Cells detect and transform specific external stimuli into precise biochemical functions in a process termed signal transduction. Sensory systems are one example of signal transduction. Dr. Pablo Villar will investigate a unique sensory system: octopus chemotactile receptors that mediate contact-dependent aquatic chemosensation. Dr. Villar will use single-cell sequencing, cryo-EM, and physiology to investigate the molecular logic of receptor expression, complex formation, and physiological function in cephalopods. These experiments will be conducted in Dr. Nicholas Bellono’s lab at Harvard University. Villar's studies will reveal general principles for the evolutionary fine tuning of signal transduction and help connect adaptations in protein structure with octopus behavior.

As a graduate student in Dr. Ricardo Araneda's lab at the University of Maryland, Villar examined how neuromodulatory brain regions regulate circuits that process sensory information. Specifically, Dr. Villar showed that the basal forebrain activates shortly after the onset of a sensory stimuli, and in a stimulus-specific manner. With this experience in neuroscience and sensory stimuli, Villar will now examine the signal transduction of stimuli at a molecular level in cephalopods.