

## Anticipation and variation in visual content

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**Abstract** This article is composed of three parts. In the first part of the article I take up a question raised by Susanna Siegel (Philosophical Review 115: 355–388, 2006a). Siegel has argued that subjects have the following anticipation: (PC) If S substantially changes her perspective on o, her visual phenomenology will change as a result of this change. She has left it an open question as to whether subjects anticipate a specific kind of change. I take up this question and answer it in the affirmative. By appealing to a widely held view of perceptual content, the view that we represent ‘factual’ properties in perception, I argue that (PC) can be refined as follows: (PC’) If S substantially changes her perspective on o, her visual phenomenology will present different views of o’s factual properties. In the second part of the article I argue that (PC’) implies that there are cases in which normal perceivers have different perceptual content under identical viewing conditions. The differences in perceptual content are due to differences in the determinacy of visual anticipation. I draw the conclusion that perceptual content is rich in the sense that it includes a unique contribution from individual perceivers. In the final part of the article, I discuss some open issues regarding the way in which (PC’) relates to the personal/sub-personal distinction, empirical models, and the distinction between perception and cognition.

**Keywords** Anticipation · Perceptual content · Vision

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## 1 Introduction

Susanna Siegel has argued that the content of visual experience includes the following expectation:

*Perspectival Connectedness (PC)*: If S substantially changes her perspective on o, her visual phenomenology will change as a result of this change. (2006a, p. 358)

According to Siegel, this expectation can be found at the level of visual phenomenology; it is not merely a background assumption or belief. Siegel leaves it as an open question “whether such a conditional like (PC) but with a more specific consequent is represented in visual experiences of object seeing” (p. 380). Here I take up this open question and answer it in the affirmative, which means that I am arguing for the following:

*Specific anticipation (SA)*: Visual anticipation is more specific than indicated in the consequent of (PC).

In the first part of the article I will defend (SA), and show how the truth of (SA) motivates a reformulation of (PC) as (PC’). Then I will elaborate on (PC’) by making four points, the last of which forestalls a possible problem with (PC’). In the second part of the article I will discuss two consequences of (PC’), consequences having to do with variation in perceptual content.<sup>1</sup> In the final part of the article I will discuss how my results relate to some conceptual distinctions, as well as empirical research.

In what follows I will assume that Siegel is correct about (PC) being represented at the level of visual phenomenology.

## 2 On the specificity of visual anticipation

This section consists of two parts. First I will make the case that we do visually anticipate with varying degrees of specificity, which justifies (SA) and (PC’). In the second part of this section, I will introduce four points about visual anticipation, the last of which addresses a possible problem of (PC’) inspired by some of Siegel’s comments (2006a).

If we accept (PC), then we accept that perceivers anticipate *some* change in visual phenomenology as a result of self-generated movement. The question here is whether the anticipation is of change in general or of some more specific kind of change. One direct way of addressing this question, I suggest, is to consider how (PC) fits with other plausible claims about visual content.

There are three relevant positions on visual content. First, one can deny that visual experience has any content, deny that visual experience represents the world to be one way or another (Martin 2006; Brewer 2006; Travis 2004). Since (PC) attributes some minimal content to experience, it is not clear that this first view is

<sup>1</sup> I follow the convention in the contemporary literature of using ‘content’ to mean representational content, or, more precisely, an information state with correctness conditions (Peacocke 1983, p. 5).

compatible with (PC). Second, one can claim that visual phenomenology is restricted to the way things appear from one's particular perspective. This view was more popular earlier in the 20th century with sense-datum theorists (Moore 1953; Russell 1912/1978). Since (PC) expresses counterfactual content about how things will appear apart from one's present perspective, it does not seem that (PC) would fit well with this second view either. Thus, my focus will be on the third view, which can be expressed using what I will call the thesis of factual content.<sup>2</sup>

*Factual content (F):* Visual perception represents factual properties, which are properties that are in principle perceivable from multiple perspectives.

Factual properties include properties such as the shape, size, and kind of object. (F) is widely accepted today (Block 2003; Byrne 2001; Dretske 1995; Harman 1990; Metzinger 2003; Noë 2004; Schellenberg 2007; Searle 1983; Tye 2000).<sup>3</sup>

As I hope to show, (PC) and (F) together make a strong case for (SA). In particular, (F) provides constraints for the consequent of (PC), thus making (SA) true. According to (PC), subjects anticipate some change. If (SA) is false, subjects anticipate no change in particular. Thus, (PC) and the denial of (SA) amounts to the claim that any change due to self-generated movement would fulfill our anticipations. It seems, though, that there are a wide range of changes in visual experience that would not fulfill anticipations; there are many ways in which visual experience can change which would violate anticipations. Denying (SA) amounts to accepting that outlandish changes in visual experience can fulfill our anticipations. Here is an example.

Assume that (F) and (PC) are true, but that (SA) is false. That is, the change anticipated from self-generated movement has no specificity whatsoever. Subjects only anticipate *some* change, but no particular change. Assume, for the sake of argument, that it is possible to anticipate some change, but no change in particular. Imagine looking at a teacup on a table. The design on the cup looks interesting, so you move your head for a look at how the design continues on the hidden side of the cup. As an apparent result of this self-generated movement, the object on the table starts to appear as if it is a vase containing orchids, rather than a teacup. According to (PC) and the negation of (SA), you anticipated some change, but no particular change. Since the change from teacup to vase was indeed *some* change, (PC) and the negation of (SA) would suggest that seeing the vase fulfills your anticipation. Indeed, (PC) and the negation of (SA) seem to suggest that any experience that is not the same as the experience had just prior to the self-generated movement would fulfill your anticipation. The problem, though, is that there is no sense in which that change—from teacup to vase—fulfills any anticipation. Such a series of experiences

<sup>2</sup> I take the term 'factual content' from Noë (2004).

<sup>3</sup> Many who accept this view also accept that we represent a special kind of property which *does* depend on our particular location and viewing conditions. Gilbert Harman (1990) and Michael Tye (2000) have suggested that we represent properties of things 'from here.' Alva Noë has suggested that we represent 'perspectival properties.' Sydney Shoemaker (2006) has suggested that we represent 'appearance properties,' and Susanna Schellenberg (2008) has suggested that we represent 'situation-dependent properties.' Whether or not one accepts this additional commitment does not bear upon the main issue here.

would be *surprising*, and would not include the fulfillment of an anticipation. The possibility of surprise in perception offers a strong clue that anticipation has some specificity: as Dennett has noted, “Surprise is a wonderful, dependent variable...” (2001, p. 982).

The vase was not anticipated because seeing a vase is not compatible with the factual content of the experience prior to the self-generated movement, not compatible with the representation that there is a teacup (and not a vase) on a table. With a little imagination, one can see that there is no limit to the range of experiences that would be surprising, experiences that would not be anticipated when moving in for a closer look at the teacup. Since the negation of (SA) leads to the unwelcome conclusion that even the most bizarre visual experiences fulfill anticipations, we now have good reason to accept (SA).

We have some specific anticipation because of (F). According to (F), we visually represent the world to be a particular way. As the example above should illustrate, we implicitly anticipate that the visual results of our self-generated movements will be coherent with the way we visually represent the world to be prior to those movements. Crucially, our visual anticipation need not include the *precise* way in which factual properties appear from different perspectives. As I discuss below, there is room for indeterminacy.

If my claims are correct, then (SA) looks to be correct also. According to (PC), we anticipate some change in visual phenomenology with self-generated movement. (F) gives good reason to think that this change will be of a particular nature, that this change will reveal new perspectives on the factual properties already being represented. If we accept both (PC) and (F), then competent perceivers should expect there to be a set of self-generated movements which will present different views on factual properties. More explicitly, (SA) can be shown to be true because now we have a more specific consequent for (PC), we have:

(PC’): If S substantially changes her perspective on o, her visual phenomenology will present different views of o’s factual properties.

With (PC’), the subject does not merely anticipate some change; she anticipates change that will reveal different views on factual properties. If I visually perceive an object to be a table from one perspective, I implicitly anticipate that it will continue to look like a table as I gain different perspectives on it. I would be surprised, and would have to reevaluate my representation of the environment, if the table ceased to look like a table as I moved to a different perspective on it.

The account that I am developing here shares some similarities with Charles Siewert’s account of perceptual anticipation (2005). A crucial difference, though, can be found in my central claim, in (PC’). Siewert appears to suggest that the specificity of the sensorimotor conditionals can only be obtained through actual movement. He writes:

It seems to me that I have no way of identifying how it looks to me as if it *will* look, *if* I do certain things, and what those ‘certain things’ are, other than the following. I actually *do* what I am disposed to do to get a better look at

something, and take doing *that* as an illustration of the kind of activity that belongs in the antecedent of the conditional... (2005, p. 286)

Siewert is correct that actually taking a better look at an object is one way, indeed the best way, of determining how that object will look from another perspective. But Siewert appears to be making the stronger claim that actually taking a look is the only way to have a sense of how an object will look from other perspectives. I think there are reasons to resist this stronger claim. As Siewert acknowledges, it is possible that we can be surprised by the new appearances. Such surprises imply that we have some anticipation of how things should appear when we move which does not depend on actually performing those movements.

The second reason to resist the stronger claim can be found in (PC') itself. Crucially, (PC') was derived based on the widespread commitment to (F). It is in (F), in the idea that we represent factual properties in perception, that one can find an alternative to Siewert's strong claim. One main way in which we can anticipate how things will appear without actually performing movements is because we represent factual properties. If I represent an object to have a particular factual property, then I anticipate that such an object will continue to appear to have that property as I gain different perspectives on it. I need not actually move in order to anticipate that new appearances of an object ought to be compatible with previous appearances of that object.

Note that there are probably perceptual experiences for which (PC') does not apply. Importantly, (PC') depends on the representation of factual properties, of properties which are in principle perceivable from multiple perspectives. Thus, in perceptual experiences with no factual content, (PC') would not apply. Many philosophers accept that normal experiences have some factual content. Can one have an experience with phenomenal character but no factual content? Perhaps after-images and abstract geometrical hallucinations would be experiences of this sort (Metzinger 2003, p. 243).<sup>4</sup> If so, then these experiences would offer instances in which (PC') does not apply.

It may also be instructive to consider whether (PC) can ever fail. That is, are there situations in which subjects actively change perspective on an object, but would be surprised to find their phenomenology changing as a result? Such situations may occur in cases of mental illness such as schizophrenia. One symptom of schizophrenia is a loss of the sense of agency. Subjects self-generate movement, but they do not have the subjective experience as if this movement is self-generated. In such situations, the change in phenomenology can be surprising because the subject does not have the sense of initiating the movement (Frith 1995; Gallagher 2005, chapt. 8).

Before turning to the objection borrowed from Siegel, I would like to make four points about perceptual anticipation. The first is that anticipation has degrees of

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<sup>4</sup> In defending weak representationalism, Michael Tye argues that there is non-conceptual representational content to an after-image (2000, p. 85). It is plausible to read Tye's distinction between conceptual and non-conceptual content as mapping onto the distinction between factual and perspectival content, especially considering his discussion of the tilted coin (2000, pp. 78–79). If this reading is correct, then it seems likely that Tye would accept that there can be phenomenal experiences without *factual* content.

determinacy. The second point is that anticipation is not limited to the hidden sides of objects. The third point is that perceptual anticipation need not be a deliberate mental act; rather it is an ongoing feature of perception. The fourth point is that perceptual anticipations are ‘stirred up’ as we change our location and shift our attention. Below I elaborate on each point, with special attention to the fourth. These points are largely inspired by Husserl’s work on perception.<sup>5</sup>

Perceptual anticipation has degrees of determinacy. One can anticipate that the table will continue to look like a table from another perspective without anticipating the details of the granularity of the wood from that perspective. In such a case, the subject’s anticipation is indeterminate with regard to the grain pattern, but the subject can reduce the indeterminacy by moving to take a close look at the grain pattern on the facing side of the table; anticipations have, as Husserl put it, “a determinable indeterminacy” (2001, p. 42; also see Siewert 2005, p. 287).

The second point to mention here is that indeterminate visual anticipation is not restricted to the hidden sides of objects. Notice that (PC) and (PC’) make no mention of hidden sides; rather, they are concerned with substantial changes in perspective on an object. There can be indeterminate anticipation for that which lies in the periphery as well as for details of the surface in the center of vision (*ibid.*). For observing peripheral indeterminacy, one cannot do better than Dennett’s well-known playing card demonstration (1991, pp. 53–54). When the card is held at arm’s length in the visual periphery, we anticipate that moving it closer to the center of vision will give us a more determinate view of the playing card, thus revealing the suit and number of the card. The indeterminacy within central vision simply refers to the fact that we can take a closer look at things (within limit, of course). To revisit the example from above, one can stand three meter’s distance from a table and try to focus on a small area of the wood in the facing surface. From that distance, the grain of the wood may appear indeterminately, but one has the option of moving in for a closer look. We anticipate, usually implicitly, that moving closer will reveal details about the surface that were not available from three meters away.

The third point is that visual anticipation is ongoing, and not episodic. We are capable of deliberately anticipating the appearance of something, but this capability is not what I am trying to describe here. The kind of visual anticipation that I mean here is a constant and ongoing feature of visual perception. We do not have to try to do it, and we cannot stop ourselves from doing it. When I claim that “I visually anticipate something,” I do not mean that I make a deliberate decision to anticipate as I would, say, make a deliberate decision to dine at one restaurant rather than another. This feature of visual anticipation may strike some readers as being at odds with some accepted ways of thinking about mental states. I will address this kind of worry in the final section of the article.

The final point to make here is that perceptual anticipations are continuously ‘stirred up’ (from Husserl’s *erregen*) in the process of perception. There are a wide range of appearances that objects can have, but these appearances are not all anticipated at once. There are at least two ways in which appearances of objects are excluded from visual anticipation. First, it is possible that appearances of factual

<sup>5</sup> See Madary (2012) for the details of where these ideas can be found in Husserl’s work.

properties currently in view are not anticipated. Second, it is possible that appearances of factual properties are not anticipated because those factual properties themselves are currently not visible. I will discuss these in turn.

First, there can be cases in which appearances of factual properties currently in view are not visually anticipated. For instance, as I walk down the street on a sunny day and look at a particularly attractive house, I anticipate how the house's appearance will change as I continuously move. I perceive the factual properties of the shape and color of the outside of the house. But I do not anticipate that the shape and color of the house will appear to me in ways far removed from my current perceptual situation. For instance, I would not anticipate that the shape and color of the house will appear to me as they would to someone who has leaped from an airplane and sees the house while free falling, or how the shape and color of the house would look at night viewed by someone standing on her head. My perceptual situation and my self-generated movements constrain the anticipations of factual properties currently in view. The second way in which anticipations are constrained can be cases in which particular factual properties of objects are not visible. This second way can be illustrated by addressing a worry raised by Siegel.

Siegel has raised the worry that there may be cases in which it does not seem correct to include visual anticipations of hidden factual properties. She describes someone looking at a flowerpot but having the bizarre false belief that there is a miniature city on the hidden side of the pot (2006a, p. 380). Say the person with this strange belief has a visual experience of the pot, but that this experience does not include the part of the pot believed to contain the city. There is a sense, we might say, in which the experience of the flowerpot, or at least of the facing surface of the flowerpot, is veridical. After all, the subject with the strange belief does not hallucinate, or see any kind of illusion. On the other hand, (PC') would seem to imply that the false anticipation of the miniature city is a part of perceptual content, which would bring some false element to the experience.

In its general form, this example brings out the problem of the *scope* of visual anticipation. There are a great number of factual properties in the world, and there is great variation in the amount of self-generated movement required to access those factual properties. Which factual properties are anticipated during normal visual experience? (PC') suggests that subjects anticipate different views on o's factual properties. But this claim must be qualified. Objects have plenty of factual properties, and it would be wrong to claim that we anticipate all of them at once. For example, when a tall building catches my visual attention from the street, I can only vaguely imagine the details of the interior of the building. I have no visual anticipation about whether the building includes conference rooms, or about the interior design of any conference rooms. The interior would involve factual properties of the building, but these factual properties go beyond my visual experience.

On one hand, (F) and (PC) together suggest that we anticipate seeing different perspectives on some of o's factual properties. On the other hand, simple reflection shows that we do not anticipate *all* of o's factual properties. I am not sure that a precise line can be drawn between the perspectives on properties that are anticipated and those not anticipated, but I think we can arrive at a rough description. I have

already noted above that not all appearances of the factual properties which are currently in view are anticipated at once. My support for this claim appealed to the way in which my current viewing conditions and self-generated movements would constrain the way in which a house would appear to me. Now, with Siegel's flowerpot example, we have a slightly different issue. The question now concerns which factual properties are anticipated. A thorough answer to the question of which factual properties are anticipated and which are not would be outside the scope of this article, but here is a sketch.

Which factual properties are anticipated? Roughly, one's current perspective determines the scope of visual anticipation: if the subject sees a factual property of the object from one perspective, she will anticipate that self-generated movement which gives new perspectives on the object will reveal new perspectives on *that* factual property. If I see the table from one perspective, I will visually anticipate that it will continue to look like a table as I move around it. This claim does not entail strange commitments in the examples from above: since neither Siegel's miniature city nor the conference rooms of the tall building are factual properties that were in the subject's current perspective, we need not claim that perspectives on those properties were anticipated. Siegel's worry can be addressed by claiming that false beliefs about hidden sides do not entail visual anticipations of the contents of those beliefs.

But the problem of describing which anticipations are stirred up is not that easy to solve. The claim in the preceding paragraph is incomplete because there are times in which we anticipate that self-generated movement will reveal an *initial* perspective on a factual property. If Siegel's subject with the strange belief about the city decides to move in order to view the city, then there is a point at which she will anticipate seeing the city, and, according to the example, her anticipation will be disappointed (since there is in fact no city there). As she moves closer to the place in which she thinks she will see the city, her anticipations of the city will be stirred up. To the extent that those false anticipations are stirred up, there is a weak sense in which her experience is non-veridical. Perhaps more interesting, there will also be some kind of perceptual conflict at the instant in which she thinks the city should be visible to her. At this instant, the anticipation of the city is in conflict with the sight of a smooth cityless flowerpot. I am not sure whether this instant of conflict should count as non-veridical, but this uncertainty bears little on (PC').

In this first part of the article I have defended the thesis of specific anticipation (SA), and combined (SA) with Siegel's (PC) to introduce (PC'). I have also introduced four features of visual anticipation and have developed the fourth feature in order to address a possible worry inspired by an example from Siegel. Now I turn to some consequences of (PC').

### 3 Variation in perceptual content

If (PC') is true, then there can be variation in perceptual content under identical viewing conditions. Here is a vignette to illustrate this claim for variation in content for two different subjects.



One afternoon at a party, Lily, unimpressed with her company, took a fleeting interest in a sculpture in the corner of the living room. A few minutes later, coincidentally, Rosemary took a look at the same piece of art. Even more of a coincidence, Rosemary viewed the sculpture from the exact same place in which Lily viewed the sculpture. In an astonishing coincidence, Lily and Rosemary viewed the sculpture with the same pattern of saccades for the same length of time. For the periods in which they each viewed this sculpture, did Lily and Rosemary's visual experiences have the same content?

Here are some details relevant for answering this question. Both Lily and Rosemary have normal vision, so there was no variation due to a general difference in the visual system. Also, neither of them had ingested any substances that might have altered their visual experience (it wasn't *that* kind of party). The two women's eyes were at the same height that day (Lily is slightly shorter than Rosemary, but was wearing higher heels), so fine-grained differences in perspective would not have made a difference either. Similarly, their bodies were positioned in the same manner. They both attended to the sculpture, and focused their eyes on the surface of the sculpture. Nothing in the visual scene changed between viewings; no one pulled the shades or vandalized the sculpture.

With these details in place, I take it that many would answer my question in the affirmative: yes, surely Lily and Rosemary had the same content of their visual experiences. Why? Mainly because there are intuitions, likely widespread, to the effect that all of us perceive the same world in pretty much the same way. I take the following passage from David Lewis to illustrate this thought:

The scene before my eyes causes a certain sort of visual experience in me, thanks to a causal process involving light, the retina, the optic nerve, and the brain. The visual experience so caused more or less matches the scene before my eyes. All this goes on in much the same way in my case as in the case of other people who see. (1980, p. 239)

More recently, Susanna Schellenberg has expressed roughly the same idea with regard to seeing a cup:

Any perceiver occupying the same location would, *ceteris paribus*, be presented with the cup in the very same way. (2008, p. 61)

I am not suggesting that these passages commit Lewis or Schellenberg to any particular thesis about variation in perceptual content. I am suggesting though, that these passages express the reasonable thought that we all pretty much see the world in the same manner.

If (PC') is correct, though, there can be variation in perceptual content under these identical viewing conditions. Consider further details about Lily and Rosemary. As it turns out, the sculpture's creator, Jack, is a close friend of Rosemary's. She is familiar with his work, and owns a few of his pieces. Two of the pieces she owns are similar to the piece in the corner of the living room at the party. Lily, on the other hand, had no idea who sculpted the piece in the corner, had little knowledge of or interest in contemporary sculpture, and had never before seen anything much like the artwork in the corner.

As a competent perceiver, Lily has visual anticipations about the sculpture. She anticipates that it will continue to look like a novel sculpture as she takes different perspectives on it. But those anticipations are indeterminate, much more indeterminate than Rosemary's anticipations, since Rosemary is familiar with Jack's artistic style. For instance, Rosemary is familiar with a new technique that Jack has started using on the surfaces of his pieces and is able to anticipate the peculiar way in which the specular highlights will change as she moves. One apparent consequence of (PC'), then, is that different subjects can, and often will, have different perceptual content under identical viewing conditions. Perceptual content is rich in the sense that it includes a unique contribution from each perceiver.

Variation in perceptual content is not limited to different subjects. If (PC') is true, then there can also be variation in perceptual content within the same subject under identical viewing conditions.<sup>6</sup> Upon leaving the party that afternoon, Lily shared a cab home with one of the party goers. It turned out to be Jack, the artist. Lily and Jack entered into a serious romantic relationship, which naturally involved her becoming more familiar with his work. A year later, Lily and Jack were back at the house for another party and Lily viewed that same sculpture in the corner, with the same pattern of saccades. But this time, of course, she viewed it with much more determinate visual anticipations; she now knew Jack's work well. Both the viewing conditions and the perceiver were the same, but the perceptual content was different.

In these two cases of variation of perceptual content, the variations in content were due to the subject's level of *familiarity* with the object. The idea that familiarity with a scene can influence perceptual experience has been explored both by Siewert (1998, pp. 257–258) and Siegel (2006b, p. 493). What I offer here is an account of *why* familiarity changes experiential character: when we are more familiar with a scene or an object, we have more determinate visual anticipations of how things will look as we move.

Here I have given cases of variation under the unrealistic constraint that the self-generated movements with which Lily and Rosemary visually explored the sculpture were the same. If we loosen this unrealistic constraint, we can see that there are factors besides familiarity which produce a variation in content. For instance, it is well known from classic eye tracking research that a subject's task influences saccade patterns (Yarbus 1967). Also, it is reasonable that a subject's attentional or emotional state can influence the precise way in which she explores a visual scene, as well as influence the determinacy of her visual anticipations.

#### 4 Remaining issues

In this final section of the article I would like to address some possible objections and areas where future work is needed. I will address three areas of difficulty: the

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<sup>6</sup> Granting that there is self-identity over time for subjects.

personal/sub-personal distinction, the relationship between (PC') and empirical models, and the relationship between perception and cognition.

Many philosophers have made use of a distinction between personal and sub-personal levels of explanation (following Dennett 1969). The former includes mental states that we commonly attribute to persons, such as intentions and beliefs. The latter includes the causal mechanisms which enable various types of intelligent behavior. On one hand, visual anticipation seems to occur on the personal level: my arguments for such anticipation depend on a priori reflection, rather than empirical modeling. On the other hand, it is not quite correct to claim that visual anticipation is something we *do* deliberately. As I claimed above, it is ongoing, and not episodic. What may be most relevant here is that if we take the sub-personal description to mean some kind of causal description, then visual anticipation, as described above, is not sub-personal. Perhaps the best understanding of visual anticipation is as a non-standard instance of personal level description. The truth of (PC') may put pressure on the distinction itself. In any case, I am happy to concede that more conceptual clarification is needed here.

The second point of difficulty with accepting (PC') may be empirical. Here is not the place to engage in the daunting task of relating phenomenal structure to sub-personal modeling, but I would like to make one quick point. The most obvious empirical model for implementing something like (PC') would be a model which includes feedback processing. Some philosophers are fond of David Marr's (1982) model of visual processing, a model which does not depend on feedback processing. These philosophers might resist (PC') for that reason alone. In response, I only need to point out that a good deal of recent work focuses on the role of feedback in the cognitive neuroscience of vision.<sup>7</sup> My arguments for (PC') do not depend on empirical models, but one cannot claim accurately that there are no empirical models which would fit with my results.

The final difficult issue with accepting (PC') comes from the distinction between perception and cognition. Is visual anticipation a part of vision, or is it better understood as a part of cognition? Are anticipations a particular kind of belief? Here it is important to keep in mind that the distinction between perception and cognition has been used because some have found it helpful for categorizing mental states and processes. The usefulness of the distinction in other domains does little to speak for or against the reality of visual anticipation or the truth of (PC'). Perhaps the truth of (PC') indicates that there are mental states that are somewhere in-between paradigmatic perceptual and cognitive states. One may want to use a liberal notion of 'belief' in order to have visual anticipations count as beliefs. I do not see that much turns on this issue. The important point is that (PC') stands or falls based on independent arguments, not on the fact that it might not fit clearly with an existing distinction.

More work needs to be done in relating (PC') to the personal/subpersonal distinction, to empirical models, and to the distinction between perception and cognition. I maintain, however, that the need for work in these areas does not serve as evidence against (PC').

<sup>7</sup> See Kveraga et al. (2007) for a review.

## 5 Conclusion

In the first part of this article I have taken up Siegel's open question about perceptual anticipation. There I argued for (PC'), for the claim that competent perceivers anticipate different views on an object's factual properties due to self-generated movements. In the second part of the article I gave some examples to show how (PC') leads to the possibility of variation in perceptual content across identical viewing conditions. The final part of the article addresses some areas of difficulty, and indicates where more work needs to be done.

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