

Final Laidlaw Reflective Essay

Theme: Lessons Learnt and Future Goals

ABO OBHAKHAN, IMMUNOLOGY STUDENT | TRINITY COLLEGE DUBLIN



Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

I didn't know exactly what to expect embarking on my Laidlaw journey. Looking back, I am incredibly grateful for the new doors of opportunity that were opened to me throughout the course of this programme...

From Summer 1, carrying out a self-led research project investigating the role of inflammation in Alzheimer's disease, to getting the opportunity to front a project broadening STEM education and career pathways for youth in an underserved community in Boston this summer, the Laidlaw Leadership & Research programme has given me the opportunity to learn more about myself and my personal interests, interact with some amazing people and grow tremendously as a leader.

Summer One: Alzheimer's Disease Research Project

📍 **Trinity College Dublin, Trinity Biomedical Sciences Institute (TBSI)**

As mentioned, I spent last Summer (2024) in a lab investigating the impact that inflammation has on brains with Alzheimer Disease. I got the opportunity to work under the supervision of Prof. Colm Cunningham. I find the work conducted by his lab very interesting and powerful in informing our knowledge on Alzheimer's Disease pathology, so to have been given the chance to contribute to this work in only the second year of my degree was an honour that I do not take lightly!



I really enjoyed my project for which I obtained four groups of mice all subjected to **four different treatment conditions**:

- Alzheimer's Disease "APP-PS1" mice treated with saline solution
- Alzheimer's Disease mice treated with bacterial toxins
- Normal "wild-type" mice treated with saline and
- Normal mice treated with bacterial toxins

I used various experimental techniques in order to establish what was going on at a molecular level involving the cells of the brain, particularly the resident immune cells of the brain — microglia.

One of the main techniques I made use of was **Immunohistochemical staining**. This involves the use of fluorescently-labelled antibodies to stain various molecular targets in the cell.

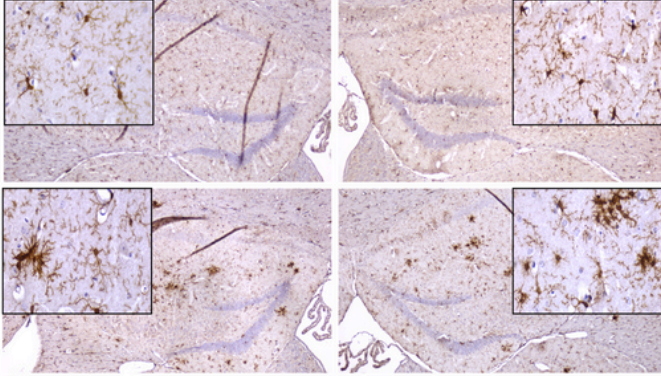
I faced roadblocks in the beginning of my project as initially it was difficult to get a hang of this technique and it was laborious figuring out the optimal concentrations of antibodies, but eventually, I did. and proceeded to stain for an array of molecules in the brain. I stained for important **cytokines and chemokines**, which are chemical modulators of the immune response and also stained for other structures involved in immune signalling. I further made use of **polymerase chain reaction (PCR)** to measure different proteins in brain tissue.

I elucidated evidence of persistent inflammation in the Alzheimer Diseased brain, which is potentially worsened by superimposed (further) inflammation.

RESULTS...

MICROGLIA

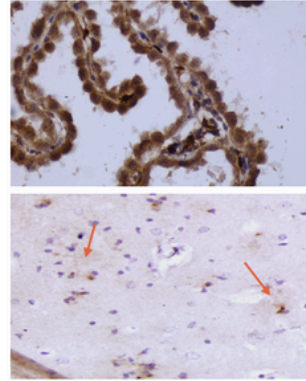
- Immune cells of the brain.
- Highly active surrounding the A β plaques of the brains of AD mice.
- Activation around the brain ventricles.



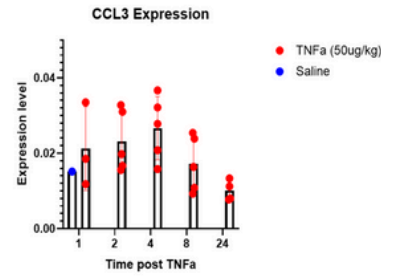
Microglia present in the hippocampi of WT SAL, WT LPS, TG SAL AND TG LPS mice

CYTOKINES

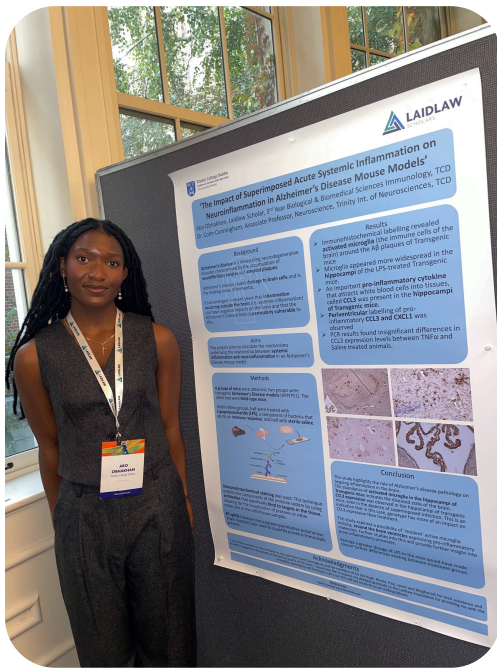
- Molecules that coordinate the immune response/inflammation.
- Pro-inflammatory cytokines IL-1 β , CXCL1 & CCL3.
- Activated microglia around A β plaques contribute to a chronic state of neuroinflammation in AD.



IL-1 β in the choroid plexus
CCL3 in the hippocampi of transgenic mice only



RT qPCR reveals that induction of systemic infection does not have significant effect on CCL3 expression in the brain



I spent a lot of time alone in the lab, carrying out experiments which provided me with the confidence in experimental set up and execution.

This experience reinforced my love of research at the intersection of Neuroscience and Immunology and definitely informed my career interests.

I presented my research at the Laidlaw North American Conference at Columbia University in NYC, which was an unforgettable experience.

Ultimately, the importance of **perseverance, open-mindedness and introspection** in scientific research was also made abundantly clear to me.

Summer Two: Development of a Community Technology Hub

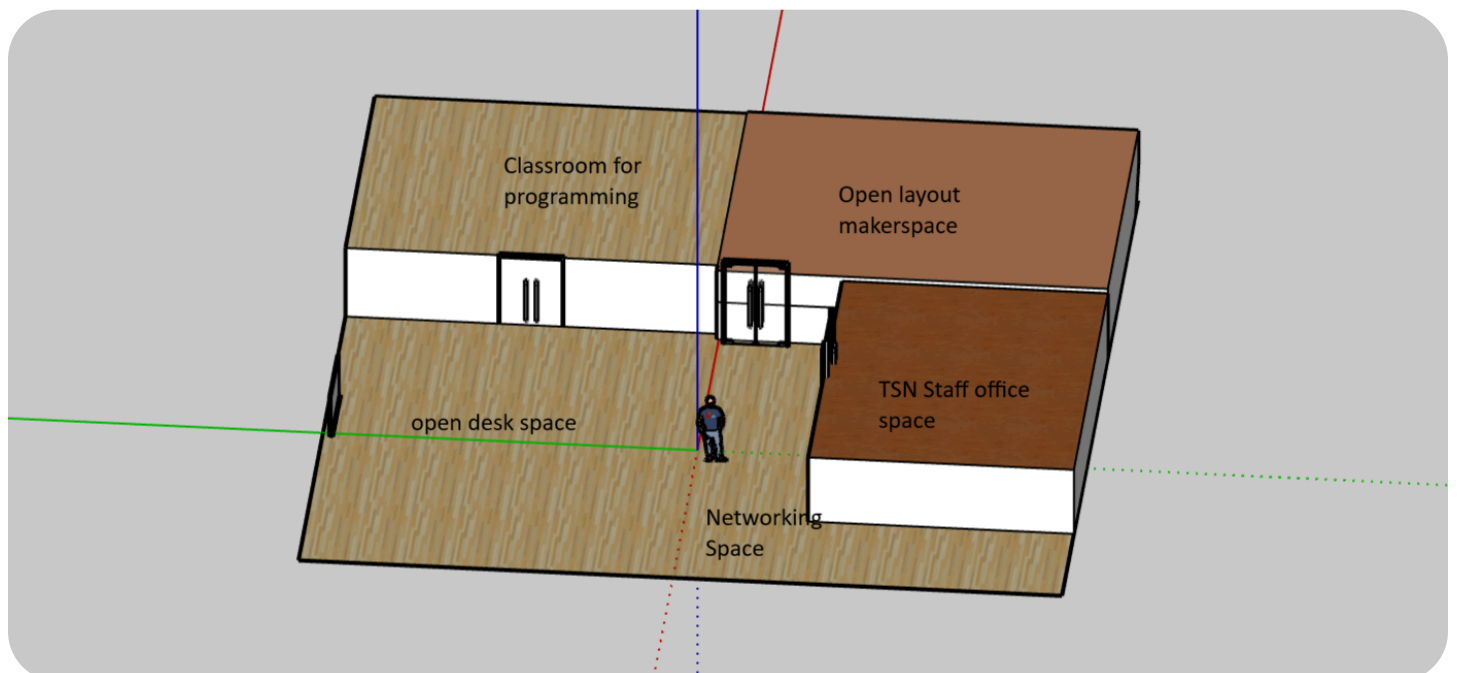
📍 **Roxbury, Boston, Massachusetts, USA**

This summer I decided to dedicate time on a Leadership in Action project that I'm extremely proud of. I reached out to a non-profit tech organisation — Timothy Smith Network (TSN) — that provides programming programs and digital literacy workshops to high school students and other community members.



TSN's work bridges the digital divide that exists between individuals from underserved communities and those from better-served areas, expanding education and career opportunities to underrepresented people, especially youth.

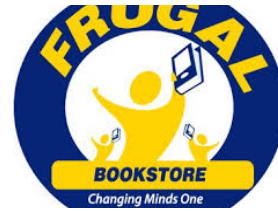
I proposed a project that involved the **creation of TSN's very own community technology hub space in Boston through which TSN staff can liaise and they can conduct their own workshops and classes**, as well as where community members can come for self development in the technology space.



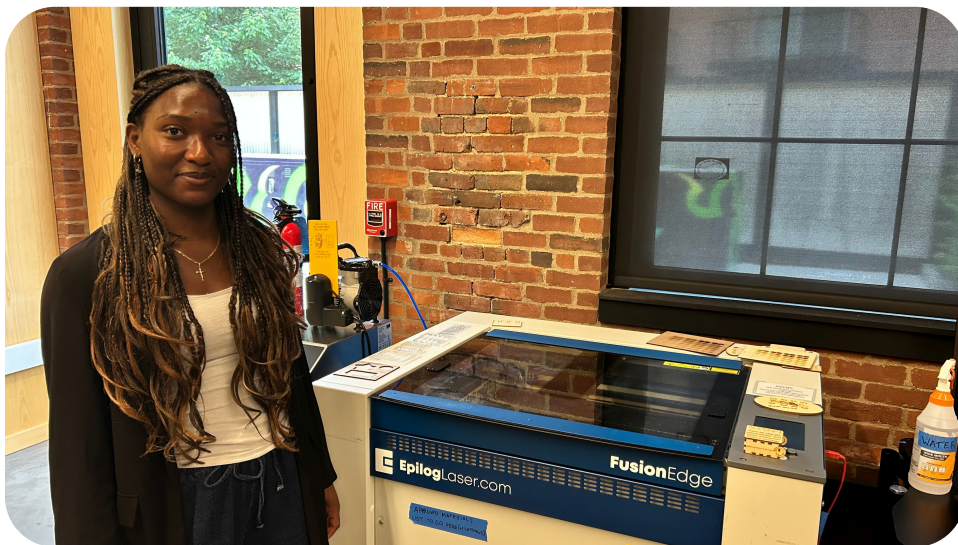
SketchUp interpretation of the physical space, based on my research (Abo Obhakhan)

My project went pretty smoothly and awarded me with the opportunity to have discussions with various groups in the Roxbury Community

I set up focus groups with elders at the Central Boston Elders Service, 11th grade high school students at TechBoston Academy, past TSN alumni and volunteers as well as meetings with potential **collaborators** and owners of companies that could get involved.



I sent out **surveys** (online and in-person), and also had discussions and facility tours with the managers/founders of various makerspaces in Cambridge and Roxbury to get an insight into the running of a space like this. I relied heavily on organisational skills during this project to ensure that no stone was left unturned. These organisational skills were also vital in the setting up of all of these meetings and discussions.



Through my interactions, I **learned so much about American culture**, especially as I was in Boston (where a lot of the events leading up to the American Revolution took place) in the run up to the 4th of July. I also got to experience Juneteenth for the first time.



The personal development workshops provided to me by the Laidlaw Leadership and Research Programme helped me better understand my strengths and weaknesses and the steps to take to optimise my leadership skills. Our cohort was great and I'm thankful to have spent this time with such a diverse group of ambitious, creative and kind scholars. Our LEAD developmental workshops days were fantastic opportunities to learn about each other's projects and offer support, while expanding our leadership skills. The Laidlaw team at Trinity, Kate and Darren, were great, and offered continuous support and encouragement!



From my experiences in the 18 months of being a Laidlaw Scholar, I have gained confidence in driving projects that align with my personal and academic interests and passions. I have become incredibly resourceful in my ideas and actions. I have broadened my view of the world — and I am eager to put newfound leadership skills into action in my future endeavours!