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## Consciousness, Neuroimaging and Personhood: Current and Future Neuroethical Challenges

**James Beauregard**

Rivier University

**Macksood Aftab**

Michigan State University

Central Michigan University

**Aamna Sajid**

Michigan State University

### **Biographies**

James Beauregard Ph.D. is a Clinical Neuropsychologist and Lecturer at Rivier University, Nashua, NH. Macksood Aftab D.O. is a Neuroradiologist and Assistant Clinical Professor at Michigan State University College of Human Medicine and Central Michigan University College of Medicine.

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# Consciousness, Neuroimaging and Personhood: Current and Future Neuroethical Challenges

James Beauregard, Macksood Aftab, and Amna Sajid

## **Abstract**

Neuroimaging has advanced our understanding of the biological bases of consciousness. At the same time, it is vital that these technologies be kept in proper perspective to avoid unsupportable claims and public misperceptions of its capacities and utility in health care and research. This presentation provides a philosophical anthropological context in which to examine current neuroimaging knowledge of consciousness and then examines the science of neuroimaging and the neuroethical considerations it raises.

## **Keywords**

Bioethics, Juan Manuel Burgos, Consciousness, Neuroimaging, Muhammad Iqbal, Personalism

## **1. Introduction: Beginning in Context: Philosophical Anthropology**

Perspective and realistic appraisal of technology are essential in neuroethics, particularly, maintaining an appropriate balance between the “neuro” and the “ethics” aspects of this discipline. Adrianna Gini et al have recently addressed these issues in an article titled, “Keeping the human: Neuroethics and the conciliation of dissident values in the 21st century,” where they have written

As neuroscience accumulates ever more factual information on brain operation, the normative problems raised by these findings become increasingly acute. In the past decade, as neuroscience has moved from peripheral sensory and motoric investigations to more central brain operation, ethical trends have shifted from an ethics concerned with the practice of neuroscience to interpretive aspects of human anthropology. No longer solely concerned with pharmacological enhancement, increasingly it reflects on the substance of our self interpretation.... The authors concern is that in our rush to change, we not overlook the prize already in our possession, the human mind in its manifold expression and oriented naturally to meaning and transcendence through beauty, truth and ethics. Keeping the human is more than a recommendation,

it is a recognition that what is kept will be the patrimony that we bequeath to our future. (Gini et al. 2015)

Neuroimaging is a frontline medical and research technology where maintaining the proper balance between persons and technology has far-reaching implications. Neuroimaging is widely employed in the clinical care of individuals with disorders of consciousness, and has already demonstrated its utility in deepening our understanding of the *biological* bases of consciousness (Blumenfeld 2010; Kolb and Wishaw 2014). New technologies create new possibilities, which may not be immediately evident, and simultaneously raise new ethical questions.

In order to place neuroimaging technology and its ethical implications in context, we would like to approach the topic of neuroimaging ethics in three ways:

1. *Philosophical Anthropology* as a broader context to help guide an ethical framework for the use of neuroimaging in the study of consciousness and its disorders.
2. The necessity of an accurate understanding of the *nature and the limitations* of neuroimaging technology so that any ethical thinking in this area is grounded in accurate information.
3. As one looks across the literature on the ethics of neuroimaging, there is a topic that emerges again and again, one that stands at the border between science and science fiction. That topic is “mind reading,” or the *detection of mental content*, which raises a host of bioethical issues.

First, we will touch on the field of philosophical anthropology from two different personalist perspectives, one European, one Islamic. Broadly speaking, Personalism is any philosophical system that takes the notion of person as its starting point, and as the key to understanding the major concerns of philosophy including ethics and anthropology (Buford). Personalist philosophy traces its roots to the ancient world, both East and West, to Hindu, Buddhist and Confucian thought, Judaism, Christianity and Islam, and the long tradition of philosophy bequeathed to us by Greece.

### 1.1 Person as Unity of Body, Mind, Spirit

A contemporary expression of this tradition is the Modern Ontological Personalism of Juan Manuel Burgos. Briefly, he envisions persons in an integrated and holistic fashion,

considering multiple *aspects* of persons including, in his terms, body, psyche and spirit (Burgos 2013; Burgos 2012). There are several aspects of his philosophy relevant to our considerations today. The first is that in order to comprehend human beings, it is necessary to think in categories specific to persons, rather than beginning with a vision of persons as animals—plus, i.e., “rational animals.” For Burgos, reason, freedom and emotion have distinctly human/personal manifestations that are different from those in the animal world. When he writes of emotion, for example, he sees it as an original and often undervalued aspect of persons that manifests in the three levels of person he describes, our bodies, our mental life (psyche) and our highest human capacities, such as love (spirit, in his vocabulary) (Burgos 2013).

### 1.2 Embodiment and Action

For Burgos, the physical *aspect* of person alone is insufficient for a comprehensive understanding of persons. Action is also central. Persons are known through action, manifested through our bodies. We know other persons through embodied action, in other words, through personal activity. Interaction and reflection on personhood fully conceived has an ethical dimension, it can yield moral norms. It is here that we touch on the interaction of the personal body with medicine and medical technology, as we attempt to understand and seek the good of health, well-being and human flourishing.

## **2. Neuroimaging and Neuroethics**

The recent advancement in neuroimaging has opened up new avenues to study consciousness and interrogate the mind-body problem. In the clinical setting it provides for the assessment of consciousness in ways previously unavailable. This technology, however, raises its own sets of ethical issues which relate directly to the use of the technology and its scientific basis. The clinical use of this advanced functional imaging carries significant philosophical implications.

### 2.1 Introduction to functional MRI

Functional MRI is a method of imaging which combines both structural and functional imaging of the brain. It allows for the localization brain activity to specific regions of the brain. It has allowed for the correlation of cognitive activity with specific areas of the brain parenchyma.

Functional MRI makes use of the detection of increased cerebral blood flow and oxygen uptake in areas of the brain which are metabolically active. The implication being

that areas which are accumulating and metabolizing oxygen are the areas which are being activated for specific sensory, motor or cognitive tasks. Functional MRI is thus a measure of the fuel uptake within active brain areas; it is not a direct measure of neuronal activity output. Nevertheless, this technology provides for the ability to assess for brain function in a way which was not possible before. A patient's motor response such as eye or limb motion is no longer required to assess for consciousness, instead it can potentially be directly assessed by assessing for areas of activation in the brain (Laureys et al. 2009).

### 2.2 Assessing Consciousness

Clinically the assessment of consciousness relies on the evaluation for arousal and awareness. Both must be present. The disorders of consciousness include coma, vegetative state, minimally conscious state and locked-in syndrome. In coma neither arousal or awareness are present. In a vegetative state patients may be arousable but lacks awareness. In a minimally conscious state patients demonstrate inconsistent and intermittent evidence of awareness. In locked-in syndrome patients are fully conscious but are unable to communicate with outside world due to disruption of brain communication pathways in the brainstem. Some locked-in syndrome patients are able to communicate with limited eye movement only. It is in these patients that fMRI has the most promise.

Awareness is, however, a subjective concept which is most immediately assessed on a first person basis. Only the individual is fully aware of their thoughts, mental status and cognitive ability. However, in the clinical setting when the patient is not fully functional and not able to fully communicate, the first person account is not available. In this setting an objective measure of consciousness is required in order to make clinical decisions regarding the patient's care and for prognostic purposes. This assessment requires some sort of response on the part of the patient based upon outside input. The idea is to assess for "intentional ability" on part of the patient. Is the patient able to understand and make decisions? If they can engage in "willed action" or demonstrate intentionality then awareness and consciousness would be established. This had traditionally been assessed on clinical grounds by a neurologic exam. More recently advanced neuroimaging has been used to assess for consciousness which does not require a motor/physical response on the part of the patient (Lloyd 2002; Bardin et al. 2011).

### 2.3 Philosophical Implications

Prior to proceeding to the use of functional MRI in consciousness, it is worth reflecting on the principles being applied in the determination of consciousness. Clinically

consciousness has been defined as the ability to engage in willed action. Those who are not in coma but lack consciousness are considered to be in a vegetative state and thus carry a very poor prognosis. This has implications for treatment and rehabilitation therapy which is considerably reduced for those unable to demonstrate intentionality. Thus, in practice intentionality is used as a measure of a person who is worth saving. This implies to some degree that what it is to be fully human is to be able to engage in willed action, the absence of which downgrades the resources placed into saving such a life. Willed action is then implicitly being used as the gold-standard for the highest state of consciousness and of personhood. Implying that what it is to be fully human is to engage in decisions and free will.

This echoes the thought of the 20th century Muslim philosopher Muhammad Iqbal who articulated a theory of the self which relies on the exercise of free will as the defining property of humanity. He argued that the mind and body come together in the exercise of free action and therefore it is misleading to create an artificial dichotomy between the physical and metaphysical elements of man (dualism). Neither define the human, rather what defines him/her is the ability to engage in free action and it is via such action that a man or woman is able to reach the full pinnacle of their human potential (Iqbal 2011).

#### 2.4 fMRI and Consciousness

In the absence of functional neuroimaging, an assessment of a patient's ability to engage in wilful thought or action required a clinical neurologic exam which required the patient to demonstrate via physical action (such as finger or eye movement) that they understand, communicate and can make choices. Patients who lack appropriate control of their limbs and bodily function due to brain injury or stroke may not be able to communicate their thoughts in this way. Thus making it difficult to differentiate patients in a vegetative state from minimally conscious states and locked-in syndromes. With functional MRI brain states can be assessed directly by examining brain activation and opens up new possibilities in the study of consciousness.

Consciousness is assessed at three levels with functional imaging: 1) passive, 2) active, and 3) communicating. At the passive level brain response is assessed after a sensory input. So an image shown to the patient should elicit a response in the visual cortex. This provides a baseline for the functioning of the neuronal hardware. However, it is unable to disentangle automatic responses from voluntary conscious brain activation.

In the active experiments, patients are asked to engage in a particular thought to assess for command following via imagery tasks. They may be asked to imagine playing

tennis or imagine walking through their home. Their ability to selectively activate different brain areas provides evidence for voluntary modulation of brain function. Modulation of brain function is a strong indicator of a patient's ability to express a desire for willed action and free thought.

The highest level of consciousness is communication which is assessed via asking the patient to answer questions. In response to a question the patient is asked to engage imagery tasks. The questions have typically been ones with known answers such as place of birth, or number of siblings to assess for the accuracy of this method. The patient's ability to communicate then is considered clear evidence of consciousness and of the ability to engage in willed action.

Despite these advances there are some limitations to the functional MRI studies. Some patients have been upgraded from a vegetative state to a minimally conscious state by the use of fMRI immensely affecting their prognosis and treatment plan. However, relying solely on fMRI the majority of minimally conscious patients (MSC), as determined by clinical exam, could not be detected. Therefore, clinical exam remains the most sensitive study to assess for MSC even though it relies on neurologic exams. Furthermore, it has been noted that many healthy volunteers are able to perform physical tasks without being able to successfully perform the corresponding imagery tasks on fMRI. This further lowers the sensitivity of fMRI in detecting consciousness. Much of these limitations may relate to the limited amount of data currently available and as the techniques for assessment improve the sensitivity of fMRI would likely improve as well.

### 2.5 The Hard Question

Does fMRI help answer the hard question of consciousness? i.e., how does neuronal activity generate a metaphysical thought or emotion? No. It simply provides correlation between areas of brain activation and the corresponding thought. Even so its clinical use has important clinical and philosophic implications. The most important of which is the reliance on free willed action as the gold standard test for consciousness. By extension this implies that what it is to be fully human is to be have the capacity to engage in intentional thought. This is an important advance, where a human is not being defined by the presence of a metaphysical entity such as a non-material soul or physical entity such as presence of certain body parts. Instead free will becomes the hallmark of humanity.

### **3. Current and Future Neuroethical Challenges for Neuroimaging**

Neuroscience itself is changing. Going back to the article from which we quoted earlier, the authors note that

A new, more integrated phase is about to begin. For 100 years neuroscience has labored to understand the constituency of the brain, its functional units, their operations and how they interact to build up the brain. Its philosophy 'principale' was predicated on a part-determines-whole approach that informed the research directed to the manner in which the brain was built from the bottom up, an operational philosophy termed Neuroreductionism. Instead, the new neuroscience considers the operations of hundreds of thousands of neurons working in unison and the manner in which their concerted operation constrains output, a philosophy of systems and downwardly operative effects. Connectomes, the term for large – scale circuit structures are now variously explored. (Gini et al. 2015)

Our argument is that if we begin with a broader notion of the whole human person, these changes will have a sound context which allows for the creation of a comprehensive ethical vision of dealing with new technologies as they emerge.

At the outset, we mentioned mind reading – that may seem at first more appropriate to the science fiction conference that was recently held at the Center for Cognition and Neuroethics. Yet, in a rudimentary way, neuroscience has already begun to examine the content of thought both in the context of disorders of consciousness and in basic science research.

At a rudimentary level, neuroimaging studies have enabled the assessment of conscious activity in a medical/diagnostic context when disorders of consciousness occur, and when behavioral investigation alone may not give a fully accurate picture.

Functional MRI and PET studies already demonstrated the utility is a diagnostic and prognostic tool in assessing the Default Mode Network for patients in the acute stage of coma. EEG studies have helped distinguish between Vegetative State and Minimally Conscious State patients. And, neuroscience has established at least some rudimentary correlations between functional neuroimaging data and language content, raising the possibility that individuals with locked in syndrome might to be able to communicate more effectively with the outside world.

Consequently, we must ask a bioethical question: to what extent might neuroimaging in the near, or distant, future be able to accurately access an individual's



mental content, in other words, to “read” thought itself? Such a possibility raises a host of ethical questions about privacy, cognitive liberty, national security and the boundaries between public and private.

Privacy rights are a given in American law, but privacy is not absolute. Adina Roskies has recently raised the question of the nature of this right to privacy. If neuroimaging technology could assess the content of thought, what might this imply for medical use, employment, and prediction. Practically speaking, these issues arise in such areas as prediction of future neurologic illness, the possibility of accurate lie detection, predicting future dangerousness, criminal activity, and recidivism (Roskies 2015).

Presumably, individuals who, through neurological injury (e.g., Locked In Syndrome) are unable to communicate with others would want take advantage of such technology. If mental content could be accurately read, it would give such individuals the capacity to communicate far more quickly and effectively with others, maintaining relationships, giving informed consent, and making decisions about medical care.

This scenario assumes informed consent for the use of such technology in individual who wants to establish communications with loved ones and health care providers. We should also ask, what if it should also become possible to determine the content of an individual’s thought *against their will*? In this case, where would we draw the boundaries between public and private, and more fundamentally, how will the resulting moral and legal questions be framed?

Is there right to privacy in general, or some aspect of privacy, that is absolute, or are there conditions under which, for example, public safety might override individual privacy? There are situations in medicine where this is already the case, for example, the reporting of communicable diseases places the common good above individual medical confidentiality. In the field of mental health, privacy can be violated in cases of danger to self or others, as well as a need to contact relevant state agencies in suspected cases of abuse or neglect.

How would this public/private balance play out in the context of new technology? What happens if neuroimaging technology advances to the point where it could be employed as a national security tool? Imagine moving through security at the airport, which already includes physical search and one type of scan to detect weapons. If it were possible to assess the content of thought, should this now-routine airport scan also include neuroimaging to detect brain states indicating increased arousal or anxiety in a terrorist, or the content of his or her thought? And would this be done with or without an individual’s consent?

September 11<sup>th</sup> in the United States and the recent terrorist attacks in Paris and San Bernadino CA take the matter a step further. Should such technology exist, what role might the neuroimaging access of mental content play in criminal investigations and terrorism investigations? Could it be used forcibly to extract information, and how would it be framed? Interrogation? Enhanced interrogation? Torture? One can envision the state's argument: "Public safety outweighs individual rights to mental privacy, and besides, it does less physical harm than waterboarding. It's a better way to get information from hostile and unwilling enemies who aren't US citizens and so not entitled to the protections of the Constitution and Bill of Rights." Who will make these decisions, and who will influence the debate?

#### **4. Back to Context: Persons**

In conclusion, we return to the notion of persons, of acting persons functioning in the world, embodied persons, as a category from which these considerations ought to be viewed. We have looked at neuroimaging as it plays a role in the study of consciousness, in disorders of consciousness, and as an interventional strategy for individuals in less than fully conscious states.

In terms of technological possibilities and neuroethical considerations, this is the tip of the iceberg, leading to deeper questions about human rights, privacy and cognitive liberty, and the relationship between the individual and the state. When we look at "neuroethics" these are questions the "neuro" aspect, the field of neuroscience on its own cannot answer. They can and must be dealt with in a broader context than the existence and potential uses of technology. Such questions can only be adequately approached from a sound philosophical anthropology and an ethical grounding that allows for the broader individual, social, medical, legal and security implications to be brought to the surface and addressed.

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