

MRTG-2/15/2009-Chander (Divya)

Divya Chander, MD, PhD

Stanford University Medical Center

“Probing the Neural Correlates of Consciousness Using Optogenetics”

Mentor: Karl A. Deisseroth, MD, PhD

Summary: This proposal seeks to find a unifying principal that defines how anesthetics act on networks to produce unconsciousness *in-vivo*. Optogenetic tools are used to introduce light-sensitive proteins (opsins) into targeted neuronal populations under genetic control; selective activation can then drive neurons to fire or electrically silence them, enabling bi-directional, rapid and reversible light-gated control of specific networks in living animals. We generate transgenic mice in which we direct opsins to both subcortical arousal structures and nuclei with long-range reciprocal projections. Neurons can then be activated in naturalistic patterns to drive anesthetized animals toward wakefulness or depress consciousness in awake animals. This will allow us to test whether putative circuits or electrical activity are necessary and sufficient for the transition and maintenance of varying levels of consciousness. It is likely these mechanisms are generalizable, sharing features with other disordered or depressed levels of consciousness such as slow-wave sleep, seizure and coma.