obstacle to automating the measurement of timber using video is tracking the location of individual trees within a forest or plantation. We can rapidly obtain video footage of large stands of trees; however, for our inventory to be precise and repeatable, we need to ensure that during each tree census the data we collect is compared with previously collected data from the same tree. We decided on identifying trees using positional data from UWB or RFID and corresponding the data to the local position of the camera at the time of data collection in the plantation as a possible way of tying video footage data to specific trees. We found that UWB requires very few transmitters/receivers while in an RFID system we would need to tag every tree. The current goal is to make measuring and data acquisition as simple and fast as possible with an automated UWB system that is accurate, precise, versatile, and resource/cost effective. The hope of the research is to create an automated system that can be implemented in the forestry industry to reduce time and resource loss while estimating the value and health of a plantation.

Research advisor Guofan Shao writes: “Akshat demonstrated his exceptional teamwork skills and positive attitude. He consistently attended weekly team meetings, either online or in person, and provided brilliant ideas to the group when other students struggled with their research. His efforts and contributions were crucial to the success of our project.”

HEALTH AND HUMAN SCIENCES
Developmental Atrazine Exposure Modifies Expression of Synucleins

Student researcher: Isabelle Akoro, Senior

Atrazine is a herbicide used throughout the midwestern United States to prevent broadleaf weeds in crops. The U.S. EPA has set the maximum contaminant level at 3 ppb (µg/L) in drinking water. Atrazine is an endocrine disruptor that interferes with normal physiology and homeostasis throughout development and the life course.
cDNA synthesized for qPCR analysis. qPCR compared the transcript level of each target gene among the atrazine treatment groups using β-actin as a reference gene, which was not changed with atrazine exposure. Statistical analysis was then conducted to determine significant changes using α = 0.05. A decrease at 0.3 ppb and 30 ppb was detected for sncga and sncgb. These findings support our hypothesis that an embryonic atrazine exposure alters expression of the synuclein genes. Additional studies are needed to determine the impact of these gene changes on PD pathogenic phenotypes.

Research advisor Jennifer Freeman writes: “Isabelle’s research project is evaluating if an embryonic atrazine exposure may alter genes in the synuclein family. Atrazine is a herbicide reported to alter some pathways related to Parkinson’s disease but overall information is limited. Isabelle’s findings support the need for further research in this direction.”

Active Herbicide Ingredients in Roundup Ready Xtend Products, Glyphosate and Dicamba, Results in Hypoactivity in Zebrafish Larvae When Exposed During Development

Student researcher: Ryker Bond, Senior

Glyphosate (GLY) is the most used agricultural herbicide in the United States and the active ingredient in Roundup Ready products. GLY residues are detected in food products and the herbicide can move in the environment after field application, contaminating drinking water sources. Thus, there are multiple exposure routes in the general population in addition to occupational exposure risks to agricultural workers. Due to overapplication of GLY leading to weed resistance, a second generation of Roundup Ready products were developed that include the herbicide dicamba (Roundup Ready Xtend). Currently little is known on toxicity risks or if increased application will result in drinking water source contamination with dicamba. This study evaluated developmental neurotoxicity of GLY, dicamba, and binary mixtures with a visual motor response behavioral assay using the zebrafish model. Zebrafish were exposed from 1 to 120 hours post fertilization (hpf) encompassing embryogenesis and the early larval development period. GLY concentrations

Expression of three synuclein genes following an embryonic atrazine exposure in the zebrafish. A decrease in expression in the 0.3 and 30 ppb treatment groups was observed for sncga (A) and sncgb (B). No changes in expression were observed for sncb (C). N = 5 (pools of 40 zebrafish each). Error bars represent standard deviation. *p < 0.05.