What you know about the brain is wrong: A review of Barrett's

Seven and a half lessons about the brain

Manh-Tung Ho

Center for Interdisciplinary Social Science, Phenikaa University

Graduate school of Asia Pacific Studies, Ritsumeikan Asia Pacific University

November 5, 2021

Seven and a half lessons about the brain by neuroscientist Lisa Feldman Barrett is a very concise and accessible book that crisply explains the basics of neuroscience [1]. In its short 180 pages including the indexes, Barrett succinctly covered a wide range of misconceptions about the brain and its functions. This review summarizes the key messages from the book.

The author opens the book with the most striking half-lesson that the brain evolves not for abstract thinking or even storytelling, but for regulating the body. Bringing up the example of amphiox, a small ancient creature that does not have a brain, yet it can move, find foods, and reproduce, Barrett argues the key to understand the brain is that it has co-evolved with the body and its most important function to regulate the body and keep the body running efficiently. As the body becomes more complex, it grows the need for a command center to regulate our metabolic resources such as blood, salt, oxygen, glucose, hormones, etc., which the author calls the '*body-budget*.' Although we do not experience every thought, feeling, and experience as a deposit and withdrawal from our metabolic budgets, Barrett argues, this is what's going on under the hood. And understanding this fact rather than holding on to the misconception that the brain evolves to form abstract thoughts is the key to stay healthy, physically and mentally [2].

Barrett then proceeds to introduce us to the most up-to-date pictures of the brain. She introduces us to a number of new terminologies in neuroscience such as *allo-statis* and body-budget. Homeostasis is the process whereby biological organisms react to changes in the external and internal environment to maintain an equilibrium, while allostasis is the process whereby biological organisms predict the metabolic needs ahead of time and try to allocate metabolic resources in a cost-efficient manner. The body-budget concept is useful in showing us how the brain performs its most important function: to balance our body-budget while making deposits or withdrawals from the body-budget to meet the predicted the needs of the body. For example, when a person is in a high-stake situation such as in a dangerous situation, before an important exam, or on the verge of a life-changing discovery, the brain can budget for a short-term withdrawal of a massive amount of metabolic resources. The person's body is flooded with adrenaline and stress hormones to perform the task for a long time without feeling the need of eating or sleeping. However, given the body-budget must be balanced, once the high-stake situation is over, the brain will demand to make up for those withdrawals via rest, food, exercises, etc. On the other hand, every day when we make deposit for the body-budget via a good sleep, a good exercise session, and nutritious foods, we are essentially availing the brain with resources needed to learn and grow better. Life is about finding this balance.

The second lesson seeks to debunk the common myth of a triune brain, the ancient idea that your brain is consist of not one brain but actually three: the rational brain (the neocortex), the emotional mammalian brain (the limbic system), the instinctual survival brain (the lizard brain). Barrett shows that picture of the brain is the modern reincarnation of the tripartite soul, which has been so compelling in the Western history of thought. For example, Plato also theorizes that human life is characterized by the unending battle among reason, spirit, and appetite. Or Sigmund Freud

theorizes the human soul is consists of three parts: the id, the ego, and the superego. In all of these models, the rational part (the superego, reason) is supposed to control the passionate parts. Plato famously use the metaphor of a chariot to visualize the human soul: an orderly soul is when our reason can control the two beasts (spirit and appetite). However, the recent advances in neuroscience and molecular genetics show reason and emotion do not live in separate parts of the brain and the idea of a constant battle to reconcile between reason and emotion is plainly wrong. And cells in human brain share many of the same genes as cells in other animals' brains.

In fact, the most correct picture is that the brains of all mammals are built from a single manufacturing plan, and most likely, the brains of all reptiles and vertebrates also have their own plans. Brains of different species look different because the manufacturing process has stages that run shorter or longer depending on the species. Human brain doesn't evolve to be better, but just different from other animals. Brains evolve to match the needs of the body operating in a particular environment.

The third lesson teaches us how the brain wires itself to the world. Here again, Barrett slays the binary distinction between nature and nurture. A baby's brain is shaped not only its genes but also by its surrounding environment. The environment includes everything: natural, natal, and social. Information such as the availability of foods or social connections is vital for the wiring of the brain. The tuning (i.e. the strengthening of neural connections) and pruning (i.e., the losing of less used neural connections) are informed by the natural environment as well as what the caregivers do and don't do. Citing the tragic story of 1960s Romania, when contraception and abortion are criminalized, which left hundreds of thousands of babies sent to orphanages, Barrett demonstrates the wiring of the brain is not only the matter of providing enough foods and shelter but also of providing social stimulation. Many of these Romanian babies in this period did not

receive any social interactions, they were only fed, changed, and left alone in their cribs. They ended up intellectually impaired, unable to learn languages and control their attention and behaviors.

The fourth lesson teaches us that the brain is best understood as a Bayesian prediction machine. This understanding of the brain is completely counter-intuitive as we often think that our perception is a kind of camera shots of reality. However, decades of neuroscience have shown that what the brain does is to construct its own reality from sensory data coming to the world in the form of electrical signals by repeatedly forming and fine-tuning predictions. This reality must match the world out there to a good extent so that a living organism can survive and reproduce. It is a kind of “controlled hallucination,” as popularized by the neuroscientist Anil Seth [3]. These predictions become our actions and sensory experiences. The trickiest thing to comprehend is our brain wires us to act first and see second, yet our commonsense tells us that what we experience is *actions follow perceptions*. Here again, from the brain perspective, there is a blurry line between action, thought, feeling, and perception. Feelings and perceptions are a kind of covert behavior, but our commonsense dictates they belong to different mental categories. From the brain perspective, whether it is an action (like running away or making body-budgeting changes to support that movement) or a feeling (like panic) or a thought (like “It’s dangerous”) or a perception (like sounds or sights), it must help us survive and the best strategy to stay alive. Thus, in a life and death situation, the best strategy is to always be wired for action first. Reflection and learning come afterward.

The fifth lesson is about how the brain works with other brains. As a social species, the human brains always work with other brains. Our brain chemistry is influenced by the words and actions of other people, and even what we imagine other people would do. As such, what we say

and do to each other matters not only in abstract terms but also in terms of the brain [2,]. Such understanding carries important implications for how we ought to live in the age of social media, how we should govern our digital lives and these technologies [4,5]. Technologies give us more freedom, but that comes with responsibility.

The sixth lesson shows us different brains produce different kinds of mind. Decades of neuroscientific studies on cross-cultural differences in perception and its neuronal correlates have provided solid evidence against the universality of our psychology. The fact that humans have so many variations in terms of psychology and mind is not a bug but a feature. Each society must find ways to adapt to its environment and govern its own internal social structures. Thus, understanding such differences and the process of *acculturation* and *cultural additivity* are among the most important and exciting tasks of future brain research [6-9].

Putting all the previous lessons together, Barrett leads us to the seventh lesson that is brains create reality. The creativity of the human brain underlies myriads social conventions, stories, shared realities that we have enjoyed and fought over in our history [10-12]. As we moved forward as a global society in the presence of powerful technologies, coming together in the questions of moral codes as well as overcoming the obstacles of post-truth politics to arrive at a shared reality are not only the matter of abstract intellectual debates but of real existential concerns [13-16]. Such is the task of a mature science of morality, which is being made possible by the advent of brain sciences [17].

References

1. Barrett LF. (2020). *Seven and a half lessons about the brain*. Houghton Mifflin Harcourt Publishing, NY.

2. Nguyen MH, Le TT, Nguyen HKT, Ho MT, Nguyen HTT, Vuong QH. (2021). Alice in Suicideland: Exploring the Suicidal Ideation Mechanism through the Sense of Connectedness and Help-Seeking Behaviors. *International Journal of Environmental Research and Public Health*, **18** (7), 3681; <https://doi.org/10.3390/ijerph18073681>.
3. Seth A. (2021). *Being you: A new science of consciousness*. Penguin.
4. Vuong QH (2015). Be rich or don't be sick: estimating Vietnamese patients' risk of falling into destitution. *SpringerPlus* **4**(1): 529. DOI: [10.1186/s40064-015-1279-x](https://doi.org/10.1186/s40064-015-1279-x).
5. Ho MT, Progler J, Vuong QH. (2021). An anatomy of contemporary Vietnamese satirical cartoons: Political communication and representation of systemic corruption. *Asian Studies Review* **45**(4), 711-728. doi:[10.1080/10357823.2021.1932743](https://doi.org/10.1080/10357823.2021.1932743).
6. Vuong QH, Napier NK. (2015). Acculturation and global mindsponge: an emerging market perspective. *Int J of Intercultural Relations* **49**: 354-367. DOI: [10.1016/j.ijintrel.2015.06.003](https://doi.org/10.1016/j.ijintrel.2015.06.003).
7. Vuong QH, et al. (2020). On how religions could accidentally incite lies and violence: Folktales as a cultural transmitter. *Palgrave Communications*, **6**(1), 82.
8. Vuong QH, et al. (2018). Cultural additivity: behavioural insights from the interaction of Confucianism, Buddhism and Taoism in folktales. *Palgrave Communications*, **4**(1), 143.
9. Vuong, QH., Bui, QK., La, VP, et al. (2019). Cultural evolution in Vietnam's early 20th century: A Bayesian networks analysis of Hanoi Franco-Chinese house designs. *Social Sciences & Humanities Open*, **1**(1), 100001. doi:<https://doi.org/10.1016/j.ssaho.2019.100001>

10. Berns GS, et al. (2012). The price of your soul: neural evidence for the non-utilitarian representation of sacred values. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 367(1589), 754-762
11. Vuong QH, Nguyen MH, & Le TT. (2021). *A mindsponge-based investigation into the psycho-religious mechanism behind suicide attacks*. Walter de Gruyter.
12. Phạm Minh Chính, Vương Quân Hoàng. (2009). *Kinh tế Việt Nam: Thăng trầm và đột phá*. Nxb Chính trị Quốc gia, Hà Nội.
13. Vuong, QH. (2020). Reform retractions to make them more transparent. *Nature*, 582(7811), 149. doi:<https://doi.org/10.1038/d41586-020-01694-x>
14. Vuong, QH. (2018). The (ir)rational consideration of the cost of science in transition economies. *Nature Human Behaviour*, 2(1), 5-5. doi:10.1038/s41562-017-0281-4
15. Vuong QH. (2019). Breaking barriers in publishing demands a proactive attitude. *Nature Human Behaviour*, 3(10):1034. doi: [10.1038/s41562-019-0667-6](https://doi.org/10.1038/s41562-019-0667-6).
16. Vuong QH. (2021). The semiconducting principle of monetary and environmental values exchange. *Economics and Business Letters*, 10(3), 1-9.
17. Harris, S. (2011). *The moral landscape: How science can determine human values*. Simon and Schuster, New York.