



# YALE NATIONAL INITIATIVE

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Curriculum Units by Fellows of the National Initiative  
2009 Volume VI: The Brain in Health and Disease

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## **The Brain Desynchronized**

Guide for Curriculum Unit 09.06.07, published September 2009

by Eric Laurenson

Ode to the brain, the most magnificent of organs! In humans, these few pounds of "gray matter" somehow manifest in cognition, self-awareness and consciousness, enabling the brain to study itself.

The means by which the brain achieves this feat is not well understood, which stimulates student's imagination, emphasizes the continual scientific pursuit of knowledge and motivates them to learn the physics and chemistry of the electrical propagation of signals. Having grasped the nature of electrical signal transmission conceptually and to a limited extent mathematically, students will explore the macroscopic functioning of the brain in this unit. They will investigate the necessity of brain signals not being synchronized, because such a state of synchronization results in seizures and, if chronic, the debilitating condition called epilepsy. The current theories of the cause of epileptic seizures will be explored and one treatment device, for which I received a patent, will be presented. Appreciating the proper functioning of the brain will provide relevance to the remarkable advances made in neuroscience over the past few decades. This unit is intended for advanced physics students studying current electricity but it could also be adapted for chemistry students.

(Developed for CAS Gifted Physics, grades 11-12, and AP Physics II B, grade 12; recommended for Physics, High School grades, and AP Physics, grade 12)

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