

Science Fair Logbook 2025-26

2025

December 15:

I completed my proposal form, as seen below:

FAIRVIEW SCHOOL
SCIENCE FAIR 2025/2026 PROPOSAL FORM

PROJECT TITLE: Time on the Wire: Neural Transmission, Aging, and the potential role of Technology

STUDENT NAME(S): Shreyas Haribaran CLASS(ES): 9-3

SCIENCE TEACHER'S NAME: Ms. Burnett

This completed form **must be presented** to your science teacher for discussion and approval prior to **Dec. 18th, 2025**.

Once your project has been approved, you will need to start your research and/or experimentation. The winter break will likely be an important opportunity for you to invest some time into your project.

Final project completion & upload deadline is Jan. 31st, 2025.

Overall description of your project idea: I want to figure out how the brain and thoughts work, what causes cognitive decline (dementia), and figure out how such diseases can be controlled through ethical, modern methods.

Decide if your project is **research** or **experimental/innovation** based and complete the appropriate section below (experimental on back).

Research/Non-Experiment Based Projects:

Problem (specific question of investigation): How are neural transmissions in the brain affected with age? Can these effects be mitigated with technology and electricity?

Hypothesis/Predicted Outcome: If controlled ~~neural~~ electrical stimulation is introduced to the brain, then ^{new} neural pathways can form, because it can simulate forced thought, causing bonds to form.

Materials required: Scientific journals, articles, 3d design/circuit design software (potentially)

Research Proposed (brief description of your plan): I want to research ~~the~~ the brain, and see what scientists ^{today} say about the preservation of neural links. Using this, I'll make an analogous representation digitally, and add my own take on ways to strengthen and create neural links using electrical stimulation.

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December 18 :

Received the following feedback from Mr. DeGelder, our school's science fair coordinator.

Shreyas

This can become a **strong research/communication project**, but as written it has a few **glaring scope and clarity issues** that will make it hard to assess—and easy for students to drift into vague or untestable claims. The key is to turn it into a **focused research question + a clear product** (and if they build something, make it a *model*, not a “solution”).

Glaring mistakes / future problems

1) Way too broad

“how the brain works,” “what causes dementia,” and “how diseases can be controlled” is multiple university courses worth of content. Without narrowing, they'll end up with a shallow summary and no defensible conclusion.

2) “Control diseases” is an untestable treatment claim

Even if it's “ethical, modern methods,” proposing ways to control dementia can slip into medical advice territory and won't be something they can validate experimentally.

3) Research methods need guardrails

If they “look through scientific journals” without a method, they may:

- cherry-pick papers that fit what they already believe,
- rely on abstracts or low-quality sources,
- misunderstand correlation vs causation,
- overstate findings (common issue with dementia topics).

4) The circuit “brain model” risks being a gimmick

A circuit can be a great **analogy**, but they need to define what it *represents* (neurons? synapses? networks? plasticity?) and what they're demonstrating (signal transmission? thresholds? loss of connections?).

A better, science-fair-appropriate direction

Option A (Best for a research project): A structured literature review with a tight question

Have them choose **one** focused question like:

- **Risk factors:** “Which lifestyle factors have the strongest evidence for reducing dementia risk?”
- **Mechanisms:** “How do amyloid/tau pathology and neuroinflammation relate to cognitive decline?”
- **Interventions:** “What is the evidence for exercise, sleep, and hearing treatment on cognitive decline prevention?”
- **Ethics:** “What ethical issues arise in modern dementia research (AI diagnosis, biomarkers, clinical trials)?”

Product: an evidence-based poster/report with a transparent method.

Option B (Research + build): Circuit model demonstrating a single brain concept

Pick one concept and model it:

- **Neural signaling + threshold:** LEDs represent neurons that “fire” only above a voltage threshold.
- **Synapses + inhibition/excitation:** resistors/potentiometers represent synaptic strength; show how inhibition reduces firing.
- **Neural networks + decline:** simulate “connection loss” by removing branches and show reduced output reliability.

Product: a demo circuit + explanation linking the model to dementia concepts (e.g., synaptic loss, network inefficiency), clearly labeled as an analogy.

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Suggested “better method”

If they do a literature review:

1. Pick **one** research question.
2. Use a clear source strategy:
 - o prioritize **systematic reviews/meta-analyses** and major health organizations
 - o include a limited number of primary studies if needed
3. Track sources in a table:
 - o study type, sample size, key finding, limitations
4. Write conclusions with strength-of-evidence language:
 - o “strong evidence,” “moderate evidence,” “emerging,” “mixed”
5. Include a section: “What this does **not** prove” (causation limits, confounds).

If you build the circuit:

1. Define exactly what each component represents.
2. Identify one measurable outcome:
 - o number of “neurons” firing, response time, signal loss, etc.
3. Run trials:
 - o baseline network vs “reduced connections”
4. Present graphs of output change and explain the analogy.

Key considerations they should make during the project

- **Scope:** One question, one concept, one clear conclusion.
- **Quality of evidence:** avoid news articles; use peer-reviewed reviews when possible.
- **Correlation vs causation:** many dementia factors are associative.
- **Ethics:** keep it educational; do not give medical advice or “cures.”
- **Bias control:** document why studies were included/excluded.
- **Clear claims:** “model,” “simulation,” “analogy,” not “we proved how the brain works.”

Teacher feedback

“This is far too broad—choose one focused question about dementia and answer it with high-quality evidence.”

- “You can’t ‘control’ dementia in a science fair project; instead, evaluate what interventions have the strongest evidence.”
- “If you build a circuit, make it a model of one brain concept (thresholds, networks, synapses) and collect data showing how the model changes under ‘decline’ conditions.”

If you tell me what grade they are and what your science fair expectations are (research-only allowed? build required?), I can rewrite their proposal into a **tight research question**, a **step-by-step plan**, and a **rubric-aligned success criteria** that fits your format.

Based on this feedback, I’ll make some changes to the method to better align with my own project goals, while keeping it realistic and more specific.

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December 20:

Now that school's off for the winter, I'm looking forward to starting my research. I created this logbook today and uploaded the above images. I want to revise the method within the next few days to make it more attainable.

December 22:

Today I've made the following changes to my method. Changes are highlighted:

Question: How are neural transmissions in the brain affected with age? Can these effects be mitigated with technology **and electricity**?

Hypothesis: If controlled electrical stimulation is introduced to the brain, then new neural pathways can form, because it can simulate 'forced thought', causing bonds to form.

Research Proposal (from scratch): I aim to investigate how the brain functions and explore the potential of technology to mitigate or prevent diseases such as dementia, Parkinson's, and others.

I realized that my initial ideas were overambitious, and I wanted to narrow them down to something more specific. Today I also started my slideshow.

I decided to divide my research into 3 phases:

1. the brain- to finish before December 29
2. common diseases and their causes - to finish before January 11
3. potential solutions. - ties in to phase 2, so before January 11

Research Phase 1:

December 23:

Today I started Phase 1 of my research. I'll summarize the research I conducted below; however, I took more detailed notes in a separate document.

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I figured out what the brain is made of and started researching the parts of a neuron, under the category Grey Matter. I did somas and axons today, and I'll continue this tomorrow

December 24: Didn't research today :(

December 25: I researched parts of the brain (cerebrum and a bit of the brainstem today, but more to come). I also finished dendrites under Grey Matter.

December 26: I researched the remainder of the midbrain, as well as the cerebellum.

December 27: I decided that instead of researching neurological diseases as a whole, I wanted to focus solely on dementia (Alzheimer's Disease) and Parkinsons Disease, because they're the most common brain diseases without a cure, and I also have personal connections to them, which I'll talk about more as I build up a personal significance section.

Today, I researched the brain lobes, ventricles, and other important brain structures. I also discovered where the two aforementioned diseases impact. Additionally, I also talked about white matter, but because of what I wrote about grey matter, there was a very limited amount of new information.

December 28: I reviewed the entire document for clarity and added some information about myelin and white matter. Officially done Phase 1!

Research Phase 2:

December 29: Today, I started Phase 2 of my research. In line with the changes to my plan that I made on the 27th, I've renamed this phase: Dementia, Parkinson's, and their causes.

I started my research by describing what dementia is and some of the variants and symptoms.

December 30: Today, I researched and noted some basic info about Parkinson's Disease, like impacts, symptoms, and risk factors.

December 31: I researched dementia causes, which include genetics and protein buildup. Specifically, the buildup of beta-amyloid and tau proteins. Today, I researched amyloid plaques and how they form. This,

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however, made me realize that I didn't know enough about how neural transmission actually works. An oversight, however, I wanted to fix it. So, I went back to my phase 1 doc and started researching synapses and synaptic connections.

2026

January 1: In my phase 2 document, I elaborated more on tau tangles, but I chose to focus on synaptic connections and neural transmission. I found this fascinating because it helped me understand and appreciate how much our brains do in fractions of a second. By this point, I paused my work on phase 1, so phase 2 could go ahead.

January 2: Today, I added info about the causes of dementia and refined existing research.

January 3: Added more info about dementia risk factors. I also wrote about Parkinsons' causes, including what Lewy bodies are. There isn't much information about Parkinson's as there is about dementia, so I'm hoping to build on this.

From here, I wanted to start my slideshow presentation.

January 4: Continued with the above.

January 5: Having completed the majority of phase 2, I decided to start an impromptu phase 3. In this revised phase, I aim to research solutions to the protein buildup that I have identified. Keeping my hypothesis in mind, I want to figure out if electrical stimulation can break down these proteins.

January 7: Didn't have much time today to research, but I discovered the glymphatic system. This is a waste management system within the brain. I'll build on this tomorrow. As of today, I think I should be done by the 20th.

January 8-9: I researched the glymphatic and lymphatic systems in the body, and how they dispose of waste using CSF and ISF, through the bloodstream.

January 11-12: As I reach the tail end of my research, I investigated the concept of electrolytic lesion. At this point, I've decided to call it here. After studying the brain thoroughly for a few weeks, I

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unfortunately haven't been able to confirm my hypothesis. My original hypothesis was, "How are neural transmissions in the brain affected with age? Can these effects be mitigated with technology?" After thorough research, I answered both of these questions; however, I found no concrete evidence that electricity or technology can be used to remove protein buildups from the brain selectively. All solutions that currently exist involve dangerous procedures that would take a long time to implement safely, and cannot be physically tested at a grade 9 level.

January 15-16: I took the time to build my slideshow presentation in preparation for the video, which I'll be recording soon.

January 18: I'm finishing the presentation up, so here's my conclusion:

After studying the brain thoroughly for a few weeks, I unfortunately haven't been able to confirm my hypothesis. My original question was, "How are neural transmissions in the brain affected with age? Can these effects be mitigated with technology?" After thorough research, I answered both of these questions; however, I found no concrete evidence that electricity or technology can be used to remove protein buildups from the brain selectively. All solutions that currently exist involve dangerous procedures that would take a long time to implement safely, and cannot be physically tested at a grade 9 level. However, I learned a lot about the brain, including how neural transmission works, how thought is processed, what causes diseases in the brain, and how changes in your lifestyle can help cure these diseases. I found this project very enlightening, because it covers a topic with personal meaning to me, and isn't something I would've learned if it weren't for this project.

However, I'm not done here!

If time permits, I'd like to extend this project further by designing a chip or something similar to help boost the speed of neurotransmitters. If this works out, this chip could help boost thought speed with electrical boosts, helping neurotransmitters bridge the gap between neurons, without being 'slowed down' by the protein buildups.

January 19-20: I've been updating and finishing up the slideshow.

January 21: Some late research brought me to DBS (Deep Brain Stimulation). This really changed my conclusion, as this is literally

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exactly what I've been looking for. Even though it only applies to Parkinson's disease, this at least confirms half of my hypothesis, so this project is increasingly becoming a success.

Here's my updated conclusion:

My hypothesis was partially correct. Through the research of DBS, I was able to confirm that electrical stimulation can be used to treat Parkinson's. However this treatment is only still treatment, and not a cure. For dementia, however, it's a different tale. I haven't been able to confirm that electrical stimulation can affect protein buildups in the brain. All solutions that currently exist involve dangerous procedures that would take a long time to implement safely, and cannot be physically tested at a grade 9 level. However, I learned a lot about the brain, including how neural transmission works, how thought is processed, what causes diseases in the brain, and how changes in your lifestyle can help reduce the impact of these diseases. I found this project very enlightening, because it covers a topic with personal meaning to me, and isn't something I would've learned if it weren't for this project.

This new piece of information also strengthens my goal to design a similar implant to deal with dementia. If it works for Parkinson's, why not dementia?

From here, due to the lack of time, I'm going to start working on the script. I aim to finish the video by Saturday.

January 22-23: Over these two days, I recorded, edited and added captions to my video. As of updating this (5:30 PM, Jan 23), I've finished the video. In case I think of anything amazing to edit in, I won't be releasing the video until tomorrow morning (Jan 24).

January 24: The video was released, and I submitted my project on Google Classroom. For now, I'll take a short break while my project is marked.

February:

Due to time constraints and other IRL commitments, I've decided to keep this project as it is. So unfortunately, this means I'm not going to be designing an implant this year. However, after some more research and clarification of various points, I have finished putting up my project

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on the CYSF platform. This is due on March 1, so I will get that all ready to go by then.