Robert H. Blank. *Intervention in the Brain: Politics, Ethics, and Policy*. Cambridge, MA: The MIT Press, 2013. 370 pp.

Politics, Policy, and Ethics contains informative chapters on the history of psychiatric "brain intervention" from lobotomies to deep brain stimulation; how advances in neuroscience have impacted the definition of death; and the commercial and military applications of new neuroscience technologies. The bulk of the book, however, is devoted to making the argument that advances in neuroscience have significantly advanced our understanding of social, political, and moral behavior.

Blank makes his case by uncritically presenting as scientifically conclusive findings the results of studies that primarily employ functional magnetic brain imaging (fMRI). fMRIs are based on the assumption that greater blood flow to a given region of the brain entails greater neuronal "activity" in that region. The fMRI is an extremely crude tool, and it is by no means clear that it actually measures increases in neuronal activity. Blank himself mentions a few of the problems (at 54-61): neuronal activity can occur in milliseconds, but increased blood flow exhibits a two-to-five second lag, and given that the fMRI is a "snapshot," the information provided may be out of sync with the actual neural activity; it is impossible to tell whether the purported increase in blood flow involves neurons whose activity is *excitatory* or *inhibitory*; the measures of differences in blood flow are small compared to the constant metabolism that occurs throughout the brain; the smallest unit of resolution of which an fMRI is capable is too large to capture the activity of tiny clusters of neurons. More generally, fMRIs provide no information as to what is going on in any region of the brain (i.e., the neurons and neurotransmitters involved, whether they are acting in an excitatory or inhibitory manner, the configuration of relevant neural networks and their relation to the brain as a whole). Any assumption as to what purported increased blood flow in a brain region indicates depends upon an assumption as to the function of that region.

Consider a representative study that Blank references as scientific fact (at 270). Writing of their findings in an op-ed in *The New York Times* (Iacoboni, Freedman, and Kaplan 2007) the authors of the study noted (among other things) on the basis of fMRIs of 20 swing voters, that those who rated Mrs. Clinton negatively were ambivalent because when viewing her image, they "exhibited significant activity in the anterior cingulate cortex, an emotional center of the brain that is aroused when a person feels compelled to act in two different ways but must choose one," indicating that "they were battling unacknowledged impulses to like Mrs. Clinton." Shortly afterwards, the *Times* published a letter signed by nineteen leading neuroscientists (Aron et al. 2007) who vigorously objected to the idea that "it is possible to directly read the minds of potential voters by looking at their brain activity while they viewed presidential candidates." As they noted: "As cognitive neuroscientists who use the same brain imaging technology, we know that it is not possible to definitively determine whether a person is anxious or feeling connected simply by looking at activity in a particular brain region… because

brain regions are typically engaged by many mental states, and thus a one-to-one mapping between a brain region and a mental state is not possible." According to the author of the letter, this study "was really closer to astrology than it was to real science," and "epitomized everything that a lot of us feel is wrong about where certain parts of the field are going, which is to throw someone in a scanner and tell a story about it" (Miller 2008, at 1412).

Given this, the cumulative effect of Blank's presentation is predictable. Hence, we are told that the amygdala (to take just one brain region) is "activated": In response to "other race faces during social categorization tasks," showing its role in "explicit and implicit race evaluation" (at 188); by being presented with the faces of candidates for whom one intends to vote which, according to the authors of the study, is not surprising given that "the amygdala is important for social evaluation" (at 269); when making deontological moral judgments (at 177) *and* when choosing an immoral option in a moral dilemma (at 175), due (in both instances) to the amygdala's role in emotional processing. Youth with a high exposure to media violence have a lower amygdala response to violent images, which relates to the amygdala's role in "violent impulses," except that in this case, the lower response is a result of "desensitization" (at 121). What the apparent activity of the *same* brain region in these studies indicates depends upon the story the researchers wish to tell.

Blank subscribes to a version of the "modular" theory of the brain (at 9-11): Very specific functions of the brain are highly localized in different regions. Thus, a "value signal" "can be used by the lateral prefrontal cortex to plan and organize behavior toward obtaining a certain outcome, and by the medial prefrontal cortex "to evaluate the overall actions in terms of its success and the effort that was required" (at 252). To speak of discrete regions of the brain as "planning," "organizing," and "evaluating" is to turn the brain into a collection of little brains. Stating that the lateral prefrontal cortex "plans" while the medial prefrontal cortex "evaluates," is like stating that the eye sees and the ear hears. Mental functions are rarely localized in one region in the brain. There is, instead, a continuous crosstalk among numerous brain regions.

Blank moves from associating activity with a given region of the brain to assuming that this is the region for that activity, to the assumption that this shows the activity is "hard-wired," part of our "nature." Blank works with a highly static and "predetermined" conception of the brain and with a few exceptions, ignores the input of the environment. The brain is not simply the most complex organ of which we are aware; it is also the most plastic. Most neuronal connections are made during infancy and early childhood, enabling adaptive plasticity within a particular environment. Almost nothing is static in the brain, which continuously rewires itself in response to experience and learning by altering the strength of connections countless times every second, while new neurons are generated throughout life in the hippocampus and caudate nucleus in

response to an array of environmental inputs (such as exercise). To separate the brain from its environment (and from its body), including the prenatal, postnatal, social and cultural environments, is to reify the brain and ultimately misrepresent the little that we in fact do know as to how it functions.

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