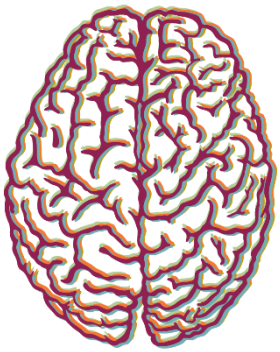

VirginiaTech®

School of Neuroscience

Faculty Candidate

Sujith Vijayan, Ph.D.
Research Assistant Professor
Boston University

"Dynamics of Human Brain Oscillations During Off-line States"

February 14, 2017
3:30pm – 4:30pm
Kelly Hall 310

Off-line states, such as sleep, are periods during which the internal dynamics of the brain are relatively independent of external stimuli. The oscillatory dynamics that occur during these states are thought to be critical for learning and memory and are often disrupted by disease. Therefore an understanding of these oscillatory dynamics offers the possibility of both enhancing the cognitive capacities of healthy individuals and providing pharmacological and stimulation interventions for diseases. In the first half of my talk I will present a mechanistic model of alpha (8-13 Hz) oscillations during general anesthesia. In the induction of general anesthesia, behaviorally defined loss of consciousness coincides with anteriorization—the spatial shift of alpha power from posterior to anterior regions. We show that anteriorization can be explained by the differential effect of anesthetic drugs on thalamic nuclei with disparate spatial projections. In particular, we show that anesthetic drugs can disrupt the alpha activity generated at depolarized membrane potentials in posteriorly projecting thalamic nuclei while engaging a new, hyperpolarized alpha in frontally projecting thalamic nuclei. In the second half of my talk I will present work examining oscillations recorded intracranially in humans during REM sleep. Although REM sleep is traditionally thought to consist of irregular activity, we discovered prominent theta (4-8 Hz) and beta (15-35 Hz) oscillations in the frontal cortices, in particular in the anterior cingulate cortex (ACC) and the dorsolateral prefrontal cortex (DLPFC). These beta and theta rhythms were coherent between the ACC and the DLPFC, spatially disparate regions that are both important for memory. The coordination of these rhythms during REM sleep may play an important role in emotional regulation and in procedural motor and emotional memory consolidation and has important implications for diseases that are marked by abnormalities in REM sleep, such as Parkinson's disease and post-traumatic stress disorder (PTSD).

Contact Anne Wailes for more information: awailes@vt.edu