NOË, A. *Out of our heads: why you are not your brain, and other lessons from the biology of consciousness*. Nova York: Hill and Wang, 2010, 232 p.

Cognitive neuroscience is the discipline that merges two influential ideas: 1) The mind is an information-processing engine that builds representations of the world and 2) The brain is the locus of all mental activity. Scientists in this field expect to obtain a comprehensive account of our cognitive capacities through the use of imaging techniques such as PET (positron emission tomography) and fMRI (functional magnetic resonance imaging). The idea is to take advantage of such resources in order to understand how the brain implements mental functions. It is thought that each cognitive ability, understood abstractly or psychologically, has a correlate in neurophysiology. Philosophers of mind tend to be especially interested in the so-called NCCs (neural correlates of consciousness) and their potential to shed light on the nature of conscious phenomena, such as sensory perception and voluntary action. Fortunately for its proponents, among whom one finds many scientifically-minded philosophers, the search for NCCs has led to testable and predictive theories of phenomena such as visual perception, and this seems to vindicate the framework within which the issues are defined and dealt with.

Philosopher Alva Noë, a professor at UC Berkeley, says the whole conception described above is, despite all its apparent success, overhyped. Indeed, he says it is overhyped to the point of being presented to audiences worldwide as a stunning novelty, when it has in fact held educated people in thrall for decades. In his latest book, *Out of our heads: why you are not your brain, and other lessons from the biology of consciousness*, Noë claims mainstream cognitive neuroscience has not and cannot achieve its goals, for it rests on false assumptions, some of which are philosophical in nature (p. 5-7; 98-99). He argues firstly that it is misleading to see biological minds as information processors; secondly (and most importantly), that our minds are not located *within* our bodies, as the search for NCCs implies. Mental activity is rather a holistic process

that extends to the organism's environment. Higher animals are not intelligent due to the possession of a map that passively and intellectually represents the world. Their consciousness, like most of their mental faculties, interacts *dynamically* with the world. This brings us to Noë's main point: People cannot be identified with their brains (p. 24). Brain activity can only give rise to a mind when situated in a biological and cultural context of action and skills. It is high time we gave up the idea that neurological activity per se is sufficient for consciousness, which seems to imply the absurdity of consciousness in a petri dish (p. 12).

So let us look first at the negative arguments Noë advances. Those whose sympathies lie with mainstream cognitive neuroscience might think brain scan technology gives us a clear-cut picture of cognitive activities in the brain. Not quite, says Noë. The definition of a baseline relative to which one can detect neural correlates of cognition is problematic. For starters, the brain is never at rest, and comparing the baseline with the target activity involves the assumption that there are no feedback mechanisms from the latter to the former. Given the fact that there are indeed such loops in certain brain systems, one must not jump to conclusions about brain imaging data (p. 20-22). Furthermore, brain scans cannot at present tell us how metabolic activity relates to the mental goings-on of patients in persistent vegetative state. One might think that reduced brain metabolism explains impaired mental functions in vegetative patients; astonishingly, though, "it would appear that global metabolic levels remain low even after full recovery" (p. 18). The upshot is that we ought not to get carried away with alleged discoveries of NCCs by cognitive neuroscientists. It is just not about looking and observing what is going on.

Another point against the identification of conscious phenomena with NCCs has to do with neural plasticity. The view that the mind is a set of dedicated information-processing modules predicts the existence of specialized systems for each sensory modality, and is supported by the apparent discovery of an area that represents faces specifically (p. 110-117). Nonetheless, Noë mentions (p. 53-56) experiments with ferrets where the animals' eyes are wired up to brain structures normally used in hearing. If there were something in the visual cortex that made experiences visual, and something else in the auditory parts making experiences auditory, the ferrets would "hear with their eyes" (p. 55). But this is not the case. The ferrets see with their supposed auditory brains. This implies a malleable connection between brain structures and the qualitative character of experiences. For this reason, it is ill-advised to equate a given conscious phenomenon with activity in this or that part of the brain. The structure of the "auditory brain" is not

the key here; what explains its role in the experience is its connection to a certain *source* of information. Moreover, it has been shown that depriving cats of sight during a given period in their infancy destroys their ability to see. Experimental data strongly suggests, then, that "sensory stimulation produces the very connectedness and function that in turn make normal consciousness possible" (p. 49). Here is a good reason for considering the possibility that the visual character of experience is determined by interaction with the environment, and not just by activity in this or that brain structure.

So how does Noë convert the insights above into a theory that actually explains the data? In a nutshell, he claims that perceptual experience happens when organisms apply their mastery of the laws of sensorimotor contingencies (p. 47-65). Put another way, conscious beings have subjectivity in virtue of their use of special skills which constitute a kind of non-propositional knowledge. They can skillfully exploit certain potentialities to get information from the environment. Creatures that are capable of seeing, for example, have mastered the lawful dependence relation between their actions and visual input, a relation determined by the character of their visual apparatus. As Noë says, "how things look depends, in subtle and fine-grained ways, on what you do. Approach an object and it looms in your visual field. Now turn away: it leaves your field of view" (p. 60). Furthermore, conscious animals tacitly understand the sensorimotor contingencies determined by visible objects and attributes such as shape, color and size. The visual character of a shape, for example, is the set of all potential distortions that occur when a given object is moved relative to the subject, and vice-versa. Similarly, the sensation of color is determined by the way a surface changes the light when it moves relative to the observer or light sources. The structure of such changes is lawful, and integrating the activities that rely on knowledge of the relevant laws in planning, reasoning and speech *is* experiencing color. The remaining sensory modalities are individuated by sets of laws that are unique to each of them. Consider auditory sensorimotor contingencies: eye movements or blinks make no difference to them, whereas head rotations do (when we move our heads towards a sound source, we change the amplitude of the input)[1]. By the same token, tactile information is not obtained from a viewpoint, and is not dependent on light sources. The relevant transformations depend on contact with the objects, that is, a particular use of our bodies. Touching allows us to perceive an object's shape when we have a sense of the movements "allowed by the object's contours" (p. 61).

[1] See *A sensorimotor account of vision and visual consciousness* (O'REGAN e NOË 2001), p. 941.

What is the brain's role in all this? According to Noë, the brain is a key element in consciousness because it "coordinates our dealings with the environment" (p. 65). Without an environment to ground such dealings, though, there is no interaction and therefore no experience. Perception is like dancing with a partner; when dancing, one moves this or that way because the partner has made a given movement. Brains are analogously connected to their environment. This implies the falsity of the neuroscientific account of a brain that generates consciousness through representational activity alone. Indeed, it is misleading to see the mind as a set of representations. The world is its own model; we do not need a map of it inside our heads because the environment is accessible to those that have the sensory motor skills described above (p. 141). This claim is supported by change blindness data. The relevant experiments show that we fail to perceive major changes in our visual environment when not attending to the fleeting elements themselves. Noë concludes that "it is untrue that we enjoy detailed, stable internal depictions of the external world" (p. 142). Consequently, the search for NCCs pursued by cognitive neuroscientists is futile. The target representations are simply not there! It is about time we realized that instead of neural representations doing the job on their own, "it is the world itself, all around, that fixes the character of conscious experience" (p. 142).

Unfortunately, there are some gaps in Noë's case on *Out of our heads*. Those familiar with his earlier work[2] will probably notice Noë fails to mention how his view can unify a range of phenomena from blindsight to visual agnosia to color vision (although prosthetic perception and perceptual stability are mentioned). This is a rather curious omission, since discussing the phenomena above would considerably strengthen the case for a sensorimotor approach. Further weaknesses can be found in the negative arguments against the mainstream view. It is certainly interesting to learn about the shortcomings of brain scanning techniques, but is it not premature to criticize neuroscience for not being able to see directly what is going on? Science, after all, does not necessarily depend on direct observations. Cognitive neuroscientists can complement brain imaging evidence with new predictions, and this has been done[3]. Another weakness on the book is Noë's portrayal of neuroscience as a science of picture-like representations (p. 140). The mainstream view does not need mental snapshots. It can use vector coding, for example, to explain representation in a more abstract way[4]. Some philosophers sympathetic to the

[2] See, for example, O'REGAN & NOË, 2001.
[3] DEHAENE & NACACCHE, 2001, p. 18-22.
[4] CHURCHLAND 2002, p. 290-302.

mainstream view are also aware that mental activity needs a wider environment that provides a context. Christopher Hill's account, for example, claims that representational content is determined by interaction with the environment in an evolutionary context.[5] This means he is quite ready to concede that it is impossible to have consciousness in a petri dish (there is no straightforward supervenience of mental properties on neurological goings-on), while holding a view where internal representations are key.

What is the main lesson to be drawn here? The main point in favor of Noë's view (as expressed in *Out of our heads*) is its concern with problems that are internal to the relevant science, but relevant to philosophy at the same time. Notions such as qualia and zombies have often been used in a way that is hardly constructive; it is arguably futile to look for a *positive* role they can play in formulating theories. Noë manages to present an intriguing alternative to the mainstream theory that is built with materials outside the box of metaphysical thought experiments, qualia and zombies. The coming battle between mainstream neuroscience and the sensorimotor approach will be a rather interesting one.

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[5] HILL, 2009, p. 148-153.