Statement of Intent

To begin my research career, I held assistant research positions in the labs of Dr. Karen Bales at the University of California (UC) Davis and Dr. Jacqueline Crawley at the UC Davis Medical Center M.I.N.D Institute. These positions provided me with introductory training in behavioral neuroscience, which I successfully applied to researching animal models of neurodegeneration. Following my tenure at UC Davis, I interned in the neuroscience department at Genentech, under the supervision of Dr. Kimberly Scearce-Levie. There I had the opportunity to take the lead in developing and advancing two important projects. The first project focused on validating a cutting-edge touchscreen technology to assess dentate gyrus function and pattern separating abilities in the APP/PS1 Alzheimer's mouse model. This involved conducting a Location Discrimination task and implementing in vivo pharmaceutical intervention. In the second project, I utilized immunohistochemistry techniques to establish correlations between previously studied behavioral phenotypes and the distribution and localization of differentially expressed protein biomarkers. As a result of these experiences, I gained a comprehensive understanding of behavioral neuroscience and the application of research techniques in practical settings. These early experiences with neuroscience, notably research in Alzheimer's disease, evolved into my career pursuit, and is the motivator for me reaching out to you today.

Alzheimer's disease is a complex multifactorial condition that progresses through various stages, including asymptomatic, mild cognitive impairment (MCI), and ultimately dementia (specifically Alzheimer's disease dementia). Unfortunately, attempts to develop therapies that can modify the course of the disease have proven unsuccessful. These failures can be attributed to two main factors: (1) intervening too late in the disease process; and (2) a lack of precise targets for intervention. However, a new research paradigm has emerged in parallel with the development and advancement of high-throughput technologies. To this end, researchers studying the etiology and progression of Alzheimer's disease are transitioning from 'top-down' clinical labels towards 'bottom up' pathological signatures created by unsupervised machine learning algorithms and high-throughput 'omic' measurements (genomics, transcriptomics, proteomics, and metabolomics). Notably, these data-driven methods have furthered biomarker discovery; revealing valuable insights into neuroinflammation and risk factors associated with Alzheimer's disease.

Consequently, I intend to focus my dissertation research on discovering multi-omic biomarkers that can further early detection of Alzheimer's disease and elucidate novel targets for therapeutic intervention strategies. To do so, I will leverage the Translocator Protein kDa 18 (TSPO) knockout transgenic mouse as an experimental model system. My overall dissertation goal is to enhance our understanding of the biological mechanisms observed in the TSPO knockout Alzheimer's disease mouse model and translate these findings into effective diagnostic tools for asymptomatic detection and personalized therapeutic strategies. By integrating "omics" data, a comprehensive in-depth biological understanding of Alzheimer's disease and its complexity may promote broader efficacy in intervention trials and lead to the commercialization of a novel diagnostic multi-omic biomarker platform with the ability to tailor intervention strategies for all Alzheimer's disease patient populations.