We have developed molecular sensors that fluoresce upon contact with important biological compounds, namely neurotransmitters. Neurotransmitters are important for many psychological and physiological functions in the body. Abnormal neurotransmission may contribute to a host of neurodegenerative diseases and disorders such as Alzheimer’s, Parkinson’s, Huntington’s, schizophrenia, and depression. Therefore, the ability to visualize the neurotransmitters in the brain is attractive to understanding both normal and disordered brain physiology.

Here, we designed and synthesized an array of fluorescent molecules and showed that they bind to neurotransmitters and fluoresce in live cells. These molecules can be synthetically altered to optimize the fluorescence properties. In live cells, we showed that one of our sensors is selective for norepinephrine (noradrenaline) over epinephrine (adrenaline), two compounds that are structurally similar. In addition, our latest sensor gives a low-energy turn-on fluorescence response to serotonin, whose properties typically quench fluorophores which has historically made fluorescence detection difficult.