My Grandpa Ross's obituary says he died in 2010, but my family and I knew he had left us much before then. As he aged, his inability to follow a conversation reduced our interactions from vibrancy to holding his hand in silence. My heart still aches when I recall the first time he didn't recognize my siblings and me. Grandpa Ross's journey through dementia became easier to accept as time passed. Even so, I couldn't shake the lingering question: How can a human lose his humanity? This dilemma affected me on an emotional level, but I also approached it from an intellectual standpoint. That is, I wanted to do something about the problem I had faced so that people of the future would not have to watch their loved ones fade away as I did.

This is the event that initiated my interest in biology and neuroscience. I wanted to know how the brain works and how the faculties of the human being arise out of the properties and interactions of mere cells. As I learned more about neural correlates of human abilities from my classes at the University of Notre Dame (UND), I became especially interested in neurodevelopment: how cells build structures that detect, process, and respond to information. These factors now motivate me to pursue advanced study in neurobiology, a goal the Neurosciences PhD program at Stanford will allow me to accomplish most effectively.

My experience with undergraduate research has bolstered both my fascination with developmental neuroscience and my commitment to improve the quality of life of people, like my Grandpa Ross, whose lives are affected by neurological disease. The subject of my current research in the lab of Dr. Joseph O'Tousa is the cellular signaling behind the way axons detect and respond to injury. Through a signaling pathway controlled by the MAPKKK Wallenda (Wnd), the neurons react to axonal injury with both degenerative and regenerative phenotypes that either prepare them to die or to grow a new axon. I am interested in this topic because it is the same process of cell death as in the major neurodegenerative diseases, including Parkinson's and Alzheimer's disease. Therefore, any knowledge of the mechanistic details of neural degeneration will have direct impacts on prevention and treatment of these diseases, both by delaying degeneration and promoting regeneration.

When I joined the O'Tousa group during the spring of 2014, my role in this project was to develop the adult *Drosophila* photoreceptor as a model neuron for studying the Wnd pathway. To this end, I learned to plan fly matings to put desired genetic constructs in a single fly to observe the effects of Wnd expression on the photoreceptor. I earned the UND College of Science's Summer Undergraduate Research Fellowship (COS-SURF), which gave me funding to work in the O'Tousa lab for 10 weeks during the summer. During this time, I learned a wide variety of techniques for gathering data, including tissue fixation, slicing, and confocal, electron, and fluorescent microscopy. I used these methods to view the effects of Wnd expression on the photoreceptor's structure. I learned to run Western blots to observe changes in protein levels in response to Wnd expression. Because of my intrigue with my project and the great fulfillment I felt in the lab, this summer was when I realized that I wanted to continue to do research throughout my career.

In the fall of 2014, I was accepted into the UND Biology Honors Program (BHP), which guides members on an intense, research-oriented journey toward a high-quality thesis. The BHP also emphasizes effective conveyance of both results and broader impacts of research in order to prepare competitive researchers for a career in which they can disseminate their information well. The BHP has helped me learn to present my research in a manner accessible to the audience through poster presentations at UND's undergraduate conferences, research talks to the UND Biology Department, and the thesis drafting process. I also have learned to write concisely

on scientific subject matter. All of this has led me to a deeper understanding of the scientific process and of my own research so that I can better communicate what I do and why.

I applied these skills in March of 2015 when I attended the 56th Annual Drosophila Research Conference, known as "The Fly Meeting." The common factor among researchers at Fly Meeting is the use of the fruit fly as a model organism, so I met researchers studying a plethora of topics in molecular and cellular biology. This diversity of backgrounds became especially apparent when a PhD student and I presented our lab's research as the poster "Activation of the Wallenda/DLK pathway triggers adult photoreceptor degeneration." I could not assume that my audience knew anything about neural degeneration. The Fly Meeting allowed me to gain presentation experience, especially in assessing people's knowledge of my topic and adapting the content and organization of my presentation to best fit listeners' needs.

After The Fly Meeting, I approached my research with a new intellectual vigor. I again received the COS-SURF in 2015, which allowed me to refine and expand my project and my scientific abilities. I implemented a genetic screen to identify key players in the Wnd pathway. Additionally, because Wnd acts through transcription factors, I designed a project to document the transcriptional changes due to Wnd expression through RNA sequencing. I have continued my research even though Dr. O'Tousa is spending the semester in Australia, demonstrating my ability to create and execute experiments without daily guidance.

More recently, I have brought my scientific journey full circle in my Developmental Neuroscience class, taught by Dr. Nancy Michael, by conveying scientific knowledge to the public. This class requires students to hone their ability to read primary neuroscience literature and translate the developmental principles from the articles to digestible messages relevant to laypeople. We will accomplish this goal through a capstone project, serving stakeholders in the community. For my project, I am working with a class of three-year-olds at the daycare El Campito in South Bend, IN. Inspired by conversations with the children about their fear of physical punishment for wrongdoing, I am designing an intervention with the children and their parents to address the effects of corporal punishment on the brain. So far, this experience has driven home the point that lack of background knowledge renders much of scientific literature inaccessible to common people, a problem I am passionate about mending. I therefore plan to enter academia after earning my PhD in order to teach at the college level.

All of these experiences lead me to the present day, applying to the Neurosciences program at Stanford. The Stanford Neurosciences program has what I need to succeed. It has labs that deal with synapse formation and neurodevelopment, the research areas I want to pursue. The Luo lab uses mouse and fly models to study specificity of neural circuits. The McConnell lab studies how neurons migrate to the cortex and develop unique identities and specific connections that give the cortex its function. And the Clandinin lab works on the fly visual system to study how the genetic code programs the formation of specific synapses that function to compute and transmit information *and* how neurodegenerative disease disrupts this computation. Stanford Neurosciences has rotations between labs to allow me to determine which of these research groups best fits my interests and expertise. Lastly, Stanford Neurosciences has an immersive intellectual environment, with faculty talks and journal clubs to guarantee students stay informed in current neuroscientific developments. Because of my interests and experiences and because of what Stanford has to offer, I believe I am an excellent fit for the program.