Swimming in the medicinal leech serves as a model system for addressing questions about the neuronal substrates of behavior. Studies have identified a network of neurons and their synaptic interactions that are integral for the initiation and the maintenance of swimming. However, little is known about the properties of these ionotropic receptors mediating synaptic interactions and their role in leech swimming. The goal of this research is to characterize the molecular and biophysical properties of one class of glutamate receptors, known as AMPA receptors (AMPARs), shown to mediate critical excitatory interactions between several neurons in the leech swim network and link their properties to better understand the initiation and maintenance of leech swimming behavior. We plan to clone and sequence AMPAR subunits, and then biophysiologically characterize them via the frog oocyte expression system. In addition, using *in situ* hybridization we will identify neurons in the leech central nervous system that contain AMPARs and characterize the synaptic connections between AMPAR-expressing interneurons and previously characterized interneurons of the leech swim network.

The broader impact of this project stems from its use of genomic information to enhance understanding of the neuronal basis of animal behavior in a well characterized, model system: leech swimming. Results from this research will add to our understanding of cellular and molecular mechanisms that generate rhythmic behaviors and will be of value for future related investigations. There will also be a direct benefit to research aiming to elucidate the neuronal mechanisms controlling other leech behaviors, such as crawling, bending, and shortening.