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EDITORIAL

What is Neural Engineering?

Editor-in-Chief

Dominique M Durand
Case Western Reserve University, Cleveland, OH, USA

It is only recently that the term *Neural Engineering* or *Neuroengineering* first appeared. The emergence of this new field can be attributed to the recognition that engineers, neuroscientists and clinicians should be working together to address the problems associated with the complexity of the nervous system. Neural engineering has generated a lot of excitement not only for the development of interfaces between the brain and computers but for its mostly untapped potential to develop treatment for patients with neurological disorders such as strokes or epilepsy. Now the field has matured significantly as evidenced by its strong and regular presence at various conferences around the world and the growth in the number of published papers in the area. As a result, the scope of the field has evolved and a clear definition of neural engineering is needed. The editorial board of the *Journal of Neural Engineering* defines the field as follows: 'Neural Engineering is an emerging interdisciplinary research area that brings to bear neuroscience and engineering methods to analyze neurological function as well as to design solutions to problems associated with neurological limitations and dysfunction'. The main goal of the field is to solve neuroscience-related problems and to provide rehabilitative solutions for nervous system conditions. The emphasis on engineering and quantitative methodology applied to the nervous system distinguishes neural engineering from traditional areas in neuroscience such as neurophysiology. The integration between neuroscience and engineering separates neural engineering from other engineering disciplines such as artificial neural networks.

Neural engineering is situated between and draws heavily from basic neuroscience on one hand and clinical neuroscience (neurology) on the other. The field of neural engineering encompasses experimental, computational, theoretical, clinical and applied aspects of research areas at the molecular, cellular and systems levels. Although overlap between various topics exists (i.e. neuromodulation and neuroprostheses), all these areas are well established and have recognizable identities.

Neural Engineering Scope

- brain-machine (computer) interface
- neural interfacing
- neurotechnology
- neuroelectronics
- neuromodulation
- neural prostheses
- neural control
- neuro-rehabilitation
- neuro-diagnostics
- neuro-therapeutics
- neuromechanical systems
- neurorobotics
- neuroinformatics
- neuroimaging

- neural circuits: artificial and biological
- neuromorphic engineering
- neural tissue regeneration
- neural signal processing
- theoretical and computational neuroscience
- systems neuroscience
- translational neuroscience

However, the definition and scope of neural engineering are best determined by the scientists and engineers that practice it and this is only an overview of the field as it is understood today. The future of this exciting new field will be determined not by what we believe neural engineering should be but by its success in improving human health and quality of life through restoration and enhancement of the function of the nervous system.