Seminar

CENTER FOR ADAPTIVE NEURAL SYSTEMS

IRA A. FULTON SCHOOL OF ENGINEERING

SLEEP IS FOR UNFINISHED BUSINESS: CELLULAR AND BEHAVIORAL EVIDENCE THAT SLEEP SERVES SYNAPTIC REMODELING FOR MEMORY CONSOLIDATION

Gina Poe, PhD

Abstract: The hippocampus is the assembly place, but not final storage site, of complex, associative memories in the brain. Consolidation is the process where temporary hippocampal memories are transferred to long term storage sites throughout the neocortex. Consolidation of many types of memories and learning tasks has been shown in dozens of studies to involve Rapid Eye Movement Sleep (REM) as REM is either disturbed or increased. In my lab we are measuring hippocampal reactivation during REM sleep compared with waking learning and testing whether the neurochemical milieu of REM creates a unique environment that allows REM sleep brain activity patterns to serve a function for memory consolidation that cannot be fulfilled under normal circumstances during waking. Specifically, in addition to strengthening newly formed synapses, we hypothesize that REM sleep uniquely allows for synaptic depotentiation of consolidated memories and the erasure of extraneous synapses. Thus REM sleep could serve a purpose more essential than another waking practice session would provide: to reorganize the brain wiring pattern after learning to allow for optimal function. We see reactivation patterns during REM sleep consistent with strengthening novel memories in the hippocampus and with weakening hippocampal synapses associated with already consolidated memories. We also see that the reactivation pattern, called theta phase reversal, takes 5-7 days, which is consistent with the time course shown for memory consolidation. Finally, we see secondary evidence that the reactivation patterns during REM are effectively changing synaptic weights in the hippocampus of the freely behaving animal.

Biography: Dr. Poe attended Stanford University from 1983 to 1987 where she earned a bachelor's degree in Human Biology with an emphasis in International Public Health Policy. She was invited to apply to the PhD program in Neuroscience at UCLA to study in one of 4 laboratories in what constituted the world epicenter for sleep research. She did her dissertation research at UCLA with the support of a Howard Hughes Predoctoral Fellowship grant in the laboratory of Ron Harper at UCLA's Brain Research Institute. She helped develop the first subcortical brain optical imaging device for the freely behaving animal. She completed her PhD in 1995 and went to the University of Arizona to do postdoctoral studies with Carol Barnes, PhD and learned the multiple single unit tetrode recording technique for monitoring neural activity in freely behaving animals.

Biodesign Auditorium, ASU
Oct. 23, 2007
4:00pm-5:00 pm

Contact for further information:
Jeanine Elliott
Phone: 480-965-9489
Fax: 480-727-8396
E-mail: jeanine.elliott@asu.edu

Map: http://www.biodesign.asu.edu/contact/

"designing adaptive engineered systems to promote adaptation in neural systems"

ARIZONA STATE UNIVERSITY