Anthony Chemero

Sensorimotor Empathy

Abstract: *The role of knowledge has long been seen as problematic in the sensorimotor approach to experience. I offer an amended version of the sensorimotor approach, which replaces knowledge with what I call 'sensorimotor empathy'. Sensorimotor empathy is implicit, sometimes unintentional, skilful perceptual and motor coordination with objects and other people. I argue that sensorimotor empathy is the foundation of social coordination, and the key to understanding our conscious experience. I also explain how sensorimotor empathy can be operationalized and studied in the lab, in terms of interpersonal synergies.*

1. Introduction

In this paper, I will outline a theory of the grounding of experience that falls into the tradition of anti-intellectualists like Ryle, Merleau-Ponty, and Gibson, a tradition that denies that our experience depends upon mentally represented knowledge of the world. I will then offer some empirical results suggesting that this might be the right way to understand the grounding of experience. Since the sensorimotor approach to experience, first described by O'Regan and Noë (2001), aims to do the same thing, I will frame the discussion of my preferred approach in part by contrasting it with the sensorimotor approach.

Let me begin by saying that there is a lot to like about the sensorimotor approach. First, it places itself in a lineage of the twentieth century's anti-intellectualist Hall of Fame. In their original paper on the sensorimotor approach, O'Regan and Noë cite Ryle and Gibson, among others, as important historical antecedents to their view; later, Noë cites Merleau-Ponty as an inspiration (2009). Second, it is inspired in part by some of the most striking psychological

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phenomena of the late twentieth century, including O'Regan's own research on change blindness. Third, and not surprising, given what I have just recounted, it is appropriately sceptical about the explanatory value of mental representations. Fourth, one of the formative moments in my own intellectual history, pushing me towards scepticism about the explanatory value of mental representations, was reading a paper by O'Regan (1992) early in my time in graduate school. However, there has also always been something troubling about the sensorimotor approach to experience. The troubling aspect can be seen in this brief exposition of O'Regan and Noë's 'central idea':

> The central idea of our new approach is that vision is a mode of exploration of the world that is mediated by knowledge of what we call sensorimotor contingencies. (O'Regan and Noë, 2001, p. 940)

The troubling aspect is right there. There seems an obvious contradiction between the anti-intellectualist aims of the sensorimotor approach and the idea that vision, and other senses, is mediated by knowledge of sensorimotor contingencies. For one thing, the term 'mediated' indicates something between the experiencer and the experienced, presumably some kind of mental representation. For another, that mediator is a kind of knowledge. Even worse, it seems like you need knowledge of counterfactuals, of what would happen if you moved in a particular way. This hardly seems anti-intellectual. Indeed, it seems straightforwardly Kantian: you can't have the kinds of experiences we have without a particular kind of knowledge. Although one might try to account for this knowledge as a kind of know-how or skill, recently Noë at least (2012; 2015) has embraced a Kantian understanding of the sensorimotor approach.[1]

In what follows, I will try to give a more properly anti-intellectualist account of what is required for us to have the sort of experiences we do. To foreshadow, it will be partly a matter of having sensorimotor skills, so potentially acceptable to O'Regan and Noë, but also of actively engaging those sensorimotor skills. The view I outline will draw heavily on ideas from Merleau-Ponty. It will also intersect with the debates over extended cognition, but move beyond them to talk about extended, multi-person cognitive systems.

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[1] In his contribution to this volume, Noë points to ways in which his views have diverged from O'Regan's in the decade-plus since their original collaboration.

2. Phenomenology versus the Sensorimotor Approach?

What is required to have the sorts of experiences and thoughts that we have? One answer, the one proposed by Descartes, is that we need a rational soul that interacts with~~out~~ the material world through our pineal glands. Contemporary cognitive scientists have tended to answer this question by claiming that we need a particular kind of brain: a brain that is a kind of computer, and minds that are computational manipulations of representations in that computer. These computational manipulations are essentially a materialist version of the Cartesian rational soul. In both cases, it is a matter of having certain rational, conceptual, mental abilities. The sensorimotor approach correctly rejects this, but, as I have suggested above, it isn't clear that the replacement on offer goes far enough in rejecting the intellectualist and cognitivist approaches.

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The phenomenological philosopher Maurice Merleau-Ponty gave a very different answer to this question. His answer is that the foundational requirement for having the sorts of experience we have is *the lived body*. Perceiving, experience, and thinking, according to Merleau-Ponty, are essentially embodied activities, the human mind in general is necessarily bodily, or 'incarnate'. The lived body opens up the possibilities that make up the world. We do not entertain these possibilities mentally, by thinking about them or imagining them. Instead, we are open to them by engaging the skills and habits of the lived body. Merleau-Ponty calls our constant readiness to deploy those skills the 'body schema'. It makes the world intelligible and hence constitutes the possibility of relating to objects and regions within it. Body schema similarly prefigure the possible experience of the world around us. A body schema consists of the body's readiness to deploy its habits and skills in every possible situation and thereby opens up the possibilities that give a situation its significance. So, for instance, our skills of reaching and grasping give form to objects that we encounter as within our reach and as graspable. Our basic motor skills, as well as our more involved culturally inflected habits, place us in an environment that consists of things to be done, objects to be manipulated. Unlike in the Cartesian understanding, the mind is not a separate substance that mysteriously interacts with a mechanical body. Consciousness is essentially incarnate. To be conscious is to be embodied. 'The union of the soul and the body is not established through an arbitrary decree that unites two mutually exclusive terms, one a subject

and the other an object. It is accomplished at each moment in the movement of existence' (Merleau-Ponty, 1962, p. 91).[2]

There is much that can be said about this alternative understanding of the foundation of our mental lives. For current purposes, the two key consequences concern the role of action and the malleability of the body. In this section, we will focus on the former; the next section will focus on the latter.

Notice that although Merleau-Ponty suggests that the kind of lived body we have is necessary for the kind of experience we have, it is also clear that it is not sufficient. The lived body, our skills and habits open up the world for us, but experiencing requires being incarnate, which is to say, actually engaging those skills in interacting with things around us. This contrasts with the sensorimotor approach, especially as originally stated. We don't experience the tomato as being a three-dimensional object (Noë, 2004) or the sponge as being spongy (O'Regan, 2011) in virtue of knowing what would happen if we were to decide to explore the tomato or sponge. We also don't experience the backside of the tomato or the sponginess of the sponge in virtue of just exploratory skills or know-how either. We have to actually engage those skills in exploring the tomato or sponge. Consider that you cannot distinguish between a cardboard cut-out and an actual tomato in a photograph, despite your skills. Nor can you distinguish between them in the room with you without moving your eyes and head. A real tomato will reveal more of itself as you move with respect to it; a cardboard cut-out will not. To experience a tomato as a tomato, you have to actually engage your skills at exploration.

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Given the cited Rylean and Gibsonian inspiration for the sensorimotor approach, I am going to assume that sensorimotor theorists will take this as a friendly amendment. The amendment is Rylean in that it notices that a good deal of our perceptual and mental terminology consists of success verbs: seeing is successful looking; hearing is successful listening; understanding is successful thinking; etc. (Ryle, 1949/1984). It is the 'verb' component of 'success verb' that is key here. According to the sensorimotor approach, experiencing is something that we do, not something that happens to our brains.[3] The amendment is Gibsonian in that it places flows, rather than punctate

2 Merleau-Ponty's views are described in great detail in Käufer and Chemero (2015).

3 I have not confirmed this, but I would wager that this claim appears in every one of Noë's writings.

events such as images, as the main information used to experience. Gibson (1979) noticed that the apparent poverty of visual stimuli disappears with movement, and stressed the unimaginable volume of information available to a moving animal. The sponginess of the sponge is apparent in the compression and expansion in response to our manual explorations; the three-dimensionality of the tomato is apparent in the revelation of more of its parts as we move our eyes and bodies around it. In fact, this is a consequence of the fact that experiencing is something we do, rather than something that happens to us. Doing things take time, after all, and we are always moving. If seeing the tomato takes time, our eyes and bodies will have moved, at least slightly, in that time. Thus, the amendment I offer is intended to be friendly, and perfectly aligned with the spirit, if not always the letter, of the sensorimotor approach. Experience is not mediated by sensorimotor knowledge, however that is understood. It requires embodied skill, which might be a kind of knowledge, but embodied skill alone is not enough. We must be engaging those skills.

3. Synergies and Extended Cognition

Another important feature of this friendly amendment is that it implies that lived bodies are malleable. In fact, Merleau-Ponty himself had argued for malleability of the lived body, with his long discussion of the experience of a blind person using a cane to explore the environment (1962). The blind person's lived body changes when he or she is carrying the cane, so that he or she doesn't experience the cane in his or hand, but the world at the cane's tip. When this happens, the blind person's body schema and, therefore, experience changes. Merleau-Ponty calls this 'changing our existence by appropriating fresh instruments' (*ibid.*, p. 166). In doing so, he moves beyond the body, to what is now called 'extended mind' or 'extended cognition' (Clark, 1997; Clark and Chalmers, 1998; Chemero and Silberstein, 2008; Chemero, 2009; Wagman and Chemero, 2014; Favela and Chemero, 2015). A cognitive system is extended whenever it is in part constituted by things outside the biological body. In Merleau-Ponty's example, the lived body that experiences the environment is partly constituted by the cane.

The phenomenology of the lived body and the thesis of extended cognition will be intuitively appealing to some readers, but others will be left cold. After all, they contradict the long-standing and scientifically fruitful cognitivist approach to understanding the mind.

However, there have been several recent movements in the cognitive sciences aimed at establishing the empirical *bona fides* of extended cognition and the phenomenology of the lived body.

The key to this is to be able to gather evidence that human–tool systems form synergies, temporary collections of parts constrained to act as a unit. The concept 'synergy' being used here has nothing to do with business or commerce, but rather is drawn from twentieth-century advances in the physics of far-from-equilibrium, complex systems (Haken, 2007; Anderson, Richardson and Chemero, 2012). In a synergy, energetic and/or chemical constraints are applied to a system, causing some of its components to form units that work together. A laser, for example, is a synergy. In a laser, large amounts of energy constrain photons so that they coordinate their behaviour with one another over long spatial and temporal scales. The whirlpool that forms when you flush the toilet is another synergy, in which a potential energy gradient (from the release of the water in the tank) constrains water molecules to act as a temporary unit. Cells are synergies; organs are synergies; organisms are synergies. See Figure 1. The top portion of the figure depicts a set of components as separate from each other, for example a collection of water molecules in a toilet. The middle portion of the figure depicts constraints among some networks of those components, so that the connected molecules will behave collectively. The bottom portion depicts the synergy: constraints acting on the already constrained networks of molecules so that a coherent collective pattern of activity (a whirlpool) emerges.

For the past several years, several colleagues and I have been arguing that some human–tool systems, like Merleau-Ponty's cane user, are synergies. As such, they form a temporary unit that behaves in coordination, as a single unified system. This is direct empirical confirmation of the hypothesis of extended cognition. I will not rehearse the arguments and evidence here, but refer the interested reader to Dotov, Nie and Chemero (2010), Anderson, Richardson and Chemero (2012), Dotov and Chemero (2014), Wagman and Chemero (2014), de Oliveira and Chemero (2015), Chemero (2015). Instead, I wish to push the idea further, suggesting that there are not just human–tool synergies, but also human–human synergies. Doing so will help to flesh out the amended version of the sensorimotor approach I have recommended.

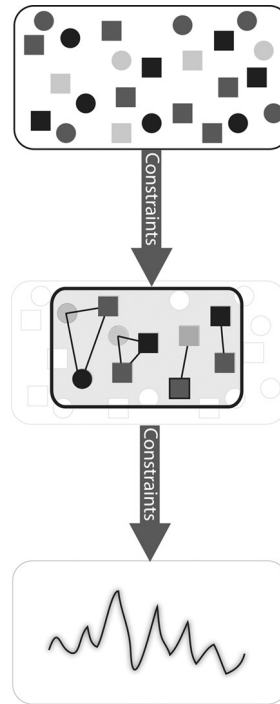

Figure 1. Courtesy of Mike Riley.

4. Two Kinds of Empathy

I want to suggest that the way to characterize the malleable boundaries of the lived body is in terms of a kind of empathy. As philosopher Joel Krueger points out (2013), 'empathy' does not have a long history as an English word: American psychologist E.B. Titchener introduced the word as a translation of psychologist Wilhelm Wundt's German '*einfühlung*', literally 'feeling-into'. The German word had been used originally to describe the feelings invoked by works of art. Only later was the usage of the term expanded to refer to feeling-into other humans, the phenomenon now more commonly called 'empathy'. The word 'empathy' has indeed come a long way from this initial sense of feeling-into. In current usage by psychologists and philosophers of mind, 'empathy' refers to (1) knowing that another person is having feelings, (2) knowing what those feelings are like, and (3) having an appropriate feelings in response to those feelings. In this latter sense, empathy has become a central concern of social psychology.

However, empathy in this sense is not especially to our present concerns, which is the grounding of experience. First and foremost, empathy is intellectual, not sensory; it is the having of feelings in response to knowing about the feelings of others. The original sense of empathy, of *einfühlung* or feeling-into, on the other hand is relevant to experience. In effect, you feel-into tools that you are using, experiencing them as something responsive to your explorations. I call this feeling-into 'sensorimotor empathy'. You experience sensorimotor empathy when your lived body expands, and temporarily includes aspects of the non-bodily environment, whether they are tools or other humans. As we will see below, sensorimotor empathy is skilful, implicit, and bodily engagement of exactly the sort that I am suggesting grounds our experience.

As noted above, colleagues and I have been studying feeling-into tools for several years now. More recently, we have been doing experiments on feeling-into other people in terms of what are called 'interpersonal synergies' (Riley *et al.*, 2011). Here, I will discuss one recent example: collective problem solving (Nalepka *et al*., 2015).

In our collective problem solving research, pairs of individuals engage in a joint sheep herding task. They control 'sheep dogs' that work to corral sheep into the centre of an arena over the course of a series of 60-second trials. In a successful trial, the pairs keep all of the sheep (three, five, or seven of them, depending on the trial) in the inner circle of the arena in Figure 2 for 70% of the last 45 seconds of a trial. If any sheep touches the edge of the arena or if all of them are outside the outer circle for any portion of the trial, the trial is halted. The pairs were not allowed to speak with each other. Nearly all of the pairs managed to succeed at the task, and nearly all of them had the same progression of strategies. In early trials, pairs engaged in what we call search and rescue, in which each player tries to round up the sheep on their side that is furthest from the centre. This strategy does not work. After several failed trials at this strategy, many of which include participants bumping into one another while trying rescue sheep, successful pairs switch to a strategy in which they coordinate with one another in an oscillatory pattern, either in phase or anti-phase. See Figure 3. To really see how this striking phenomenon happens, it is best to watch the videos at this url: http://www.emadynamics.org/bi-agent-sheep-herding-game/.

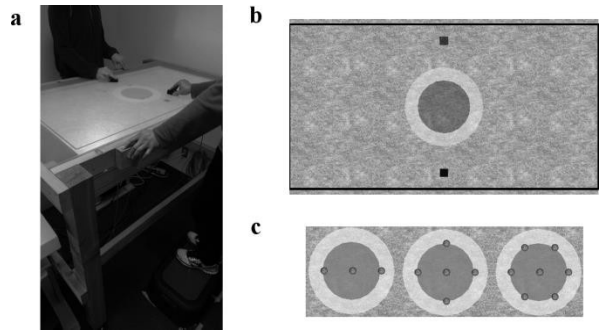

Figure 2. 2a shows two participants at the virtual table. 2b shows a top down view of the game. 2c shows the starting positions with three, five, or seven 'sheep'.

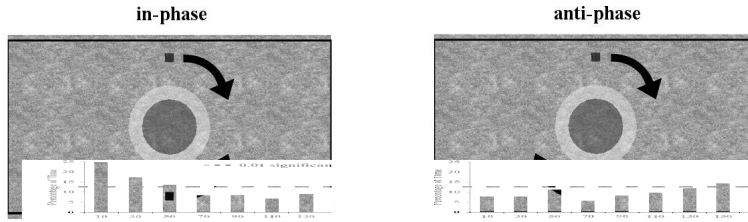

Figure 3.

The first video shows the behaviour of a pair in an early trial, when they engage only in the search and rescue strategy. The second video shows the behaviour of a pair after they have discovered the oscillatory strategy. (The third video shows artificial agents playing the game.) The typical progression of trials is that participants initially engage in separate search and rescue, and do not succeed. After some number of trials, participants accidentally fall in to an oscillatory pattern, which works. Eventually, they stop coordinating with the sheep at all, and only engage in coordinated oscillation with each other. That is, they form an interpersonal synergy.[4]

[4] Of course, it takes more than this to establish the presence of a synergy. The details of the data analyses are beyond the scope of this paper. See Riley *et al*. (2011) or Nalepka *et al*. (2015).

That pairs or collections of humans can form synergies should not be a surprise. Remember the last time you danced or jogged with someone: you and your partner formed a temporary unit, in which each of you allowed your behaviour to be constrained by the unit you comprised. See Figure 4. The earliest work on interpersonal synergies was done by Schmidt *et al.* (1990). They showed that while two people swing their limbs in synchrony, they are connected to one another in the same way that the limbs of a single individual are connected. That is, the interpersonal connection between two people is a temporary version of the intrapersonal connection among the parts of a single person. More recent work has shown similar interpersonal synergies arising when people sit next to one another on rocking chairs (Richardson *et al.*, 2007), when they converse (Cummins, 2013), and when professional jazz musicians improvise together (Walton *et al.*, 2015).

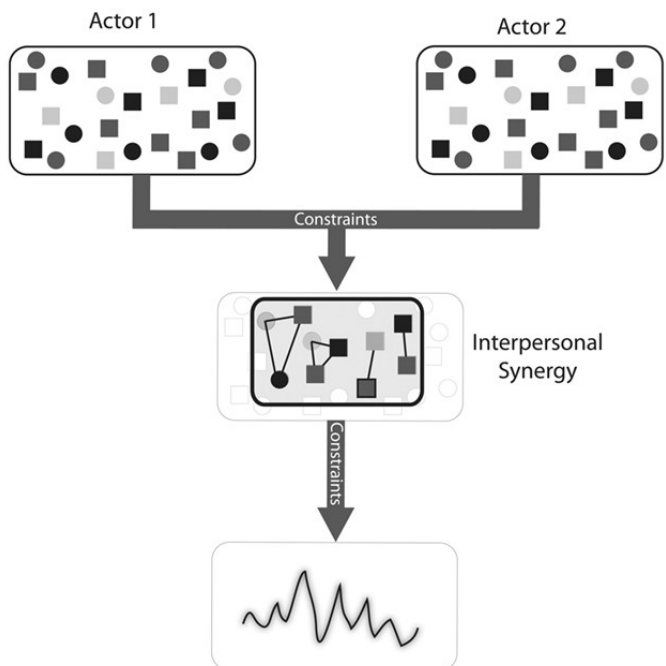

Figure 4. Courtesy of Mike Riley.

As I said above, I want to suggest human–tool synergies and interpersonal synergies form when humans feel-into things outside their biological bodies. Doing so is engaging in sensorimotor empathy, which is to say ~~treating~~ experiencing yourself as expanding to include other things. Sensorimotor empathy differs from the cognitive form of empathy described above in several ways. Sensorimotor empathy is genuinely sensory, and not dependent upon explicit thought or concepts. The cane navigator doesn't think about the cane; she feels the world through it. Dancers don't think about what their partners are doing; they engage in constant push and pull so that they form a unit. Engaging in sensorimotor empathy is not a matter of knowing about a tool or another human. It is a feeling of connection. Moreover, sensorimotor empathy is a matter of genuine, two-way engagement. While watching a movie, you can feel cognitive empathy for a character, in virtue of knowing that he has been dumped by the girl of his dreams, knowing how you would feel if you were dumped by the girl of your dreams, and having an appropriate emotional response. However, the movie character does not respond to your empathy. In contrast, a dance partner responds. This is the very definition of being a dance partner. A bicycle also responds to your action, while simultaneously constraining it. You and the movie character do not form a synergy; you and your bicycle or dance partner do.

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5. Sealing the Deal

Recall that the discussion of sensorimotor empathy just concluded was not merely a digression. It was an attempt to put some flesh on the suggestion made above that we need to go beyond the possession of sensorimotor skill or sensorimotor knowledge to account for our experiences. We need not merely have skills or knowledge; we need to be actively engaging with the world. I have suggested that we can think of this engagement in terms of sensorimotor empathy, which is connecting to things or people that are also connected to you so that you and they form a single unit. I have also suggested that this connection is scientifically accessible via human–tool and interpersonal synergies. This suggests that the amended sensorimotor approach goes beyond being 'merely philosophical', to being a testable hypothesis in the cognitive sciences. I hope proponents of the sensorimotor approach will accept the amendment. To try to seal the

deal, I will conclude by considering two of the canonical examples of the sensorimotor approach in light of my proposed amendment.[5]

Consider the back of the tomato that seems present to me, even when light hitting my eyes does not reflect off it. The unamended sensorimotor approach suggests that I experience the presence of the back of the tomato in virtue of knowing what I would see if I were to move around the tomato or pick it up or otherwise explore it. Consider the sponginess of the sponge. Can we experience that without actively engaging with the sponge, squeezing it and feeling it resist the pressure of our fingers? The unamended sensorimotor approach has it that I experience the sponginess of the sponge in virtue of knowing what would happen if I were to pick it up and squeeze it. In both cases, it is simply insufficient to explain my experience of the object in question (a tomato, a sponge) as differentiated from a movie prop in terms of my knowledge. The issue is that the tomato does not seem present to me as a three-dimensional object at the instant ~~of~~ the light reflecting off of it first hitting my eyes. Nor does the sponge feel spongy in an instant. Remember the Rylean point that seeing and feeling are actions, and successful actions at that. Actions take time, and during the few hundred milliseconds it takes a standing person to recognize a tomato, we will have made somewhere between two and ten saccadic eye movements and will have swayed through several degrees at the feet, which translates to several inches at eye height.[6] Each of these movements will have revealed different portions of the tomato, including many parts that would not have been visible in the first instant. This is more than enough to see that what you have is a tomato and not a cardboard cut-out or photograph — a cut-out would look exactly the same despite our saccades and sway. During the same time, the sponge would have compressed under our attempts to grip it, in a way that a plastic sponge look-alike would not, even if we are not trying to squeeze it. During this sort of exploration, your motion causes changes in what you are exploring which cause changes in your motion which causes changes…[7]

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5 Another factor, that I won't explore here, is that what I am calling 'sensorimotor empathy' seems quite in line with what Noë calls 'organized activity' in his 2015 book.

6 Thanks to Scott Bonnette for answering my questions on sway and point of observation.

7 A referee asks how the suggestion offered here relates to Noë's controversial views concerning presence-in-absence (2004). Certainly, according to what I have said here, parts of a tomato that are not currently reflecting light that hits my eyes, but were just a moment ago, are present to me. This is a Gibsonian point (1979), really: the continued

We have the kinds of experiences that we do in virtue of our unreflective, skilful interactions with the animate and inanimate world around us and the way that the world responds to us. As Merleau-Ponty put it, in a passage quoted by Noë (2009), we experience ourselves as 'empty heads turned toward one single, self-evident world, where everything takes place, even dreams' (Merleau-Ponty, 1962, p. 355). Knowledge that a tomato has a back or that the child has shorter legs is not enough. We need to feel-into the tomato and the child, by forming temporary synergies with them, by feeling them as parts of ourselves. I have suggested that this is a sensorimotor sort of empathy, in which you and the world you engage with, and which engages with you, is for the moment, at least, not separate from you.

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existence of something currently occluded is specified by having seen it go out of sight. A more interesting question is whether the not-yet-observed parts of the tomato are also present. In cases of familiar objects like tomatoes, I would argue that they are. In the normal course of things, nothing other than an engagement with a full three-dimensional tomato, with a fully fleshed-out back, generates optic flow like that we encounter while moving about a tomato. To use the Gibsonian terminology once again, the optic flow contains information about a fully three-dimensional tomato. So we experience a fully three-dimensional tomato. The never-seen tomato portions are present-in-absence. This feeling of presence is subject to revision, of course, if further exploration reveals the apparent tomato to be flat on one side, or hollow. There is a lot of technical baggage here, not all of it innocent. See Chemero (2009) or Withagen and Chemero (2012) for details.

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