during hallucination or dreaming, amounts to a *fundamental* difference in the nature of experience. Thus, in cases of hallucination, dreams, and so on, the capacity for sensorimotor activity may be sufficient for experience "as of" an apple, in the absence of a concurrently present apple, although some apple or apples previously encountered play a necessary, but indirect, causal role in producing the illusory experience.

« 8 » Lastly, I am mindful of Susan Hurley's comments on the causal-constitution debate: "If extended multidimensional dynamic patterns provide the best explanation of quality type in some cases, why assume that external dimensions are merely causal while internal are constitutive?" (Hurley 2010: 126). She also advocates the adoption of a bottom-up approach, guided by the explanatory value of psychological accounts. (I note that Beaton's account does just this, in drawing on empirical research.) At the same time, I share Fred Dretske's concerns about the false dichotomy, widespread in the literature on philosophy of mind and action, between internal and external causes of action. Dretske (1988: 22) says that there is "no hard and fast line separating internal from external causes," and that "by tracing the causal sequence far enough back in time, one can, sooner or later, find external causes for *every* change or bodily movement." The boundaries thus become blurred in causal explanation, depending on how causes are individuated, and distinctions break down. This leads me to question, by analogy, whether what is or is not a constitutive part of perceptual experience might sometimes be relative to individual, context-dependent conceptualisations and/or indeterminate, or whether it might be contingent upon coherence with some further (psychological or other) account of perceptual experience.

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How Far Can Sensorimotor Direct Realism Go?

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> Upshot • The target article convincingly argues in favor of the idea that the sensorimotor account of perception provides a positive scientific context for direct realism. In some cases, however, perception and experience do not seem to fit easily with sensorimotor direct realism. This raises a question of scope that requires further elaboration.

« 1 » In his target article, Michael Beaton convincingly argues in favor of the idea that the sensorimotor account of perception provides a positive scientific context for direct realism. Beaton's central claim is that, according to the sensorimotor account, perceiving consists of engaging in sense-making interactions with the world, through which sensorimotor couplings are established. The practical understanding (the "mastery," which does not require explicit knowledge) of these couplings is the same thing as perceiving. The perception of an object or an event is an action, is the very fact that an agent is realizing a sensorimotor coupling with that object or event.

« 2 » Beaton argues that, in this conception, there is no need to postulate that perception is mediated by an (internal) representation of the (external) world. Agents *directly* perceive the apple by interacting with it, they do not perceive a representation of the apple. Moreover, the sensorimotor account vindicates a form of perceptual realism insofar as what is perceived – the couplings – are *real* structures in the sense of being open to third-person objective scientific examination. As a result, the sensorimotor account of perception carries on a form of direct realism.

« 3 » As Beaton appropriately emphasizes, direct realism should be distinguished from naïve realism, i.e., the idea according to which the object of perception is mind-independent. By construction, indeed, the sensorimotor account claims that what is perceived is co-constituted by the agent, which does not have access to an independent reality: therefore, the account is realist, direct, but not naïve. In this respect, it integrates insights coming from both realism and constructivism, without contradiction.

« 4 » I find the core theoretical framework philosophically compelling and scientifically fecund. Yet, it seems to me that sensorimotor direct realism still has to deal with several challenges that all have to do with its *scope*, i.e., the set of capacities and phenomena to which it is supposed to apply. Indeed, there are cases of perceptions and experiences that do not seem to fit easily with the sensorimotor account and specifically with its version in terms of direct realism. In the target article, Beaton does discuss most of these cases, but I think that these issues require further elaboration in order to assess adequately the prospects of the theory.

Non-veridical experiences

« 5 » The first set of uncooperative cases includes what Beaton labels "non-veridical experiences," i.e., all those experiences that do not correspond to perceptions of present objects, such as imaginations, hallucinations, illusions, or dreams. Non-veridical experiences are supposed to be a challenge for direct realism insofar as they occur in the absence of the "real" object.

« 6 » One straightforward way of handling these cases would be to restrict the application of sensorimotor direct realism to veridical experiences, i.e., to perception. Sensorimotor direct realism, one could argue, is a theory of perception, not a general theory of cognition. As a consequence, it might be the case that while perception does not involve representations, other cognitive capacities do.

« 7 » Beaton seems to adopt a different strategy. He does emphasize the differences between veridical and non-veridical experiences, the former being, among other things, "richer" than the latter in the sense that they continuously transcend us, outrun us, and surprise us. This seems to me well taken, although Beaton wants to maintain that sensorimotor direct realism would *also* be able to account for non-veridical experiences. According to him, the sensorimotor structures underlying such experiences are

different, and yet "relevantly similar" to those involved in perception.

« 8 » In my view, this line of thought is problematic insofar as it seems to lead to the idea that non-veridical experiences also rely on sensorimotor couplings. But how should these couplings be understood in these cases? In veridical perception, the meaning of the two terms to which the "sensorimotor" term makes reference, at least to a first approximation, is clear: "sensory" refers to the sensations impinging on our organism, while "motor" is about the movements made by the same organism. What kind of sensorimotor couplings would be established in the case of non-veridical experiences? Either there are none, or the meaning of the concept is stretched and altered so as to become applicable: in both cases, I think that sensorimotor direct realism is in serious trouble with regards to these capacities. A clarification and probably a theoretical development seem mandatory.

« 9 » The trouble goes even deeper, for the following reason. Even if it were able to provide a convincing explanation of non-veridical experiences, sensorimotor direct realism should still explain how an agent could be able to establish the "relevant similarities" mentioned above without invoking some kind of representation. If an agent knows that she is currently imagining an apple, that is because she is comparing the (supposed) ongoing sensorimotor coupling with a different one that she would have experienced in perceiving an apple. But this second coupling is not realized, it is merely potential. So with what kind of structure is the agent comparing the ongoing mental image of the apple?

« 10 » As for the cases discussed below, non-veridical experiences raise, therefore, the question of the scope of sensorimotor direct realism. Should it be understood as a theory of perception, while a broader version of the sensorimotor account, which would presumably include some form of representation, would apply to non-perceptual experiences? I would like to underscore that, although it would include representations, such a broader sensorimotor account would still be original and innovative with respect to classical representationalist approaches, insofar as it would shift the focus onto *sensorimotor* representations, in conformity with its inherent interactive and constructivist dimension.

Perceptions relying on potential sensorimotor couplings

« 11 » A second set of recalcitrant cases are those in which perception (i.e., veridical experience) does not seem to rely on the mastery of ongoing sensorimotor couplings. A relevant example is discussed by Beaton in §8 of the target article. There, he discusses the situation in which an agent perceives that a distant tree has the same size as a closer tree. As Beaton explains:

> "In seeing a distant tree to be the size that it is, one is understanding (practically) that if one moved closer to it, then the reaching and looking movements necessary to delimit its shape would be exactly the same as those required to delimit the shape of a closer tree of its size." (§8)

« 12 » This explanation sounds convincing from a general sensorimotor perspective, but it seems at odds with its interpretation in terms of direct realism. The reason is that an actual, ongoing perception (the distant tree being as big as the closer tree) would consist of the mastery of a potential, non-ongoing sensorimotor coupling (the way in which the shape of the distant tree *would* change with the reaching and looking movements): the agent perceives even though she is not engaged in an interaction with the environment. In a first approximation, this is in conflict with the definition of perception given at the beginning.

« 13 » As with the non-veridical experiences discussed above, it seems that sensorimotor direct realism has difficulties in accounting for these perceptual capacities. In §§41f, Beaton does advocate the idea that sensorimotor direct realism could pertinently apply to perceptions relying on potential sensorimotor couplings and, more generally, to perceptions relying on counterfactual situations. In my opinion, however, his argument is not compelling precisely because it does not deal with the main issue, which is the *hiatus* between an ongoing perception and a potential coupling.

« 14 » If the agent is not actually (here and now) engaged in a sensorimotor interaction, then sensorimotor direct realism implies that she does not perceive, by definition. Perception *is* engaging in sensorimotor interactions. Vice-versa, if one wants to maintain that there is indeed perception, then it remains unclear how sensorimotor direct realism can consistently account for it. Again, one solution would be to redefine the scope of the sensorimotor direct realism even *within* perceptual capacities. If their advocates do not want to follow this path, then additional justifications seem to be required.

Non-sensorimotor perceptions

« 15 » The third and last set of noncompliant cases are those perceptual situations that do not seem to rely on sensorimotor couplings at all. These cases constitute a general and classical objection to the sensorimotor theory as a whole (and particularly to its constructivist dimension) and not just to his interpretation in terms of direct realism. As a matter of fact, there seem to be perceptual experiences that do not require being engaged in a sensorimotor coupling. Consider the case of a person who is listening to music with headphones. In this situation, she is actually perceiving the music even though there is no coupling between the sensations and her movements: the sensations do not vary with the movements, the two being completely decoupled. More generally, hearing does not seem to require sensorimotor couplings as a necessary condition, at least in humans.

« 16 » Again, it might be possible to apply the sensorimotor account to these cases by broadening the meaning of the term "sensorimotor," for instance by claiming that when one listens to music with headphones, there is a sensorimotor coupling between sensations and, say, brain dynamics. Yet that could be not just an extension but probably a useless dilution of the approach, which would lose its specificities and explanatory power. Beaton does not explicitly deal with these cases in the target article. Yet it seems to me that any sensorimotor theory of perception and experience should make explicit whether and, at least tentatively, how it intends to include them within the framework. That would greatly enrich the theory and avoid useless debates.

Conclusion

« 17 » Beaton's article convincingly argues in favor of a sensorimotor-centered direct realism in perception. There are a number of situations in which perceptual capacities could be adequately explained in terms of the engagement of an agent in sensorimotor couplings with the world, without appealing to representations. Yet my comment was aimed at raising one main question: How far can sensorimotor direct realism go? As a matter of fact, the sensorimotor theory seems unable to account for some kinds of perceptions and experiences, while embracing direct realism. That raises an issue of scope that calls for further elaboration.

« 18 » I can envision two strategies for taking up the challenge. Either the scope of sensorimotor direct realism is restricted to (some kind of) perceptual experience, which raises the question of whether the sensorimotor theory should embrace some (original) form of representationalism to account for the cases in which direct realism does not apply. Or an adequate justification is provided to show how sensorimotor direct realism can apply to difficult situations and, thereby, that it constitutes a general theory of experience. Both strategies could be pursued; let us see how the philosophical and theoretical debate, hopefully nourished by future experimental results, will deal with them in the future.

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Author's Response
The Personal Level in Sensorimotor Theory

Michael Beaton

> Upshot • I offer responses to the commentaries on my target article in five short sections. The first section, about the plurality of lived worlds, concerns issues of quite general interest to readers of this journal. The second section presents some reasons for rejecting "enabling" as well as "constitutive" representational approaches to understanding the mind. In the remaining three sections, I clarify aspects of sensorimotor direct realism relating to the self, qualia, counterfactuals, and the notion of "mastery."

An introductory comment

« 1 » I wish to thank the authors of the commentaries for their thoughtful and helpful responses to my target article. It is pleasing to note that the commentators were overall rather sympathetic towards my proposals, even though I presented a philosophical and scientific approach to perception that is very different from that taken in most mainstream cognitive science today.

The plurality of worlds

« 2 » I would like to thank John Stewart for a particularly careful commentary. His points are well-made and well-taken; I would not have been able to make them myself in the same way, and they complement my target article well. Nevertheless, I wish to try to defend myself on the points at which Stewart quite rightly pushes me.

« 3 » Stewart is correct that the *umwelt* of a tick and the *umwelt* of an oak tree are quite different from each other (§2), and that neither will ever see the world as the other sees it. Nevertheless, I would suggest that this is a cognitive limitation of oak trees and ticks that is not sufficient to show that these two forms of life do not, in fact, share a world. Two issues are raised at this point: whether agents share a world, and whether or not they are aware that they do. I will address the latter issue first.

« 4 » A seagull has a quite different *umwelt* from mine, yet it sees me as an agent, as I do it: it understands at least some of my motivations (though it misunderstands others), as I do its. Does a tick, or an oak tree, view me as an agent? I suppose not. Do at least some insects view me (at least implicitly, at least some of the time) as an agent, given the way in which some of their responses to me are structured (albeit that these are evolved, not learnt, action structures)? Yes, I suspect so. Do many higher animals view me as an agent, as I do them? Yes, certainly. When agents can manifestly see each other *as* agents (which certainly seems to be the case as between us and many higher animals), I think there must be less objection to the claim that they and we share a world, in some important sense.

« 5 » However, even in the case of the tick and the oak tree, where they certainly cannot see each other as agents, I do not think that their worlds are completely incommensurable with one other. They each have a world structured around basic positive and negative valence, at the least, as does any agent. My target article concentrated mainly on human experience. Stewart has said more, and better than I could, about the experience of much simpler beings.[1] Nevertheless, I persist in the claim that, in the end, the tick, the oak tree, and I all live in the same, shared, world;[2] despite that fact that we experience very different parts of it, very differently; and despite the fact that not all of us can recognise that we do share a world. I think that this claim is compatible with (indeed, follows from) the otherwise somewhat relativist and idealist tone of my approach, precisely because I think there is *some* overlap between the mental lives[3] of

1| However, I suspect that Jakob von Uexküll's description of the tick, which Stewart endorses (§2), probably radically underestimates the behavioural range of the tick (I suspect that Stewart might agree, however).

2| Indeed, it seems that von Uexküll might agree, given that he uses the metaphor of partially overlapping soap bubbles for his *umwelten* (von Uexküll 1957: 29).

3| Of course, overlap between mental lives only entails overlap between worlds on a view in which the shape of mental lives determines the shape of worlds, but that is exactly the view that I, Stewart and von Uexküll endorse.