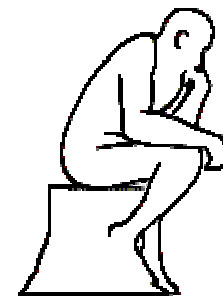


# BIOETHICS NOTES

a newsletter from the Bioethics Review & Advisory Committee



#21  
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***"The whole drift of my education goes to persuade me that the world of our present consciousness is only one out of many worlds of consciousness that exist."***  
William James (1842-1910)

## Neuroethics

By Jill Gotoff

*What a sensation stethoscopy caused! Soon we will have reached the point where every barber uses it; when he is shaving you, he will ask: "Would you like to be stethoscoped, sir?" Then someone else will invent an instrument for listening to the pulses of the brain. That will make a tremendous stir, until in fifty years' time every barber can do it. Then, when one has had a haircut and shave and been stethoscoped (for by now it will be quite common), the barber will ask, "Perhaps sir, you would like me to listen to your brain-pulses?"*

*Kierkegaard, 1846*

Smile if you will at the absurdity of this prediction made over a century and a half ago but I am sure that when the electroencephalogram was invented in 1929 by Hans Berger there were many who thought we were well on our way toward reading people's thoughts. Berger showed that the relative strength, frequency and distribution of impulses produced by the cerebral cortex could be measured by placing electrodes over the scalp. Since that time EEG has become a standard tool in the study and treatment of epilepsy patients and others with intracranial pathology. The placement of electrodes on the surface of the brain allows us to map brain function and localization of seizure foci relative to normal brain function in motor, sensory and language areas. EEG was essentially the first type of neurologic study to give us some insight into the function of the brain.

Over the years there have been numerous claims of being able to "read" a person's mind based on their EEG data, none of which have truly lasted the test

### MEET OUR COMMITTEE MEMBERS JILL GOTOFF

Dr. Jill Gotoff came to Geisinger Medical Center in 1996 as a staff neurologist and neurophysiologist. She has been a member of the Bioethics Committee since shortly after that time and has been involved in the clinical consult service as well as annual teaching activities. Dr. Gotoff specializes in the treatment of adult and pediatric patients with intractable seizures and evaluation of surgical candidates.

of time and scientific scrutiny. Recently a patient of mine made me aware of a private group of psychiatrists who claim to be able to determine the best medication for the treatment of a whole host of neurologic and psychiatric disorders such as ADHD, schizophrenia, depression and Alzheimer's disease by reading their EEG patterns.

Consider the use of EEG in the evaluation of the violent crime offender. In a relatively new approach to this mind reading, the use of "brain-fingerprinting" has been promoted as a tool for determining whether an individual is in possession of certain knowledge of a crime.<sup>1</sup>

Perhaps even more exciting and frightening has been literally the explosion of articles written on the use of functional imaging techniques to assess almost every aspect of our minds. Here is just a sample of recent titles of articles found in our scientific journals:

"fMRI reveals large-scale network activation in minimally conscious patients"<sup>2</sup>

"Using Functional Magnetic Resonance Imaging to Detect Covert Awareness in the Vegetative State"<sup>3</sup>

"Cerebral response to patient's own name in the vegetative and minimally conscious states"<sup>4</sup>

Ask many a neurologist and they will tell you that their worst nightmare would be to have some type of devastating injury leaving them in a persistent vegetative state. Perhaps even more nightmarish would be to have a family member or loved one left in that state. To go further on that nightmare ladder would be to have the thought or possibility of our loved one being conscious but “locked in” a body that doesn’t allow them to communicate.

In one of the above recent studies published in the Archives of Neurology the potential for such fears coming true have come closer than we thought possible. A team of neuroscientists describe a clinically unconscious victim of an accident who could, on command imagine herself playing tennis and walking through the rooms of her house.<sup>5</sup> They showed that the areas activated in her brain using fMRI were virtually identical to those of normal control subjects performing the same tasks. Moreover, this led them to conclude the fMRI “confirmed beyond doubt that she was consciously aware of herself and her surroundings, and was willfully following instructions given to her, despite her diagnosis of a vegetative state.”<sup>3</sup>

These conclusions have prompted not a flurry but a blizzard of commentary and questions challenging our concept of what it means to be in a conscious state and how it is to be measured. Disorders of consciousness encompass a wide range of states that are defined by two main components: arousal (i.e., wakefulness or vigilance) and awareness (sense of the self and environment). Traditionally, we have had standardized ways of assessing the state of consciousness, based on the person’s response to stimuli and examination by trained experts. As we saw in the case of Terri Schiavo; however, when patient advocacy groups, self-serving lawyers and politicians choose to put in their two cents, conclusions can be made based on emotion rather than understanding the facts and/or science. Furthermore, this is not simply an academic debate affecting just a few. There are literally tens of thousands of people with varying degrees of altered consciousness being cared for in chronic care facilities and at home whose care is estimated to have an annual cost of between \$1-7 billion.<sup>5</sup>

As members of the health care community neurologists have special ethical obligations in

dealing with this scientific frontier. The ever expanding field of Neurobiology calls for an ever expanding role for Neuroethics, referring to the *ethics of neuroscience*. However, Roskies 2002 and others have also argued for the study of Neuroethics to include the converse or the *neuroscience of ethics*. See Bioethics Notes by Dr. Berberich in July 2004 which looks at how fMRI studies have been used to assess the process of moral reasoning and decision making.

We need to proceed cautiously, recognizing that the ethical principles of the 16th century can still provide a framework to help address the challenges science and technology bring in the 21st century as we work toward unlocking the secrets of the human mind. In an upcoming Bioethics Notes we will look further into some of these ethical issues.

Respectfully Submitted,  
*Jill Gotoff*

<sup>1</sup> Illes, J. and E. Racine (2005). "Imaging or Imagining? A Neuroethics Challenge Informed by Genetics." *The American Journal of Bioethics* 5(2): 5-18.

<sup>2</sup> Schiff, N. D., D. Rodriguez-Moreno, et al. (2005). "fMRI reveals large-scale network activation in minimally conscious patients." *Neurology* 64(3): 514-523.

<sup>3</sup> Owen, A. M., M. R. Coleman, et al. (2007). "Using Functional Magnetic Resonance Imaging to Detect Covert Awareness in the Vegetative State." *Arch Neurol* 64(8): 1098-1102.

<sup>4</sup> Di, H. B., S. M. Yu, et al. (2007). "Cerebral response to patient's own name in the vegetative and minimally conscious states." *Neurology* 68(12): 895-899.

<sup>5</sup> Burton, R. The light’s on, but is anybody home? [http://www.salo.com/mwt/feature/2007/09/25/isshe\\_conscious/print.html](http://www.salo.com/mwt/feature/2007/09/25/isshe_conscious/print.html)