

Advances and Challenges in Neural Engineering: Neurogenesis, Neurocontrol and Neurochips

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***Abstract*–Neural engineering is an emerging discipline to understand the organizational principles and underlying mechanisms of the biology of neural systems and to study the behavior dynamics and complexity of neural systems in nature.**

It coalesces the engineering including electronic and photonic technologies, computer science, physics, chemistry, mathematics with the molecular, systems, cellular, cognitive and behavioral neuroscience. Therefore, the neural engineering deals with many aspects of basic and clinical problems associated with neural dysfunction including the representation of sensory and motor information, the electrical stimulation of the neuromuscular system to control the muscle activation and movement, the analysis and visualization of complex neural systems at multi-scale from the single-cell and to the system levels to understand the underlying mechanisms, the development of novel electronic and photonic devices for experimental probing, the simulation studies, the design and development of human-machine interface systems and artificial vision

sensors and neural prosthesis to restore and enhance the impaired sensory and motor systems and functions.

In this presentation, we will briefly overview the recent developments in this emerging field, Neural Engineering from neurogenesis to neurochips. Then, we will discuss the ongoing research activities at the Neural Engineering and Informatics Lab at ASU, AZ, USA.

First, we will discuss our recent finding about the relative contributions of maturation to the dynamical behavior of respiration during ontogeny in the neonate and the underlying mechanisms of the respiratory network.

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