The goal of the research in the Cummings lab is to uncover the circuit plasticity mechanisms responsible for the promotion and suppression of learned fear, with an initial focus on the rodent medial prefrontal cortex (mPFC).

While the ability to learn about and respond appropriately to threats is essential for survival, such responses to innocuous stimuli are maladaptive and are a prominent feature of neuropsychiatric disorders such as posttraumatic stress disorder (PTSD). In both humans and rodents, the dorsal and ventral regions of the mPFC are postulated to promote and suppress cue-elicited defensive behaviors, respectively. However, the exact circuit organization and plasticity mechanisms supporting these roles remain unclear. To investigate these circuits, we employ a multi-dimensional approach by combining viral and genetic techniques in transgenic mice, activity-dependent tagging of neural ensembles (or 'engrams'), *in vivo* optogenetic manipulations, *ex vivo* whole-cell electrophysiological recordings in brain slices, and *in vivo* calcium imaging techniques in freely behaving mice, including fiber photometry and miniature head-mounted microscopes (Miniscopes). Our findings will reveal the organization, connectivity, and plasticity of circuits responsible for encoding and suppressing fear, and how these circuits might go awry in neuropsychiatric disorders like PTSD.

We recognize that outstanding science can only be achieved through inclusive excellence, and as such we encourage and welcome prospective team members with diverse perspectives and backgrounds.