

EMPIRICAL AND EPISTEMOLOGICAL IMPLICATIONS OF AN ENACTIVE  
SENSORIMOTOR CONTINGENCY THEORY

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Abstract: By virtue of Kevin O'Regan and Alva Noë's enactive sensorimotor contingency theory, and its central tenets- perception is constituted by mastery of occurrent sensorimotor contingencies used for thought and action-guidance- the theory suggests the resolution of the explanatory gap problem and provides arguments to dismantle representationalist research programs. I address two objections to O'Regan and Noë's sensorimotor contingency theory. The first is that synaesthetic visual color-perception creates the problem of one-to-many ratios of qualitative experience. One environmental input, for a synesthete creates multiple sensory experiences, and this threatens the law-like nature of sensorimotor contingencies which constitute perception along with a perceiver's knowledge of them. The second problem I address for a sensorimotor contingency theory is discussed by Daniel Hutto, and he argues that the theory implies propositional knowledge by requiring that skills or knowledge create perceptual experience along with sensorimotor contingency laws. Consequently, this would render perceptual consciousness as state-based, and falling back onto mental representation. I suggest that the occurrent nature of perception for a sensorimotor contingency theory shows that synaesthesia, or any phenomenal experience, does not have to be constituted by isomorphic input-output mappings for perceptual consciousness. In answering the second objection, I suggest that the best way to understand a sensorimotor contingency theory is pragmatically. For example, the sensorimotor contingency theory and enactivism provided an answer to some of the problems the paradigm of mental representation faced when trying to explain consciousness. Whereas Hutto's arguments are a critique of enactivism, I suggest that the value of a sensorimotor contingency theory is best seen in the context of the tradition, which I illustrate with Varela, Thompson, and Rosch's theses concerning embodied cognition and mindfulness

traditions. In light of Varela, Thompson, and Rosch's work, the value of a sensorimotor contingency theory can be highlighted, which I suggest, can guide future research about the mind, and guide research in the cognitive sciences to a more unified approach to understanding phenomenal and cognitive consciousness. I offer that embodied cognition highlights the context of a sensorimotor contingency theory and shows its epistemological and pragmatic value for scientific research.

*Keywords:* sensorimotor contingencies, visual perception, consciousness, synaesthesia, radical enactivism, enactive and embodied cognition, mindfulness/meditation, phenomenology, cognition

## **I. Introduction to the Sensorimotor Contingency Theory: An Explanatory-Gap Solution, and a Representationalist-Paradigm Critique**

Alva Noë and Kevin O'Regan propose a theory of perceptual and visual consciousness in their paper, "A sensorimotor account of vision and visual consciousness," in which the qualitative character of perceptual experience is constituted by a perceiver's mastery of sensorimotor contingencies. One's mastery of sensorimotor contingencies is used for rational planning, action-guidance, and thought.<sup>1</sup> Sensorimotor contingencies are the laws that govern perception and sensory experience. For example, when perceivers scan the visual field, the changes in the optical array causes changes in the retina. These changes, in light of perceivers' bodily movement, are sensorimotor contingencies.

O'Regan and Noë's sensorimotor contingency theory is proposed as a solution to the problems that representational theories of visual consciousness are not able to adequately address.<sup>2</sup> Representational theories of visual consciousness take perceptual and visual consciousness to be formed on the basis of inner mental representations of visual scenes, and attempt to locate a neural correlate of consciousness.<sup>3</sup> On O'Regan and Noë's account, a perceiver's capacity to interact with the environment is instantiated by a perceiver's knowledge of law-like sensorimotor contingencies in which the environment couples with one's perception.<sup>4</sup> The sensorimotor contingency theory is an enactive take on visual consciousness and perception, in which enactive means that the perceiver explores the environment, and this activity constitutes perception.<sup>5</sup>

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<sup>1</sup> Kevin O'Regan and Alva Noë, "A sensorimotor account of vision and visual consciousness." *Behavioral and Brain Sciences* 24 (2001): 940, 944, 1019.

<sup>2</sup> *Ibid.*, 946

<sup>3</sup> *Ibid.*, 940.

<sup>4</sup> *Ibid.*, 943.

<sup>5</sup> *Ibid.*, 945.

The motive behind enactivist theories about perception and consciousness is that they stand to present an alternative to the approach of a representational theory of the mind.<sup>6</sup> Thus O'Regan and Noë argue that perceptual experience does not involve the use of internal mental representations, but rather involves the use of capacities on the part of the perceiver, to interact with the environment.<sup>7</sup> The way in which O'Regan and Noë discount the idea that representations are able to account for experience is through the explanation that regardless of the kind of representations that we have in the mind, they cannot account for the temporality, spatiality, and conceptuality of phenomenological experience.<sup>8</sup> Instead, O'Regan and Noë offer that implicit and innate abilities that individuals have to experience couplings between sensorimotor contingencies and the environment are what create unified perceptual experiences.<sup>9</sup>

O'Regan and Noë state that their sensorimotor contingency theory solves the explanatory gap for consciousness by arguing that sensory experience is active, and something we do, and so explains the nature of perceptual consciousness.<sup>10</sup> The explanatory gap is best illustrated by Joseph Levine in "Materialism and Qualia: The Explanatory Gap," but is also discussed as the "hard problem" of consciousness by David Chalmers, and stands as the idea that those working in the sciences and philosophies of the mind and consciousness have not yet agreed upon one comprehensive, unified, theory of why cognition includes "feeling-states."<sup>11</sup> The explanatory gap

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<sup>6</sup> Ibid., 940.

<sup>7</sup> Ibid., 1021.

<sup>8</sup> Ibid., 967.

<sup>9</sup> Ibid., 967.

<sup>10</sup> Ibid., 1019-1020.

<sup>11</sup> cf. Joseph Levine, "Materialism and Qualia: The Explanatory Gap," *Pacific Philosophical Quarterly* 64 (1983): 359.

is, as Joseph Levine states, the problem that physicalism (or the physical sciences) have in describing mental terms and experiences.<sup>12</sup>

There is a problem of matching explanations within scientific theories of the mind to conceptions of the mental that accept Cartesian dualism, or even emergentism and supervenience, and this causes a gap in unified theoretical explanations about consciousness.<sup>13</sup> Emergentism and supervenience theories hold that mental properties arise out of physical events, like neural interactions. The explanatory gap concerns conflicts between explanations for the theoretical underpinnings of consciousness among scientific paradigms. The “hard problem” of consciousness is the same idea, with a different name, which is the problem that the felt nature of conscious experience cannot yet be completely described in scientific terms, or by scientific theories about the mind.<sup>14</sup>

O’Regan and Noë’s theory is posed in order to solve the problem of the explanatory gap for consciousness by stating that visual consciousness arises because vision is a mode of exploration that depends on the perceiver’s knowledge and mastery of law-like sensorimotor contingencies.<sup>15</sup> One’s knowledge of sensorimotor contingencies solves the problem of the explanatory gap according to O’Regan and Noë because perceptual consciousness is constituted by a kind of “doing.”<sup>16</sup> Thus, the felt nature of experience is instantiated by a way of acting, and

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<sup>12</sup> Joseph Levine, “On Leaving Out What It’s Like,” in *The Nature of Consciousness: Philosophical Debates*, ed. Ned Block, Owen Flanagan, Güven Güzeldere. (Cambridge: The MIT Press, 1997), 547-548, 550.

<sup>13</sup> Joseph Levine, “On Leaving Out What It’s Like.” in *The Nature of Consciousness: Philosophical Debates*, ed. Ned Block, Owen Flanagan, Güven Güzeldere. (Cambridge: The MIT Press, 1997), 544-545.

<sup>14</sup> David Chalmers, “Facing up to the Problem of Consciousness,” *Journal of Consciousness Studies* 3 (1995), <http://consc.net/papers/facing.html>, paragraphs 8-10.

<sup>15</sup> O’Regan and Noë., 943.

<sup>16</sup> *Ibid.*, 970.

not by a state, while explanatory gap rests on the idea that the qualia of conscious experience are mental states that cannot be described in physicalist terms as of now.<sup>[17][18]</sup>

On a more metaphysical reading, O'Regan and Noë's sensorimotor contingency theory holds that the sensory quality of experience determines perceptual consciousness because of an individual's ability to enact, spatio-temporally, perceptual consciousness. In that way, the phenomenal nature of consciousness is not a state, because it is instead determined by spatio-temporally continuous kinds of events, which supervene on both the perceiver's the ability to act, and on one's possession of innate capacities for things like bodily movement, guidance, and rational thought.<sup>[19][20]</sup> Hence, O'Regan and Noë claim there is no explanatory gap according to their theory. This is supported by the notion that one's knowledge of sensorimotor contingencies constitutes perceptual experience, and the qualitative character of perceptual experience- neither of which can be described in terms of discrete occurrences.<sup>21</sup> Since the notion of the explanatory gap generally asserts that there is a lack of continuity in explanation between dualist, or internalist theories of the mind, and physicalist, and scientific theories about the mind, an enactive sensorimotor contingency theory, according to the claims of its proponents, falls into neither of these paradigms. This is how enactivism avoids the explanatory gap problem.

Not only is the problem of explanatory gap able to be solved according to O'Regan and Noë's sensorimotor contingency theory, the theory also explains that representations of the outside world, used functionally or computationally, do not and cannot describe the perceptual

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<sup>17</sup> Ibid., 960.

<sup>18</sup> Levine, "On Leaving Out What It's Like," 553.

<sup>19</sup> cf. David Silverman, "Sensorimotor enactivism and temporal experience," *Adaptive Behavior* (2013): 4-5, 8.

<sup>20</sup> O'Regan and Noë, 969.

<sup>21</sup> Ibid., 961-962.

nature, or the “what-it’s-like” of visual consciousness.<sup>22</sup> Part of that is because seeing happens as it actively attends to the world, and so cannot be located solely within the brain.<sup>23</sup> This claim has been introduced above through the argument that perceptual consciousness is not state-based, but rather, for O’Regan and Noë, is temporally extended.<sup>24</sup> They offer that the visual system stores information (which can be representations) that are able to influence behavior and mental states either directly or indirectly.<sup>25</sup> O’Regan and Noë state that stored information that can be instantiated as representations, might account for changes in behavior, but they argue that we are not always consciously aware of these changes, nor do these representations allow for visual perception.<sup>26</sup>

### I.1 Empirical Work on Change Blindness

In order to support the sensorimotor contingency theory and its scope of (1) solving the explanatory gap, and (2) ridding science of the need to find a neural correlate of consciousness, or the need for positing inner mental representations as descriptive in some way of perception, O’Regan and Noë cite empirical data. The empirical data that supports this theory include: change blindness, sensory substitution, and inverted-goggle experiments, and it concerns the nature of sensory modalities.<sup>27</sup> One of the empirical studies discussed in further detail here includes change blindness, although O’Regan and Noë offer a wealth of empirical data that lends support to their theory.

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<sup>22</sup> O’Regan and Noë, 946.

<sup>23</sup> Ibid. 946, 962.

<sup>24</sup> Ibid., 961.

<sup>25</sup> Ibid., 1017.

<sup>26</sup> Ibid., 1018.

<sup>27</sup> Ibid., 1020.



In change-blindness experiments, subjects are shown flickering images of the same visual scene that cyclically repeat.<sup>28</sup> In the series of these observed images, a large object might drastically change place, or an object might disappear completely from the scene.<sup>29</sup> The flicker in these cases, is what causes the low-level mechanisms in the visual system that would normally detect the change, i.e., the transient signal, immediately to either miss the change all together, or to only notice it after a considerable lapse of time.<sup>30</sup> Because these relatively large-scale changes go undetected by observers (caused in part by the quick flickering of the images) O'Regan and Noë hold that this study demonstrates that what is seen consciously does not always coincide with the visual scene.<sup>31</sup>

O'Regan and Noë use change blindness theories to provide further reasoning for the claim that perceptual consciousness does not happen on the basis of the formation of inner mental representations. In other words, perceptual consciousness for O'Regan and Noë cannot be explained only via inner mental representations. They argue that change blindness and other empirical work demonstrates that we do not need to depend upon explanations for perceptual consciousness that require unified and continuous inner mental representations because seeing is an activity that requires “*doing something of a visual nature* with information available to the brain.”<sup>32</sup> In this way, perception is active, and happens outside the brain, as the agent or perceiver engages with the environment, and is attuned to sensorimotor laws governing visual exploration. O'Regan and Noë argue that we can have continuous and unified experience, without having

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<sup>28</sup> Ibid., 954.

<sup>29</sup> Ibid..

<sup>30</sup> Ibid.

<sup>31</sup> Ibid.

<sup>32</sup> Ibid., 1017.

continuous and unified representations, and they use experiments of change blindness to support this idea.<sup>33</sup>

### *1.2 Change Blindness*

O'Regan and Noë further use the change blindness studies to support the idea that we do not necessarily “see” everything in a visual scene, but have the impression that we do because the world functions as an “outside memory.”<sup>34</sup> The world as an “outside memory” consists in the idea that the visual scene is available for probing just as a memory is available for inquiring into and reflecting upon.<sup>35</sup> This metaphor entails that while a memory may not be consciously present in the mind, one can incite a memory into conscious thought at-will, and so going, all aspects of a given visual scene are not consciously attended to in every temporally continuous moment,<sup>36</sup> but should one focus on different objects of a scene, one can verify that those objects are veridically being understood or perceived.<sup>37</sup>

As concerns the change blindness studies, O'Regan and Noë argue that because visual consciousness does not require internal representations, only what is currently being attended to by the visual apparatus is then seen.<sup>38</sup> This is how one could miss the change of an object during the flicker of the visual scene shown to them. The flicker, they explain, floods, or overtakes the local transient signal caused by the change, that the visual system would normally detect. The information from the flicker distracts the visual system from detecting the usual transient signals that would allow one to be aware of such a change as an object disappearing from a scene, or

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<sup>33</sup> Ibid., 1017.

<sup>34</sup> Ibid., 946, 954, 1020-1021.

<sup>35</sup> Ibid., 946.

<sup>36</sup> cf. Silverman, 5.

<sup>37</sup> O'Regan and Noë., 946, 1020-1021

<sup>38</sup> Ibid., 946.

some part of the scene being relatively drastically altered.<sup>39</sup> Thus, empirical work from change blindness experiments support the idea that while visual consciousness entails the subjective quality of the appearance of richness of the entire visual scene, visual consciousness is only aware of what it actively attends to. This constitutes the idea of the world as an outside memory, and describes why we can miss large-scale changes in a visual scene, but still perceive the environment as richly detailed.<sup>40</sup>

## **II. Objections to a Sensorimotor Contingency Theory**

There are problems concerning the feasibility of an enactive sensorimotor theory that stand to make the theory non-credible. Two are addressed here: one is an empirical objection, and the other conceptual. The empirical objection addressed here to an enactive sensorimotor contingency theory includes the phenomenon of synaesthesia. The conceptual objection to an enactivist's sensorimotor contingency theory illustrated here can be seen through the analysis of Daniel D. Hutto from his article, "Knowing *what?* Radical versus conservative enactivism," and centers around problems with the use of knowledge that perceivers have of sensorimotor contingencies, and a problem with the nomological nature of sensorimotor contingencies.

### **II.1 An Empirical Objection to an Enactive Sensorimotor Contingency Theory: the Problem of Synaesthesia**

An empirical problem that requires further critical exposition from an enactive sensorimotor-contingency theory is the phenomenon of perceptual synaesthetic experience. Color synaesthesia is looked at in the literature, but there are other kinds as well, and it is the neurological condition that occurs when vivid sensations of color are experienced during the

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<sup>39</sup> Ibid., 954.

<sup>40</sup> Ibid.

reading or hearing of words in subjects who possess this condition.<sup>41</sup> Instead of experiencing typical qualitative states in response to visual or auditory-stimulus inputs, synesthetes experience for example the hearing of a word, which simultaneously pairs with a color sensation.

In work by Susan Hurley and Alva Noë on neural plasticity, they address evidence, and proposals for a sensorimotor account of consciousness, which they call in their article, “Neural Plasticity and Consciousness,” the dynamic sensorimotor hypothesis. The dynamic sensorimotor hypothesis can be thought of here as a specification in like manner to O’Regan and Noë’s “A sensorimotor account of vision and visual consciousness.” For Hurley and Noë, the dynamic sensorimotor hypothesis demonstrates on the basis of supporting empirical evidence that changes in qualitative experiences of consciousness depend not just on neural activity related to corresponding brain regions in which those sensations are typically located, but also on embodied activity. Embodied activity for Hurley and Noë is instantiated by patterns of sensorimotor contingencies as they depend on environmental stimuli.<sup>42</sup> Thus, they hold that conscious visual perception also depends upon dynamic patterns of sensorimotor contingencies.<sup>43</sup> Hurley and Noë offer that both changes in qualitative expression, which are qualitative experiences that reflect their sensory inputs, and perceptual adaptation depend on dynamic, modality-specific patterns of sensorimotor contingency, which perceivers have knowledge of and actively exploit as a skillful activity in order to explore and negotiate with their environments.<sup>44</sup>

According to Hurley and Noë in the case of synaesthesia, the visual cortex defers to visual qualitative experience, despite having received input from a new sensory source. In this

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<sup>41</sup> Ibid.

<sup>42</sup> Susan Hurley and Alva Noë, “Neural Plasticity and Consciousness,” *Biology and Philosophy* 18 (2003): 146.

<sup>43</sup> Ibid.

<sup>44</sup> Ibid.

way, the case of the neurological condition of synaesthesia involves intermodal cortical dominance.<sup>45</sup> Hurley and Noë illustrate empirical evidence that supports the automatic, and completely perceptual nature of synaesthetic color experience.<sup>46</sup> For example, they explain a study done by Ramachandran and Hubbard in 2011, in which a different kind of Ishihara test was performed (normally used to test for red-green color blindness) on individuals who saw numerals synaesthetically. The numbers two and five were presented as mirror images of each other, and the numerals were arranged so that the fives made a pattern. Normal color-perceivers could not distinguish the pattern, while the synaesthetes were able to do so, since they saw the two's and fives in different colors; thus, the synaesthetes were able to discern the pattern in the numbers.<sup>47</sup>

This illustration of synaesthetic color perception is important to Hurley and Noë's dynamic sensorimotor hypothesis because it presents a direct challenge in which there is a disconnect between the law-like sensorimotor contingencies that apply cross-modally during the process of perceiver-engaged visual experience, and perception. This disconnect occurs because in this case, "qualia varies independently of sensorimotor facts."<sup>48</sup> That is, the qualitative inputs are not in a one-to-one relation with the sensorimotor contingency laws, but instead the relation between the qualitative input to the sensorimotor contingency laws is one-to-many. According to Jeffrey Gray in "How are Qualia Coupled to Functions?" in this way, there are two distinct, and entirely separate sensory experiences for one peripheral input. Thus, the corresponding neural

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<sup>45</sup> Ibid., 137.

<sup>46</sup> Ibid.

<sup>47</sup> Ibid.

<sup>48</sup> Alva Noë and Susan Hurley, "The deferential brain in action: Response to Jeffrey Gray," *Trends in Cognitive Sciences* 7 (2003): 195.

activity typically paired with the peripheral inputs in synaesthetic color experience does not functionally correspond to that sensory experience.<sup>49</sup>

This creates a problem for the coupling between qualitative states and brain-behavior, as Gray describes Hurley and Noë's hypothesis, or the coupling between the sensorimotor dependencies of experience on qualitative perceptual experience.<sup>50</sup> Noë and Hurley respond to the challenge that synaesthesia presents to the idea that qualitative experience is gained perceptually via the coupling of sensorimotor contingencies by stating that further empirical work needs to be done in order to know whether or not a kind of sensorimotor approach can be applied (as an integrated account) to perceptual consciousness.<sup>51</sup> For this reason, it is clear that Hurley and Noë's dynamic sensorimotor hypothesis faces difficulty for its plausibility when met with the phenomenon of synaesthesia.

Jeffrey Gray takes Hurley and Noë's dynamic sensorimotor hypothesis to be interpreted as functionalism in the case of cortical deference, which occurs when qualitative experience is influenced by sensorimotor-contingent enacted behavior.<sup>52</sup> Hurley and Noë give an example of cortical deference as the following: during blind-persons reading of Braille, their visual cortex is active, although they are experiencing tactile sensory inputs.<sup>53</sup> There have also been multiple studies done which show that when blind persons receive transcranial magnetic stimulation (TMS), as opposed to subjects with typical vision whose visual, but not tactile perceptions are distorted, blind persons' tactile perceptions are distorted.<sup>54</sup> In the case of Braille readers, the

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<sup>49</sup> Jeffrey Gray, "How are qualia coupled to functions?" *Trends in Cognitive Sciences* 7 (2003): 194.

<sup>50</sup> Noë and Hurley, 195.

<sup>51</sup> *Ibid.*, 196.

<sup>52</sup> Gray, 193.

<sup>53</sup> Hurley and Noë, 134.

<sup>54</sup> *Ibid.*, 134.

tactile cortex - normally activated in individuals with typical eyesight during haptic experience - defers to activation of the visual cortex because of the sensory inputs received.<sup>55</sup> In this way, cortical deference demonstrates relevance of sensory inputs as able to effect qualitative character.

## II.2 Implications for Synaesthesia and Enactive Sensorimotor Theories

The general conclusion of both O'Regan and Noë's work on the sensorimotor contingency theory, and Hurley and Noë's work on the dynamic sensorimotor hypothesis is that neural activity and functional representations are not sufficient on their own in determining the character of qualitative experience. If we take Gray's functionalist construction of the dynamic sensorimotor hypothesis to apply adequately to sensorimotor theories, then the problem that synaesthesia presents for the application of sensorimotor theories to conscious perception remains, and threatens the nomological nature of sensorimotor contingencies as they are to constitute visual perception. Gray, as well as Hurley and Noë suggest that if their dynamic sensorimotor hypothesis is a functionalist theory, any phenomenon in which there is two qualitative percepts for one functional input, may not hold true to functionalism. The sensorimotor contingency theory, consequently would appear not to functionally apply across all phenomena given the case of synaesthesia.

To the extent that O'Regan and Noë suggest that the mapping of functions to qualia can be non-isomorphic, synaesthesia then would present no detrimental problem for a sensorimotor contingency theory.<sup>56</sup> O'Regan and Noë are critiquing representationalist views about the mind, however it can be extrapolated that if there is no one-to-one or isomorphic relationship between

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<sup>55</sup> Ibid., 136 (see Figure 1).

<sup>56</sup> O'Regan and Noë, 968.

the neural substrate and qualitative states, then this affects the sensorimotor contingency theory's applicability to the phenomenon of synaesthesia. It does so by allowing the possibility that the laws of sensorimotor contingency can include the ontological relationship in which one functional input produces many qualitative states, or vice versa. Since this is not the way that most normal perception occurs, that is, except in the case of synaesthesia, this idea is on shaky ground from a representationalists' perspective. Consequently, it would be doubtful that the sensorimotor contingency theory could account for perceptual experience.

There is one major issue with this objection. I suggest that this form of objection harkens back to a dispositional, internal, and state-based ideas about conscious experience. If we take the temporal-extendedness of sensorimotor laws seriously, there is no reason why they cannot substantiate a non-isomorphic-based phenomenality. David Silverman notes in "Sensorimotor enactivism and temporal experience" that content itself must be temporally extended in order to couple with a temporally extended vehicle.<sup>57</sup> If content, as Silverman says, "temporally tracks a temporally extended vehicle,"<sup>58</sup> and this accounts for occurrent perception, then perception lacks state-based access to experience, and synaesthesia would be a phenomenon that cannot be described functionally according to a sensorimotor contingency thesis, but may not have to be. That is, a sensorimotor contingency theory's predictive power does not lie in accounting for a kind of input-output matching to qualitative states, but rather in the notion that experience is always temporally extended.<sup>59</sup>

If O'Regan and Noë are correct, then the phenomenon of synaesthesia ought to be able to be described empirically and under the laws of sensorimotor contingency, like any other

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<sup>57</sup> Silverman, 4.

<sup>58</sup> Ibid., 6.

<sup>59</sup> cf. Silverman, 3, 7.



perceptual phenomenon. It would be a mistake to the objection about synaesthesia for the sensorimotor contingency theory as detrimental to an enactivist position, given O'Regan and Noë's argument which puts forward that experience consists of temporally extended knowledge of sensorimotor contingencies,<sup>60</sup> and Silverman's analysis. This brings us to the conceptual objection to O'Regan and Noë's sensorimotor contingency theory, for which, the embodied nature of cognition needs to be explained. This may be the best way to understand the motives behind an enactive and sensorimotor contingency theory, and thus illustrate the theory's epistemological implications for both the nature of consciousness and the empirical and cognitive sciences.

### **II.3 Propositional-Knowledge and Nomological Objections to a Sensorimotor Contingency Theory**

Daniel Hutto, in his article, "Knowing *what?* Radical versus conservative enactivism," brings up the argument that O'Regan and Noë's sensorimotor contingency theory cannot not depend upon skillful, practical knowledge.<sup>61</sup> Hutto iterates this claim by is to drawing the distinction between propositional knowledge and knowledge that is skillful, technical, or practical.<sup>62</sup> Hutto argues that know-how is not described in many of O'Regan and Noë's central claims of the sensorimotor contingency theory.<sup>63</sup> Hutto contests O'Regan and Noë's use of the terms, "knowledge that" when referring to the sensorimotor contingency theory because he argues that this usage relegates the claims they are making to being propositional-knowledge claims, and not practical-knowledge claims, since knowledge "that" something is the case is a

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<sup>60</sup> Ibid., 961.

<sup>61</sup> Daniel D. Hutto, "Knowing *what?* Radical versus conservative enactivism," *Phenomenology and the Cognitive Sciences* (2005): 398, 401.

<sup>62</sup> Ibid., 389-390.

<sup>63</sup> Ibid., 401.

kind of statement that entails justified true belief, and not the explication of a technique or skill.<sup>64</sup> Hutto states that instead, O'Regan and Noë's unacknowledged use of propositional knowledge causes their theory to fall back onto endorsing inner mental representations, and thus Hutto argues that O'Regan and Noë lose their central argument.

For Hutto then, O'Regan and Noë's sensorimotor contingency theory cannot be constituted by knowledge or skillful mastery.<sup>65</sup> Hutto states that O'Regan and Noë's claim that the qualitative nature of perceptual consciousness can be accounted for by the conceptualization of visual consciousness as being constituted by the perceiver's capacities to interact with the environment<sup>66</sup> cannot consist of knowledge, practical, or propositional because 1) it would fall back onto a representationalist paradigm<sup>67</sup> and 2) because practical knowledge of perception cannot be taught, in that perception is not a learned skill.<sup>68</sup>

Hutto also takes issue with the idea that sensorimotor contingencies are law-like, or nomological in nature.<sup>69</sup> He states that once laws are posited as entities, they need to be prescriptive and normative, and those that involve sensorimotor contingencies are neither of the two.<sup>70</sup> He argues this is the case because the *mastery* of sensorimotor contingencies needs to account for what ineffectual accomplishment of executing sensorimotor coupling might entail.<sup>71</sup> Hutto holds that sensorimotor contingencies are not laws because there is no counter-account of them. In other words, Hutto argues that O'Regan and Noë's proposed sensorimotor contingency

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<sup>64</sup> Ibid., 391, 392, 397-398.

<sup>65</sup> Ibid., 398.

<sup>66</sup> O'Regan and Noë, 1021.

<sup>67</sup> Hutto, 390, 393.

<sup>68</sup> Ibid., 397.

<sup>69</sup> Ibid., 394.

<sup>70</sup> Ibid., 394, 399.

<sup>71</sup> Ibid., 394.

laws are not normative since they provide no account for what perception would be if the rules failed.<sup>72</sup> Rather, Hutto states that “bodily behavior” is not determined by laws, but that the character of perceptual experience can be determined by the response of the different sensory modalities to specific objects.<sup>73</sup> Hutto also argues that the only way for perceptual experience to occur would be to subtract the “knowledge of” something from a sensorimotor contingency theory, and instead suffice with the more minimal claim that perceptual experience is determined by the character of the reaction of different sensory modalities to external objects.<sup>74</sup>

I offer that this is a highly semantic interpretation of the sensorimotor contingency theory, and disregards the scientific and metaphysical account that O’Regan and Noë are offering, which is that sensorimotor laws are the physical changes that occur when a perceiver, whose knowledge more or less, constitutes innate abilities *to* perceive, interacts with the environment. The sensorimotor laws are just the way an individual interacts with the environment, given what her perceptual modalities are capable of. Additionally, O’Regan and Noë’s sensorimotor contingency theory is not incompatible with Hutto’s suggestion about contentless interaction. The sensorimotor laws on O’Regan and Noë’s account are instantiated by a perceiver’s response to her environment.

Hutto lastly claims that instances of sensorimotor coupling do not coincide with continuous temporal experience, and this is another reason why he suggests that knowledge be removed entirely from their thesis, since having knowledge he argues, necessitates the idea that having an experience can be understood as a series of discrete synchronic events,<sup>75</sup> although he

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<sup>72</sup> Ibid., 394-395.

<sup>73</sup> Ibid., 395.

<sup>74</sup> Ibid.

<sup>75</sup> Ibid., 399, 400.

further elaborates that this will leave them with a weak theory.<sup>76</sup> Instead, Hutto offers that what O'Regan and Noë's sensorimotor contingency theory allows for is an empirically supported refutation of the idea that experience is constituted by the formation of passive, internal representations of outer scenes.<sup>77</sup>

Hutto's claim that knowledge is not needed for conscious experience is based on the idea that experiences cannot be accounted for on a dispositional-like schema. If one has knowledge, Hutto claims, then it delimits the possibility of change in perception in the future, and of continuous, or recurrent temporal experience, and thus occurrent perceptual experience.<sup>[78][79]</sup>

Hutto and Myin address this problem in *Radicalizing Enactivism* by proposing that we can have perceptual consciousness without any kind of content, and call this radical enactivism.<sup>80</sup> They also deny the vehicle/content distinction,<sup>81</sup> and propose that perception is constituted by patterns of perceiver-activity as they are situated environmentally.<sup>82</sup> Hutto and Myin's solution to the objections they present to a sensorimotor contingency theory is that perception is made up of perceivers' patterns of activity between them and the environment: nothing more and nothing less.<sup>83</sup>

For these reasons, I argue that we can solve Hutto's claims by looking toward an account that answers these objections. We can take up Varela, Thompson, and Rosch's embodied cognition theory, and enactivism in order to understand the theoretical basis of a sensorimotor

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<sup>76</sup> Ibid., 401.

<sup>77</sup> Ibid., 402, 404.

<sup>78</sup> Hutto, 398-399.

<sup>79</sup> Daniel D. Hutto and Erik Myin, *Radicalizing Enactivism* (Cambridge: The MIT Press, 2013), 29.

<sup>80</sup> Ibid., xiii, 151.

<sup>81</sup> Ibid.

<sup>82</sup> Ibid., 11.

<sup>83</sup> Hutto and Myin, 11.

contingency theory that can be found in embodied cognition. Embodied cognition is such that the body and mind are brought together, where reflection is experiential, performative, and mindful.

<sup>84</sup> I offer that understanding the embodied cognition aspect of an enactivist theory demonstrates the value of an enactivist theory, which is especially concerned with guiding future cognitive science research to a more unified view of phenomenology and cognition.

### III. Embodied cognition

I suggest that there is more to take away from O'Regan and Noë's sensorimotor contingency theory than the metaphysics of enactivism that Hutto and Myin propose as a solution in *Radicalizing Enactivism*. Specifically, I take a pragmatic stance with O'Regan and Noë's enactive sensorimotor contingency theory, and suggest that the ideas of embodied cognition illuminate the theory's value. For this reason, we should look to Varela, Thompson, and Rosch's definition of enactivism, and then the epistemological implications of enactivism can be illuminated.

Varela, Thompson, and Rosch describe enactive cognitive science as a paradigm instantiated by the mindfulness/meditation tradition.<sup>85</sup> O'Regan and Noë's sensorimotor contingency theory is compatible with Varela et al.'s theory of how perception can occur: that is, via a coupling of the perceiver's sensorimotor and environmental structures.<sup>86</sup> For Varela et al., cognition is embodied, which means it depends on structural couplings, or sensorimotor couplings.<sup>87</sup> They suggest that the implications that this has on cognitive science research is such

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<sup>84</sup> Francisco Varela, Evan Thompson, and Eleanor Rosch, *The Embodied Mind* (Cambridge: The MIT Press, 1993), 27.

<sup>85</sup> Varela, Thompson, and Rosch, 31, 246.

<sup>86</sup> *Ibid.*, 173, 180.

<sup>87</sup> *Ibid.*, 206

that if cognition is thought of as environmentally dependent,<sup>88</sup> and human experience, broadly, is consequently selfless, or open-ended, then we can rid ourselves of absolutist views in empirical research.<sup>89</sup> Instead we can view experience as lived and shared, which can create liberating transformation in the natural and social sciences.<sup>90</sup> The epistemological implication of Varela, Thompson, and Rosch's embodied, or enacted cognition is that knowledge is a lived experience. Knowledge is not preexistent, but is constructively formed, and shapes the existing world, through historical couplings.<sup>91</sup> Varela puts forward that "histories of structural coupling are amenable to scientific investigation," but have no fixed or permanent substrate,<sup>92</sup> thus they are "groundless," or are constructively formed, and can be apprehended most clearly through mindfulness perspectives towards cognitive science and phenomenal consciousness.<sup>93</sup> For Varela et al., this also includes a Buddhist approach to philosophy of mind and cognitive science.

One of the important epistemological implications of Varela's embodied cognition is the "groundlessness" of subjectivity.<sup>94</sup> Varela supports the notion that there is a unity, or oneness between organisms, or perceivers, and the environment.<sup>95</sup> For Varela, Thompson, and Rosch, we need to take into consideration, about consciousness the "middle way," or philosophies of the Buddhist tradition, which entails a kind of egolessness.<sup>[96][97]</sup> Varela, Thompson, and Rosch present these ideas as a kind of pragmatic ethical approach to cognitive science that often is not

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<sup>88</sup> Ibid., 207.

<sup>89</sup> Ibid., 235.

<sup>90</sup> Ibid., 235, 246, 253-254..

<sup>91</sup> Ibid., 179, 207.

<sup>92</sup> Ibid.

<sup>93</sup> Ibid., 224, 235.

<sup>94</sup> Ibid., 217.

<sup>95</sup> Ibid.

<sup>96</sup> Ibid., 220-221.

<sup>97</sup> 247, 249, 251.

approached in these terms.<sup>98</sup> Instead, theories of mental representation assume a sort of divide between the phenomenal and the cognitive aspects of the mental. Varela, Thompson, and Rosch in *The Embodied Mind* urge the enlargement of horizons of sciences about the mind.<sup>99</sup> They argue that the ideas from mindfulness traditions can illuminate new ideas about the presupposed divide between phenomenal and cognitive experience.<sup>100</sup>

To me, it seems that we have an old way of understanding the ontology of the relationship between the mind and body, expressed in a new way, given Varela, Thompson, and Rosch's account. The theoretical context of a sensorimotor contingency theory within an embodied and enactivist account of conscious experience, I suggest, is pragmatically valuable for research endeavors. In comparison to Hutto's metaphysical thesis about basic minds without content, I argue the pragmatic theory of embodied cognition offered by Varela Thompson and Rosch highlights the purposes of a sensorimotor contingency theory. I argue that the embodied cognition offered by Varela Thompson and Rosch is a way of understanding theories that fall in within the scope of enactivism that provides ideas for new research avenues, and this is valuable. I suggest that the benefits of an enactive or embodied theory of perception stem mostly from the idea that it suggests further research directions for perception. From what I can tell, we find that in Varela et al.'s embodied and enactive cognition theories regarding mindfulness/meditation and Buddhist traditions.

I argue this is the best way to address the conceptual problems that Hutto brings up for O'Regan and Noë's sensorimotor contingency theory. By looking to Varela, Thompson, and

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<sup>98</sup> Ibid., 228, 234.

<sup>99</sup> Ibid., xv.

<sup>100</sup> Ibid., 254.

Rosch's work on enactive cognition, there is opportunity to guide scientific research.<sup>101</sup> The notions of embodiment are foundational to the motivation behind an enactivist sensorimotor contingency theory, and have pragmatic value that can be best illuminated by Varela, Thompson, and Rosch's original ideas about experience and embodiment.

*Conclusion.* I presented O'Regan and Noë's sensorimotor contingency theory, and then I offered two critical objections to a sensorimotor contingency theory- one concerning the phenomenon of synaesthesia, and the other concerning the problem of perceiver-based knowledge for perceptual experience. These objections, I hold, are shown here to have less argumentative force when analyzed comparatively in the broader framework of the history of enactivism and contextualized in the surrounding ideas about the embodied nature of cognition.

The phenomenon of synaesthesia was shown compatible with sensorimotor coupling because of the temporally extended nature of both the content and vehicles of perception in sensorimotor coupling. The problems that Hutto presented for the sensorimotor contingency theory were that the theory falls back onto a representational paradigm about the mental because of the skills or knowledge one uses to physiologically enact sensorimotor laws. I then argued that context of enactivism, which has its foundations in Varela et al.'s embodied cognition and mindfulness traditions, needs to be addressed in order to understand the value and uses of a sensorimotor approach in further research. Conceptually and contextually framing a sensory motor contingency theory theories in embodied-cognition base emphasizes the theory's value for future scientific research and cognitive science research regarding both the nature of the mind

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<sup>101</sup> Ibid.



and perceptual consciousness. This is arguably the most productive way of understanding an enactive sensorimotor contingency theory.

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