Deep Brain Stimulation Treatment for Impaired Cognitive Function
Nicholas Schiff

Background
Cognitive impairment is also a frequent result of treatment of acquired neurological disorders (e.g., brain radiation for neoplastic disease, post-infectious autoimmune related brain damage), and certain developmental and degenerative diseases. There is increasing evidence that fundamental mechanisms underlying key neuropsychological components of cognitive function, primarily attention, working memory and intention, can be influenced by modulation of selective neuronal populations. Current methods of treating impaired cognitive function include behavioral retraining and limited use of adjunctive pharmacotherapeutic stimulatory agents. These have a poor success rate with moderate to severe brain injuries.

Invention Summary
Dr. Schiff and colleagues have developed technologies for treating cognitive impairment using deep brain stimulation. The approach provides a rational therapy for complex brain injuries using a method that allows deep brain stimulation targets and patient selection to be optimized. The technology involves electrical stimulation of the intralaminar nuclei of the brain with or without concomitant pharmacologic treatment. These deep brain structures have unique anatomical and physiological properties that make them the preferred site for interventions aimed at improving the integrative brain functions underlying cognitive activity. The method has been developed from novel clinical observations of brain injured patients, basic neuroscience studies of deep brain stimulation of the intralaminar thalamic nuclei, and multi-modal imaging studies of catastrophic brain injury.

Potential Applications
- Treatment of patients with impaired cognitive function

Figure 1. (above) is a schematic diagram of equipment used for controlling stimulation of intralaminar nuclei as a function of saccadic eye movement.

Figure 2. (above) is a schematic diagram of the anatomical connections of the intralaminar nuclei with distributed circuits underlying arousal, attention and gaze control.

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