

Dear Cornell Admission Committee members, my name is Christian Zwierlein, and I am on a personal mission to uncover the intersections between biochemistry, genetics, and disease pathology. More specifically, I am interested in researching the gene mutations which impact the biochemical cycles of methylation, and the effects of these mutations on the following: gut-brain axis regulation, neuronal growth and development, neuronal regulation, epigenetics, pharmacological metabolism, and the post-translational modification of proteins in the gastrointestinal tract. Discovering these truths is imperative to me because there is a high prevalence of all the aforementioned conditions in my family. These include various neuropsychiatric, neurodevelopment, and neurodegenerative diseases. Furthermore, when I turned 19, I was diagnosed with ADHD, major depressive disorder, seasonal affective disorder, and various anxiety disorders. On top of all this, the various the medications that I tried were failing. This was when I took a genetic test to interpret my gene-drug interactions, and found that I have the recessive homologous mutation of the C677T MTHFR (Methylene-tera-hydro-folate-reductase) gene. This inhibits my body's ability fully express the critical enzymes used to help "farm" and synthesize the vitamins B2, B12, and folic acid. I only received 10% - 30% of these vitamins when compared to the homozygous dominate allele pair. These SNP's inhibits my body's ability fully express the critical enzymes used to help "farm" and synthesize the vitamins B2, B12, and folic acid. I only received 10% - 30% of these vitamins when compared to a more dominant genotype. Over time, deficiencies in these vitamins impacted my development, and there was no way to know until the major symptoms arose in young adulthood. My mission is to find a way to non-invasively identify these life-changing gene mutations, which don't immediately show an altered external phenotype, but have a serious internal affect. Acceptance into your genetics and biochemistry departments would allow me to continue my mission, and hopefully change the world for the better. Thank you for your time and consideration.

Christian Zwierlein

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Education:

Le Moyne College (2018-2020)

- *Relevant Coursework:* Human A&P I with Lab, Human A&P II with Lab

St. Joseph's Hospital College of Nursing (2019-2020)

- *Relevant Coursework:* 2 semesters of clinical nursing experience

Elmira College (2020-2023)- Bachelor of Science in Biochemistry with a Minor in Art

- *Relevant Coursework:* Introductory Chemistry, General Biology I with lab, General Biology II with lab, General Chemistry I with lab, General Chemistry II with lab, Genetics with lab, Organic Chemistry I with lab, Organic Chemistry II with lab, Advanced Genetics & Genomics, Biology of Cancer, Biochemistry I with lab, Biochemistry 2 with lab, Medicinal Chemistry with lab.

Research Experience:

Olber Summer Research Program

- Led by: Dr. Paulson
- Model Organism used: *c.elegans*
- Experiment: Using Feeding RNAi in *c.elegans* to research genes related to Autism and the Gut-Brain Axis

Lab Techniques Used: Platinum plated pick transfer of *c.elegans*, egg-bleaching to obtain a synchronous population of *c.elegans*, feeding RNAi, GFP fluoroscopy analysis of *c.elegan* excretory cells, & live scanning microscopy analysis of *c.elegan* phenotypes

Winter Term Research (2021-2022)

- Led by: Dr. Lyndaker
- Model Organism used: *s.cervisiae*
- Experiment: 9-1-1 DNA Replication Complex, Looking for Mismatched-DNA Pairing Using Gel Electrophoresis.

Lab Techniques Used: Gel Electrophoresis, micro-pipetting (volumes as small as 0.2 μ), & DNA extraction

Fall Term Research (2021-2022)

- Led by: Dr. Paulson
- Model Organism used: *c.elegans*
- Experiment: Using Feeding RNAi and blotting technique in *c.elegans* to research the gene's impact on serotonin levels.

Lab Techniques Used: Western Blot, Feeding RNAi, egg bleaching

Community-Based Leadership Events

- Class Sustainability Leader (2022-2023)
- President of the Sustainability & Gardening Club
- 60+ hours of community service at the Southern Teir Food Bank

** I plan to continue research in the terms: Winter 22'-23, Fall 23'-24', Winter 23'-24'*

** I also plan to reapply to the Olber Summer Research Program in 2023.*