNTcSY5lvdkkyQ-FP5fyMzSLwf2WNzJ3MfuwavZQAiDI94BIFhDviiX3alhLdTKN0B6dOyOAYBYrDDeHP-0ctS0CNdLqYBbtEBjX9Wn9U.8rmRx60oLil-ET-ZrGF5xaxt-WCnxv5D1PfcUHN_7GU&dib_t ag=se&keywords=NIR%2Blight&qid=1760471131&srefix=nir%2Blight%2Caps%2C138&sr=8-15&th=1

October 20th, 2025

I looked over a few projects from last year that did very well and concluded that I need some expert advice, meaning I need to email some people that have lots of knowledge about the topic I'm doing (bio medical engineers). So I need to figure out who to email most likely someone from a university and have to make my project a bit more interesting for them and write a very good proper email.

I also found something very new that is changing the project its called EIT its a process which you place electrodes around the part that needs "X-Raying" and you scan its more useful the NIR and IR cameras because it can detect more things plus is low cost. It can detect collapsed lungs(pneumothorax). Also is in an experiment to detect brain strokes and breast cancer and possible internal bleeding. So my goal is to make a non expensive working model.

October 24th, 2025

Today I started off diving deeper into how EIT works and wrote about it on the main prodget page.

November 6th, 2025

Today I looked into getting professional help on how to create my project. I looked at the biomedical facility staff in Calgary and found a person who does research and job matches close to my project. And started my letter to send within a week.

Dear Maryam Badv,

My name is Lauren Robinson, and I am a Grade 8 student at Branton Jr High working on a science project to design a low-cost, portable Electrical Impedance Tomography (EIT) machine.

I've researched how an EIT machine works by using tiny electrical currents sent through the body and measuring the resulting voltages to build an image of the internal conductivity.

I'm looking into designing a EIT machine mainly for imaging a fake/phantom lung like object. I understand that around 16 electrodes will have to be placed on a flexible belt. Also that due to wanting it to image a lung that it will have a different image reconstruction algorithm. I'm wondering what the best way to create the belt plus what's the best way to reconstruct the information the electrodes receive into images.

Thank you very much for your time and consideration.

Sincerely,
Lauren Robinson

November 10th, 2025

Today I sent the letter to Maraym Badv who hopefully will respond within the next month.

November 11th

Today I started to research how EIT machines are helpful for imaging lungs. In the next few days I need to look at this article about EIT machines and imaging lungs since when over viewing it quickly it looks very informative.

November 12th, 2025

Still waiting on an email response. I read over the article which was very informative and wrote about its conclusions on experiments plus any other information in the article.

November 15th, 2025

Still waiting so I sent another email to Steve Boyd, my second choice to email, hoping he will respond soon.

November 18th, 2025

Today I got a response from one of the people I sent a letter to who now is redirecting me to his son who has more knowledge on this area.

Hi Lauren,

It seems you have an interesting project! I am not an expert on EIT, but my son is a graduate student in electrical engineering and likely can help you out. He went to Branton too not long ago. I'll ask him if he can help.

Best regards,

S Boyd

Here is Duncan's response below. It seems he has some nice suggestions. Although it'll be challenging, that's how it goes in science. If you find your original plan was a bit too challenging then simply adapt and keep moving forward. Good luck!

Hi,

That sounds like a very complicated middle school science fair project! Brendon is doing this basically at microwave frequencies instead of the very low frequencies that this would use. He'd be able to answer this better than me, but based on his work, I could offer some suggestions:

There are many paths through the tissue under measurement, which makes reconstruction very hard, you won't know what path the signal takes. Our lab probably has some good resources for this but I haven't been involved in that yet.

If timing (time it takes for a signal to pass through) is important, the electrodes have to be at a known place. This is probably also true for determining signal paths through tissue. For these reasons, a belt could be challenging, since it would be flexible. Brendon uses a 3D printed ring for this reason.

For this level of stuff, it would be best to use sensor development boards + a simple microcontroller dev board (eg. Arduino). [This link](#) looks like it could be promising. Having to design stuff like electrodes/sensing hardware from scratch would be very tricky.

Overall, this sounds like quite a hard project, it could also be a good idea to look at similar but simpler ideas like EEG diagnostics, which are also more accessible because of dev kits/precedent.

Thanks,

- Duncan

November 19th, 2025

Today I looked at the kit Duncan suggested and ran into an issue. It's not cheap, it's 2,400 \$ way off my budget which is under 400\$. I was thinking of emailing the company to find a cheaper price like the one 7 years ago listed for 250\$ but it is not in stock so I could make one but it probably will not work.

So I decided to send the company an email asking if they had any 299\$ ones they could sell for the science project. Here is my letter down below. And now I shall wait for a response.

contact@mindseyebiomedical.com

Dear mind eye biomedical,

My name is Lauren Robinson and I'm an 8th grade student competing in the Calgary Youth Science Fair doing a project about EIT machines. I was looking into your company's Spectra: electrical impedance tomography machine and saw you have one listed right now for 2400\$, but I also saw you had one listed some time ago on crown supply for only 299\$ but now has been taken off so you can't buy it. I was wondering if you had any left in stock or else were for me to buy that were only 299\$.

Thank you for you time and consideration

Sincerely Lauren

November 20th, 2025

to day i got my response back for the company

Thank you for your interest. I used to sell EIT devices more cheaply so that I made a loss on the efforts and time spent on building them. After some deliberation, and in order to keep the effort going I came to the conclusion that I should be paid for my efforts... otherwise the entire effort needs to be shut down. I think it's a really cool effort to try to make lower cost biomedical imaging techniques, and I am so glad you think so too. Any assistance, encouragement, funding or support is always appreciated. Do let me know if you know of grants or funding sources which might be interested in helping to subsidize the cost of EIT devices for school students like yourself as I would be happy to chat with them.

Sorry I can't help you further and I hope you understand.

Best,

Jean

November 23rd, 2025

Today I signed into my CYSF account and filled out the forms safely. I also started a parts list since i cannot buy the kit for cheap and find a second hand one. I looked over articles and found a promising one that had a parts list that was simple and had code to go with it, which is a large perk since I'm not the best at coding. Down below is the link or the Study/article.

[eit-kit:%20An%20Electrical%20Impedance%20Tomography%20Toolkit%20for%20Health%20and%20Motion%20Sensing](https://hcie.csail.mit.edu/research/eit-kit/eit-kit.html)
<https://hcie.csail.mit.edu/research/eit-kit/eit-kit.html>

November 28th, 2025

Today i created a parts list to do a 4 electrode machine that will hopeful work.

https://www.amazon.ca/gp/cart/view.html?ref =nav_cart

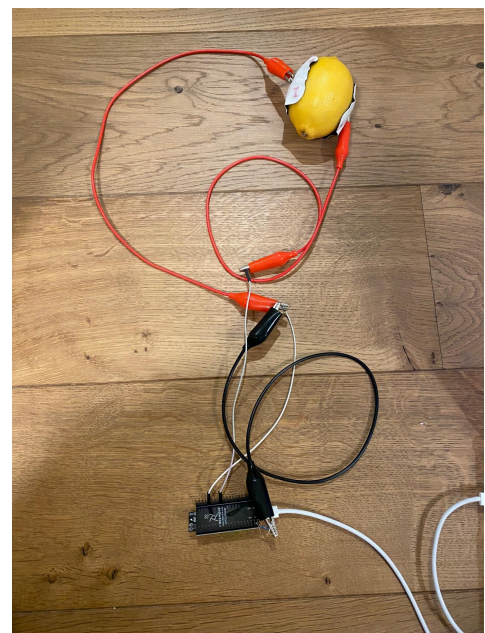
December 6th, 2025

Over the week the parts I ordered can and I started to build the machine. It was quite complex since I first had to erase the ESP32 board then add the micropython to it. In the end I connected it to Thorny, a programming terminal that works with my ESP32 FREENOVA board and started very small by just turning the small led light on on the board and getting it to blink. Similar to when I did programming it took all night but I finally got it working after a very long time. I also had lots of issues trying to connect the board to my computer since I would get the name wrong or the wrong port and i could not find the right adapter cord but I did and it all worked in the end. I should order some lists to test energy when using the board.

December 21st, 2025

Today I started to test the start or the EIT machine on fruit! Today I started mostly on lemons since I found the right resistor for it(100k). When using the resistor with two electrodes connected to the computer on hard wood floor these were the readings from the code for the lemon 3.7 inches around.

What this implies about the fruit the higher the number the drier it is the lower the number is more wet or juicy. 65k Ω was the average for the lemon while if it was dry it would be more like 30k Ω because the easier the electricity moves though the higher the number so the water makes it easier for the electricity to move through.



Tomorrow I need to scale up and try different fruits.

This is a ruff timeline for the amount i should be finished each month

December

Building and testing of machine

January

Testing and building of the whole machine

February

Writing down all info on CYSF website

March

Trifold board

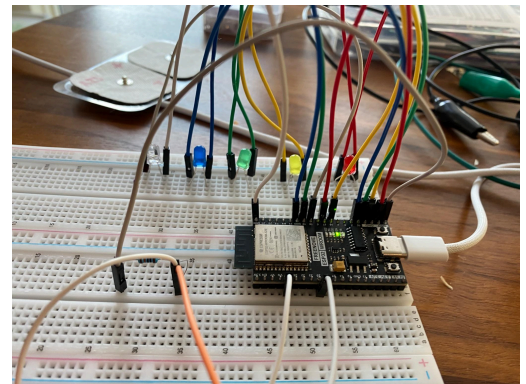
April

Competition

December 22-23, 2025

Today I tested the small simple version on the EIT machine on different fruits. Here are notes that I found.

- Mushy pear when burst goes from 540000 to 320000
- When attaching the electrodes to a plastic cup full of water there was no results
- The fruit numbers all went up over night did the electrodes or fruit lose water
- When smushing or bruising a fruit the number goes down a could thousand



December 24th, 2025

Here are the numbers from today with the fruits. This is all im testing for today
Melon

January, 14th , 2026

Today and yesterday I CADED in OneShape a box for the board and wire to make it look more presentable plus I could easily print it too if I enclosed the board and had spots for lights. Also ordered new lights since the other box vanished should come tomorrow, also will add pictures tomorrow for the log book when all printed.

January 24,2026

Worked on research on the online page for science fair information MISSING LOTS OF INFO BEFORE THIS

January 25,2026

Tested a new round of fruit all found in google sheets, i will do 2 more round of testing to ad to the information , and this week i will work on the online part finishing research, variables, application and round 2 of testing

February 1st 2026

I did another round of testing twice in google sheets the info is recoded.

Feb 2-28th, 2026

This is the timeline when I worked on the online CYSF website typing all of my information.