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Abstract:

This paper explores the field of contemplative neuroscience as a means of studying consciousness on both neurological and experiential levels. While our current scientific paradigm favors the view that consciousness is a purely physical phenomenon and should be examined as such, contemplative neuroscience posits that awareness, attention, and emotion are malleable skills that can be refined in order to provide detailed, accurate self-reports about the conscious experience. These reports can then be used to inform neurological data, in order to form a more holistic understanding of consciousness as both a physical and mental process. Buddhist meditation techniques are a paradigm example of the type of training necessary to cultivate accurate awareness of mental states. I practiced Buddhist meditation extensively over several months as a way to inform my study. In addition, I conducted a comprehensive review of scientific publications on the current research being conducted on meditation, and philosophical literature



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on the importance of contemplative training in respect to neuroscience. My experience meditating highlighted the large difference between the untrained, unaware mind and the mind that has been trained in awareness, emphasizing the value of using experienced contemplative practitioners as a means to further consciousness studies. These results point to a need to use refined phenomenological reports as a more accurate way of interpreting neurological data, making use of subtleties and details that would not be available to us were we to use untrained subjects.

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CONTEMPLATIVE NEUROSCIENCE

An Integrative Approach for Investigating Consciousness

By Dayna Stimson

Every mental experience, be it a thought, emotion, sensation, or perception, comes to us by means of what philosophers and neuroscientists have come to call the “mind,” or “consciousness.” While many still grapple with ascribing a concrete definition to consciousness, it may be generally classified as the collection of subjective, first person experiences of which we are aware during wakefulness and unaware during sleep. It is the awareness of what it is like to be a human, animal, or other being, and this subjective awareness seems to be ontologically irreducible to its neurophysiological correlates. That is not to say that a relationship does not exist between mind and brain, but we must ask ourselves whether the brain controls the mind, the mind controls the brain, or if there is some kind of combination of upward and downward causation at play.

This question, the mind-body problem, is generally studied in the scientific community using third person, or “objective” methods of examining consciousness. While the mind was once studied as a first-person experience early in the evolution of psychology research, this technique was abandoned due to its unreliability and inconsistency, and scientists adopted behavioral markers as a more objective way to study consciousness. However, a growing number of neuroscientists and philosophers of mind have begun to recognize the importance of using first-person experience when describing and studying consciousness. Because consciousness is a first-person phenomenon, behavioral and neurological markers will only ever be correlates for the experience itself, and thus several researchers have shifted toward examining consciousness as such. These researchers study consciousness on a micro, neurological level as well as on a macro, experiential level to gain insight that couldn't be obtained by examining one without the other.

The larger scope of my project has been guided by three questions: 1. In what ways is our current scientific paradigm limited by its materialist assumptions that consciousness is an entirely physical phenomenon? 2. How do these limitations apply to the study of the brain and consciousness? and 3. How can we expand our understanding of volitional consciousness utilizing introspection and contemplation as valid research methodologies? In this paper, I will argue for the importance of contemplative neuroscience, a research approach that views awareness, attention, and emotion regulation as malleable, trainable skills, and works with advanced contemplative practitioners who have undergone extensive education in contemplative practices to perfect these skills. These practitioners provide evidence that humans are capable of conscious control over their mental states, and they are able to provide detailed, accurate self-reports about the conscious experience. In particular, the Buddhist contemplative tradition provides a paradigm example of the rigorous techniques necessary to provide refined descriptions and reproducible experiential states. To better contextualize this argument, I will first outline the mind-body problem, and then discuss how contemplative neuroscience and other philosophical frameworks have addressed this relationship.

My research methods were twofold. I began with a comprehensive review of two different types of literature: scientific publications on the current research being conducted on meditation, and philosophical literature on the importance of contemplative training in respect to neuroscience.

Scientific research on meditation can be broadly divided into three categories: research on neuroplasticity, or the brain's ability to change and adapt,¹ research on meditation's effect on the body and genetics,² and research on the neural basis of subjective experience using first-person reports.^{3, 4} The philosophical literature I reviewed was primarily based in the tradition of neurophenomenology and the work of Francisco Varela and

1 Richard Davidson et al., "Alterations in brain and immune function produced by mindfulness meditation," *Psychosomatic Medicine* 65 (2003): 564-70. doi:10.1097/01.PSY.0000077505.67574.E3.

2 Tonya Jacobs et al., "Intensive meditation training, immune cell telomerase activity, and psychological mediators," *Psychoneuroendocrinology* 36 (2011): 664-81. doi:10.1016/j.psyneuen.2010.09.010.

3 Antoine Lutz et al., "Guiding the study of brain dynamics by using first-person data: Synchrony patterns correlate with ongoing conscious states during a simple visual task." *PNAS* 99 (2002): 1586-91. doi:10.1073/pnas.032658199.

4 Heleen Slagter et al., "Mental training as a tool in the neuroscientific study of brain and cognitive plasticity," *Frontiers in Human Neuroscience* 5 (2011): 1-12. doi:10.3389/fnhum.2011.00017

Evan Thompson. This field emphasizes that first-person phenomenological data and third-person neural correlates are equally important in neuroscience, and neither should be interpreted without consideration of its counterpart.⁵ Within this framework, the term “phenomenology” refers to the disciplined, first-person techniques used to probe and analyze the conscious experience.^{6, 7}

A separate aspect of my research was developing my own meditation practice. In addition to weekly meditation sittings, I attended two weeklong meditation retreats. I found these retreats to be highly valuable in exploring which specific meditation techniques could best be used to study aspects of the conscious experience, especially given the importance I have placed on first-person experience in the realm of scientific research.

In order to understand the significance of primary experience and introspection in the realm of neuroscience research on consciousness, it is helpful to have an understanding of the history of the philosophical debate surrounding the relationship between mind and body, and how various parties have attempted to bridge the explanatory gap. René Descartes concluded that while the mental and physical domains interacted somehow within the human body, they were entirely distinct substances, an idea that came to be termed “dualism.”⁸

Other philosophers, however, have attempted to bridge the gap between the mental and physical. Idealists have attempted to reduce physical phenomena to mental experience, postulating that only mental experience is real and that matter can only be explained in terms of mind, while physical materialists have done the reverse, claiming that consciousness is reducible to purely physical and neurobiological processes. Indeed, our entire modern scientific worldview has been built from the idea that the physical world is causally closed and only physical actions can cause physical events. The prevailing view among

5 Francisco Varela, “Neurophenomenology: A methodological remedy for the hard problem,” *Journal of Consciousness Studies* 3 (1996): 330-49.

6 Evan Thompson, “Neurophenomenology and contemplative experience,” in *The Oxford Handbook of Science and Religion*, ed. Philip Clayton (Oxford: Oxford University Press, 2006).

7 Antoine Lutz et al., “Meditation and the neuroscience of consciousness: an introduction,” in *The Cambridge Handbook of Consciousness*, ed. P.D. Zelazo, et al. (New York and Cambridge: Cambridge University Press, 2007).

8 David Presti, “The Mind-Body Problem,” in *Encyclopedia of Human Behavior*, ed. Vilanayur Ramachandran (London: Elsevier Press, 2012).

scientists is that consciousness is “caused by and realized in” the brain.⁹ Thus, most contemporary consciousness studies focus on finding the neural correlates of consciousness and ignore the possibility of mental causation.¹⁰

The prevalence of these materialist theories is evidenced in examining the evolution of neuroscience and psychology research in the past century. In 1890, the psychologist William James postulated that we must study consciousness by observing behavior, underlying neural correlates, and direct inspection of mental phenomena, declaring, “introspective observation is what we have to rely on first and foremost and always.”¹¹ However, introspection was quickly abandoned as a legitimate scientific technique and researchers moved on to using empirical markers such as behavior, neurophysiology, and computational modeling.

But even as our knowledge of the neural as correlating with some aspects of thought has grown greatly, no materialist explanation has given a satisfactory account of how lower-level physiological processes give rise to subjective mental states without the possibility of the reverse process, mental causation. Thus, many contemporary neuroscientists and philosophers of mind are beginning to reexamine introspection and related strategies as valid and important research paradigms. They enable one to experience volition and agency as real, embodied experiences in order to counter the prevailing materialist view that we have no true control over our minds and brains.

Phenomenology is a Continental philosophical tradition claiming that perception plays a foundational role in understanding the world. This tradition emphasizes the body as the primary means of learning about and understanding our surroundings. Both Edmund Husserl (1859-1938) and Maurice Merleau-Ponty (1908-1961) stressed that the body and the mind cannot be separated. The phenomenal object of perception is not an unchanging object of natural sciences, but rather a correlate of sensory-motor functions. Merleau-Ponty remarked, “All my knowledge of the world, even my scientific knowledge, is gained from

9 John R. Searle, *The Mystery of Consciousness* (New York: The New York Review of Books, 1997), 4.

10 For an example, see Francis Crick and Christof Koch, “A framework for consciousness,” *Nature Neuroscience* 6 (2003): 119-26.

11 James, William, *The Principles of Psychology*, (Cambridge: Harvard University Press, 1981), 185.

my own particular point of view, or from some experience of the world without which the symbols of science would be meaningless.”¹² Both Merleau-Ponty and Husserl recognized that although Western science attempts to find ultimate objectivity in the world, it ignores the fact that even the purest objective observation is made through human eyes and within a human body.¹³

Francisco Varela and Evan Thompson, two contemporary philosophers of mind, further developed this idea, establishing the field of neurophenomenology. This field provides a tangible means of integrating phenomenology into the realm of neuroscience research, focusing on the embodied nature of cognition.¹⁴ Varela and Thompson hold that having an understanding of phenomenological philosophy helps to better understand the biological aspects of intelligence and cognition, while a strong understanding of neurobiology helps to better interpret a phenomenological analysis of experience.¹⁵ Contemplative neuroscience, a related field, builds on neurophenomenology by proposing to use experienced contemplative practitioners as subjects and collaborators. In order to obtain “precise and detailed first-person accounts of experience,” contemplative mental training may serve as a research tool for developing and refining phenomenological reports.¹⁶ Using skilled experimental participants such as experienced Buddhist meditators who have extended training on the observation and report of mental phenomena allows for a much more accurate and nuanced understanding of mind. This provides important information in the investigation of agency and free will in a way that untrained individuals cannot.^{17, 18}

While there are several meditation techniques across the various Buddhist schools, two are particularly relevant to neurophenomenology

12 Maurice Merleau-Ponty, *Phenomenology of Perception*, trans. Colin Smith. (New York: Routledge, 2005). (Original work published 1945), ix.

13 Merleau-Ponty, *Phenomenology*.

14 Varela, “Neurophenomenology,” 330-49.

15 Thompson, “Neurophenomenology,” 4-7.

16 Francisco Varela and Jonathan Shear, *The View from Within: First-Person Approaches to the Study of Consciousness* (Thorverton: Imprint Academic, 1999).

17 Thompson, “Neurophenomenology,” 4-7.

18 Evan Thompson, “Contemplative Neuroscience as an Approach to Volitional Consciousness,” in *Downward Causation and the Neurobiology of Free Will*, ed. N. Murphy et al. (Springer Berlin: Heidelberg, 2009), 187-97.

and contemplative neuroscience. The first, Shamatha, is a technique used to improve concentration; advanced practitioners can maintain focus on a single object for a theoretically unlimited amount of time. One is able to focus the mind on an object while simultaneously being aware of the quality of one's awareness, or meta-awareness. The second technique, Vipassana, is useful in conjunction with Shamatha, for it enables the practitioner to gain insight into the nature of thoughts, emotions, sensations, and perceptions the moment they arise. It particularly uses the faculty of meta-awareness to monitor mental states as they fluctuate from moment to moment.¹⁹

Practitioners experienced in these techniques are able to supply “refined first-person descriptions” that are far more useful and accurate than those of naïve and untrained subjects.²⁰ They report that by being fully aware of their mental states, they are able to measurably alter normal fluctuations in their conscious state and choose whether or not to act or engage with a thought, emotion, or other state.²¹ In my practice, I found that what was highlighted, more than anything else, was my normal lack of awareness of my mental states. In attempting to empty my mind of thoughts and feelings, I became aware of how I often am not aware of a thought arising until I am already well immersed in planning, reminiscing, or daydreaming. I began every meditation session by focusing on various aspects of my breath within the body, beginning with a descent into relaxation and full body awareness. As I relaxed, I moved my attention to the rise and fall of my abdomen, and later, to the sensation of the breath as it moved in and out of my nostrils. These techniques serve to stabilize the mind, allowing it to rest in a sort of “ground state” from which thoughts and emotions arise and allowing me to move on to the Shamatha and Vipassana techniques.

While the ultimate goal of this type of practice is to watch a thought arise, acknowledge it, and then let it dissipate, showing the practitioner the true nature in which thoughts arise, it was difficult as a novice meditator not to get caught up in thoughts. Initially, I found that my mind would vary between states of excitation and laxity, jumping from thought to thought without conscious control, or falling asleep mid-meditation. When I would finally become aware that I had engaged with a thought,

19 Lutz et al., “Meditation.”

20 Lutz et al., “Meditation,” 55.

21 Thompson, “Contemplative Neuroscience,” 187-97.

memory, or plan, I would let the thought go and return to focusing on the breath. This would occur over and over again, in each meditation session. As I improved, I did not find that I would get distracted less often, but that I became more and more aware of the moments when I had become distracted, catching my train of thought much earlier and moving back to the breath. The repetitive nature of this experience emphasized for me that the untrained mind does most of its activity unconsciously and without much cognitive control, unless we choose to actively intervene.

Even with the training I did throughout the summer, my ability to become aware of a thought and then avoid engaging in the thought does not begin to come close to the skills acquired by advanced practitioners, who log thousands of hours in their meditation practice. Although I am now beginning to recognize thought patterns and emotions that I often find arising, it is all too easy to fall back into habitual processes. It has become clear to me that the majority of the time, my attention wanders, I am not fully aware of an action even as I complete it, and I am not fully present in each moment. Without sustained training, this is the standard for each person, and for every subject in a neuroscience experiment studying consciousness. The kind of introspection accessible to the untrained individual is phenomenologically quite distinct from the awareness and self-reporting abilities of the highly trained meditator. While the gap between a novice meditator and a subject who has never trained in contemplative practice is quite large, the gap between novice meditators and advanced practitioners is even greater. My own meditation practice has made me increasingly aware of the challenges of rigorous self-reporting and true awareness of experience, but it has also reaffirmed that self-report is indispensable as an integral piece of any type of neuroimaging method. When both self-report and neuroimaging are used in conjunction, data analysis can be much more nuanced and enlightening. For example, using self-report in order to analyze EEG data allows the researcher to cluster results based on awareness levels of the participant, rather than averaging results across all trials.²²

Therefore, it seems critical to collaborate with individuals who have a high degree of understanding of their own phenomenological

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Lutz et al., "Guiding" 1590.

experience so that they can best provide the type of detailed and accurate self-reports that are necessary to develop a true grasp of consciousness. When investigating the experience of conscious will and mental causation, a careful attention to the phenomenology of volition and agency may help us to understand this process more fully. In this type of experiment, it is crucial to utilize experienced Buddhist contemplatives who have trained themselves to cultivate an attention to and awareness of each time an intention arises, rather than working with naïve subjects who often demonstrate inattention and lack of awareness. For the average, untrained individual, intentions, volitions and other thoughts arise without this sort of sustained awareness, and almost always lead to automatic action, a phenomenon I have struggled with in my own meditation practice. Someone who notices these thoughts arise, however, is able to choose whether to act on them or not, without “mindless automaticity.”²³ By living fully in the body, moment-by-moment, these experienced practitioners are able to produce a sustained awareness while experiencing the world mindfully.

With this more nuanced exploration of consciousness will come a new understanding about the nature of consciousness and its relationship to the physical world. Perhaps the most important theoretical aspect of neurophenomenology is its conception of emergence and embodiment.²⁴ Analyses of neurodynamics (as examined using EEG) have found both upwards and downwards causation in the form of synchronization and decoupling of neuronal firing. That is to say, mental processes can affect neurological processes just as much as neurological processes can affect mental processes, in a fluid interplay that does not violate the causal closure of the physical world.^{25, 26} Embodiment provides an understanding of the conscious experience that entirely transcends the traditional categories of mind and matter, in that it does not create two artificial categories that we must then relate to one another. If we come to understand that consciousness

23 Thompson, “Contemplative Neuroscience,” 187-97.

24 Varela et al., *The Embodied Mind*. (MIT Press: Cambridge, Massachusetts, 1991).

25 Evan Thompson and Francisco Varela, “Radical Embodiment: Neural Dynamics and Consciousness.” *Trends in Cognitive Sciences*, 5 (2001): 418-25.

26 Michael Bitbol. “Downward causation: Concept and experience” (lecture presented at the conference *De l’Autopoïèse à la Neurophénoménologie/From Autopoiesis to Neurophenomenology: Un hommage à Francisco Varela/A Tribute to Francisco Varela*, Paris, France, June, 2004).

is an emergent and embodied phenomenon, we will be required to radically revise our scientific conception of the physical world, such that the mental and physical do not mutually exclude each other from the beginning, but rather arise simultaneously.

The results of my work this summer will serve as a guide for a subsequent collaboration with Stan Klein, David Presti, and Sahar Yousef that will use EEG to investigate the synchronization of gamma wavelengths in experienced meditators. The small glimpse I have gained of what it is like to live a phenomenological life will help to ground me in our future study, examining the effects of multiple types of meditation on visual phenomena. Working with advanced contemplative practitioners will allow us to glean more data and understanding from their accurate first-person reports, with subtleties and details that would not be available to us were we to use untrained subjects. Ultimately, collaboration with experienced meditators may help to elucidate facets of the mind-body problem. Only when one is fully aware of a thought as it arises is one truly able to choose whether or not to act upon it, making decisions in a fully conscious, fully lived manner.

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