
ILLUSIONS OF OPTIMAL MOTION, RELATIONISM, AND PERCEPTUAL CONTENT

BY

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Abstract: Austere relationism rejects the orthodox analysis of hallucinations and illusions as incorrect perceptual representations. In this article, I argue that illusions of optimal motion (IOMs) present a serious challenge for this view. First, I submit that austere-relationist accounts of misleading experiences cannot be adapted to account for IOMs. Second, I show that any attempt at elucidating IOMs within an austere-relationist framework undermines the claim that perceptual experiences fundamentally involve relations to mind-independent objects. Third, I develop a representationalist model of IOMs. The proposed analysis combines two ideas: Evans' dynamic modes of presentation and Fine's relational semantics for identity.

1. Introduction

A central question in contemporary philosophy of perception is whether representational contents must figure in an analysis of the structure of perceptual experiences. There are two prominent responses to this question. *Austere relationism* holds that representational contents are unnecessary for analyzing the structure of perceptual experiences. It also holds that perceptual experiences fundamentally involve relations to mind-independent objects such as trees, tables, and stones (Antony, 2011; Brewer, 2011, forthcoming; Campbell, 2002, 2009, 2014; Genone, 2014; Johnston, 2014; Raleigh, 2015; Travis, 2004). *Representationalism*, by contrast, holds that representational contents are necessary for analyzing the structure of perceptual experiences (Burge, 2010; Byrne, 2009; Pautz, 2010, 2011; Peacocke, 1992; Searle, 1983; Siegel, 2010).¹

Misleading experiences have often been cited in support of representationalism. On this account, misleading experiences are incorrect perceptual representations. Defenders of austere relationism have challenged this assumption, though. Some have argued that representationalism provides an inadequate account of hallucinations and illusions (Brewer, 2011; Campbell, 2014; Johnston, 2014), while others have claimed that it mischaracterizes the phenomenology of perceptual experiences (Raleigh, 2015; Travis, 2004). A number of philosophers have even put forward accounts of misleading experiences that do not introduce perceptual contents (Antony, 2011; Brewer, 2011, forthcoming; Campbell, 2014; Fish, 2009; Genone, 2014; Kalderon, 2011; Martin, 2004, 2006).²

The goal of this article is to examine a rather neglected class of misleading experiences that presents a serious challenge for austere relationism. I call them – following Max Wertheimer (1912) – ‘illusions of optimal motion’ (IOMs). These are experiences of apparent motion in which subjects report one object moving from one location to another when, in fact, there are two stationary objects. Interestingly, these cases do not clearly fit into the orthodox philosophical dichotomy of hallucinations and illusions.

I shall argue that austere relationism cannot adequately account for IOMs. In addition, any attempt at accounting for these cases without introducing perceptual contents threatens the austere-relationist claim that relations to mind-independent objects constitute ‘the most fundamental characterization of our experience’ (Brewer, 2011, p. 92; see also pp. 62–3). I provide three arguments in favor of these claims.

First, the austere-relationist account of hallucinations cannot be generalized to IOMs because it is only tailored for *total* hallucinations. Indeed, if one applies the austere-relationist account of hallucinations to IOMs, one is led to neglect or mischaracterize the contribution of the external world to their phenomenal character.

Second, the austere-relationist account of illusions cannot be generalized to IOMs because perceptual relations to physical objects do not constitute an adequate basis to ground their phenomenal character. Indeed, there are good reasons to hold that the items involved in IOMs are not successfully perceived.

Third, if one insists on providing an austere-relationist account of IOMs, one has to characterize the subject as being perceptually related to entities other than mind-independent objects. With some additional assumptions, this conclusion undermines the austere-relationist claim that relations to mind-independent objects offer the most fundamental characterization of perceptual experiences.

In the remainder of the article, I develop an account of perceptual content designed to account for IOMs and, more generally, for our experience of objects as persisting over time. On the proposed view, when a subject is prey to an IOM, she misrepresents phases of numerically different objects as phases of the same object. By contrast, when a subject perceives an object

as persisting over time, she correctly represents phases of one object as phases of the same object. This account combines two ideas: Evans' (1981) insight that perceptual tracking requires dynamic modes of presentation and Fine's (2007) relational semantics for identity. As it turns out, the proposed view differs from other Fregean accounts that introduce *de re* or *de dicto* modes of presentation.

The article falls into seven sections. Sections 2 to 4 set out the terms of the debate: I introduce IOMs (Section 2), defend my description of them (Section 3), and define austere relationism (Section 4). Next, I examine the two main strategies available to austere relationism to account for IOMs: accounts that treat them as hallucinations (Section 5) and accounts that assimilate them to illusions (Section 6). In Section 7, I sketch an account of perceptual content that elucidates IOMs and, more generally, our experience of objects as persisting over time. I conclude with some implications of the proposed account for the broader debate on the structure of perceptual experiences (Section 8).

2. *Illusions of optimal motion*

Illusions of optimal motion (IOMs) belong to the broad class of experiences of apparent motion. In the so-called ϕ phenomenon, two numerically different images a and b (e.g. two dots) are projected at different locations l_a and l_b at different times. Wertheimer (1912, pp. 32–3) introduced ϕ as a variable for any event that takes place between l_a and l_b during the temporal interval that mediates the presentation of a and b . With long intervals, observers have an experience as of the *succession* of two different images. With very short intervals, they have an experience as of two images presented *simultaneously*. The interesting phenomena occur when the intervals lie between the long and the very short ones. In these cases, most observers report an experience as of movement between l_a and l_b . Since there is no movement, all these cases involve apparent motion. Apparent motion can take different forms. In some cases, the movement is 'dual': one can have an experience as of a moving a little bit toward b , then disappearing, and then another experience as of b starting its movement just after the midpoint that separates a from b up to l_b . In other cases, observers report an experience as of what Wertheimer calls 'optimal' or 'definite' motion. As he makes clear, these cases are 'exactly as would be experienced when viewing an object that actually moves from one location to another' (Wertheimer, 1912, p. 7).³

One reason why IOMs are theoretically challenging is that they do not seem to fit into the philosophical dichotomy of hallucinations and illusions. Indeed, they seem to have features of both types of misleading experiences.⁴

On the orthodox view, a *hallucination* is a case in which a subject has an experience as of an item and that item is not there. Thus, Fiona Macpherson writes:

When philosophers talk of hallucinations, they typically imagine cases in which one's perceptual experience is completely hallucinatory. That is, they imagine that one is seeing nothing and that each element of one's perceptual experience is hallucinatory (Macpherson, 2013, p. 8).

Similarly, John Campbell points out:

The philosophers' idea of a hallucination (as opposed to the empirical phenomenon of hallucination) is the idea of a mental state that is intrinsically just like seeing something, but without the external world being there (Campbell, 2014, p. 92).⁵

Consider a paradigmatic example of a philosophical hallucination. Suppose that Macbeth's visual cortex is stimulated in exactly the same way in which it is activated when he is seeing a dagger in front of him. In this case, he could have an experience that exactly matches a successful visual experience as of a dagger in front of him. Contrary to this case, however, IOMs are not produced by directly stimulating the perceptual system but by presenting some distal items at some locations and separated by some temporal intervals. Thus, there is a sense in which these experiences are not completely 'empty'. The world out there seems to play a decisive role. What goes wrong is the cardinality of the items that seem to be presented in the scene. Instead of having an experience as of *two* dots, the subject has an experience as of *one* dot moving from one location to another.

The orthodox view also tells us that an *illusion* is an experience in which a perceived object seems to instantiate a property it does not instantiate. Thus, Bill Brewer writes:

In an illusion a physical object, *o*, looks *F*, although *o* is not actually *F* (Brewer, 2011, p. 64).

Similarly, Michael Tye submits:

[I]n cases of illusion the perceived object appears other than it is. In such cases [...] the object is not as it appears to be (Tye, 2011, pp. 172–3).⁶

The Müller-Lyer diagram is an illusion in philosophers' sense because the two main segments seem to instantiate a property they do not have. The segment with outward-extending slashes seems to be longer than the segment with inward-extending slashes. Yet, the former does not instantiate the property of being longer than the latter. In IOMs, subjects certainly experience at least one property that is not instantiated

in the world: motion. Nevertheless, this does not seem to be sufficient to classify it as an illusion in the traditional sense of that term because it is unclear what the object of perception is. While Brewer's and Tye's definitions require that a perceived object look or appear other than it is, this condition does not seem to be satisfied in IOMs, where the subject gets the numerical identity of the dots wrong.⁷

Although the first studies on the ϕ phenomenon were carried out more than a century ago, this phenomenon has played a rather marginal role in contemporary philosophy of perception.⁸ It certainly played a role in Goodman's (1978) argument for constructivism and in Dennett's (1991) defense of the multiple draft theory of consciousness. Illusions of apparent motion have also played a role in recent work on temporal experience (e.g. Dainton, 2000; Grush, 2008). Nevertheless, the fact that they do not seem to fit into the philosophical dichotomy of hallucinations and illusions has not received sufficient attention in contemporary work on the structure of perceptual experiences. I do think, however, that this very fact makes them ideally suited to test the available views on the structure of perceptual experiences.⁹

I will argue that austere relationism lacks the theoretical resources to account for IOMs while remaining faithful to its main motivation: to assign a fundamental role to perceptual relations to mind-independent objects in an account of the phenomenal character of perceptual experiences. Hence, we have good reasons to revise this claim and posit perceptual contents. Before I present my arguments, let me defend the previous description of IOMs as involving numerical identity.

3. *The identity interpretation defended*

In this section, I defend my description of IOMs as involving numerical identity. To this end, I examine and reject two alternative characterizations.

3.1 ILLUSIONS OF OPTIMAL MOTION DO NOT INVOLVE OBJECTS

One might grant that IOMs constitute a *sui generis* class of misleading experiences, yet deny that they are relevant to assess austere relationism, which is mainly concerned with the perception of objects such as trees, tables, and stones. In the present case, the relevant items are not objects but dots or flashes presented in succession.

I find this restriction on the items of perception unmotivated. After all, we do not merely perceive objects but also rainbows, soap bubbles, flames, explosions, and many other entities. Moreover, although cases of apparent motion do not involve objects like trees, tables or stones, they involve items that display some of the main signature properties of objects. As Palmer (1999, p. 498) points out, the mechanisms that compute apparent motion

are sensitive to high-level phenomena such as position constancy, object rigidity, and occlusion/dissocclusion events.¹⁰ Moreover, as Goodman (1978, p. 80) rightly indicates, paths of apparent motion do not cross. A plausible explanation is that they do not cross because the entities involved are parsed as objects, and objects do not cross their own trajectories.

3.2 ILLUSIONS OF OPTIMAL MOTION CONCERN QUALITATIVE IDENTITY

One might grant that IOMs are relevant to assess austere relationism but deny that they involve *numerical* identity. To this end, one might re-describe those cases as involving a *qualitative* similarity between two objects. Hence, in cases of optimal motion, there is no experience as of *one* object moving from l_a to l_b . Instead, there is an experience as of *two* qualitatively similar objects at l_a and l_b , accompanied by a connecting movement in between.

Although this line of reply is relatively popular among philosophers, I have never encountered it among psychologists and non-philosophers, who grant that IOMs concern numerical identity.¹¹ Interestingly, there is experimental evidence in favor of the numerical-identity description. Kolers and Pomerantz (1971) compared two scenarios. In the first one, two dots were flashed at an interval that would normally lead to an IOM. Hence, observers reported the first dot as following a straight trajectory toward the location of the second dot. In the second one, a virtual barrier was interposed between locations l_a and l_b , and the dots were flashed at the same temporal interval. They found that, rather than experiencing the dot as passing ‘through’ the barrier in a straight line, most observers reported the first dot as moving in depth around it. These experiments provide compelling evidence in favor of the numerical-identity description. If IOMs merely concerned the qualitative similarity of two objects, it would be difficult to explain the change of direction in the presence of a barrier.¹²

This verdict is confirmed by additional experiments in which observers report an object changing qualities. One can have IOMs in which a green dot follows a red dot or a long line follows a short line. In these cases, observers report an experience as of *one* object changing color or size (Goodman, 1978; Kolers and von Grünau, 1976; Sekuler, 2012; Wertheimer, 1912).

I conclude that we have good reasons to use IOMs as a litmus test for austere relationism and interpret them as involving numerical identity. In the next section, I offer a precise characterization of austere relationism.

4. *Naïve realism and austere relationism*

Naïve realism characterizes perceptual experiences as *fundamentally* involving relations between subjects and mind-independent entities (Martin, 2004, 2006; Soteriou, 2010). There are two influential versions of this view. One of

them takes the relevant entities to be mind-independent objects like stones, tables, and trees (Brewer, 2011, forthcoming; Campbell, 2002, 2009, 2014; Genone, 2014; Johnston, 2014). Another takes them to be complex entities like facts or states of affairs (Dokic, 2000; Fish, 2009; McDowell, 1996). Although my conclusions apply to both views, my main focus will be on versions of naïve realism of the former sort. Brewer (2011, forthcoming) calls it the ‘object view’ and Campbell (2002, 2009, 2014) the ‘relational view’.¹³

Let us follow Brewer, and characterize the object view as the conjunction of two claims:

- (I) Physical objects are mind-independent.
- (II) Physical objects are the direct objects of perception.

These two claims articulate the idea that physical objects provide ‘the most fundamental characterization of our experience’ (Brewer, 2011, p. 92; see also pp. 62–3). In other words, the phenomenal character of perceptual experiences – ‘what it is like’ to have them – is to be characterized by citing mind-independent objects in the world (see also Campbell, 2014, pp. 33, 41, 51; Genone, 2014; Soteriou, 2010).¹⁴

As Brewer interprets it, claim (II) turns the object view into a radical form of naïve realism. By ‘direct’ he means that perceptual experiences do not fundamentally involve representational contents (or sense data). Thus, representational contents are unnecessary for analyzing perceptual experiences. The object view is therefore a form of austere relationism.

There is one dialectical reason why austere relationism is theoretically interesting. Defenders of this view often advertise it as the best articulation of our commonsense view of perceptual experiences. Whereas common sense takes for granted that we are presented with stones, tables, and trees in perceptual experiences, the existence of perceptual contents is unobvious, so it should be established by argument. In this respect, the status of perceptual representations is arguably similar to that of theoretical entities like sense data, qualia, and non-existent objects (Campbell, 2014, pp. 20–2, 42–3, 88; Cassam, 2014, p. 136; Raleigh, 2015). In the remainder of this article, I shall grant that perceptual contents are theoretical entities.

What is meant by ‘representational content’? There are many different ways of developing this idea (Brogaard, 2014; Pautz, 2011; Schellenberg, 2014; Siegel, 2010). For my present purposes, I will presuppose a minimal and relatively uncontroversial analysis. A representational content will be understood as an abstract entity. Typical examples of contents are propositions. I shall say that representational contents determine *correctness conditions*. The latter are situations under which a representational content is correct or incorrect. The proposition <<John>, being a dog> is correct if and only if John exemplifies the property of being a dog. It is incorrect otherwise. I will use the adjective ‘correct’ as a generic term covering a

variety of evaluations like truth and accuracy. My positive claim is that entities that determine correctness conditions offer a plausible explanation of IOMs. Whether these entities are propositions is a question I will not address here.

It has been pointed out that one can associate perceptual contents with perceptual experiences and, still, those perceptual contents need not offer a fundamental characterization of those experiences (Brogaard, 2014; Pautz, 2011; Schellenberg, 2014; Siegel, 2010). A good way of showing that perceptual contents are not trivially associated with perceptual experiences is to argue that they have some explanatory roles to play. My aim is precisely to show that perceptual contents offer a plausible explanation of IOMs.

How could austere relationists account for IOMs without introducing perceptual contents? Given that current proposals have mostly focused on philosophers' hallucinations and illusions, they might try to reduce IOMs to any of these categories. I will argue that neither of these approaches is plausible.

5. *The epistemic account of hallucinations*

Recall that IOMs do not seem to fit into the philosophical dichotomy of hallucinations and illusions (Section 2). Nevertheless, austere relationists might insist that IOMs are plausibly characterized as hallucinations as of one moving object. Arguably, this view does not need to introduce a non-existent, intentional object because the phrase 'one moving object' appears after the intensional expression 'hallucination as of'. I will submit that there are decisive asymmetries between IOMs and philosophers' hallucinations that prevent austere relationists from adapting their preferred analysis of hallucinations to IOMs. To this end, I will argue that the epistemic account of hallucinations cannot be applied to IOMs. At the end, I will generalize my conclusions to any attempt at assimilating IOMs to philosophers' hallucinations.

The epistemic account of hallucination is a paradigmatic way of analyzing misleading experiences without introducing perceptual contents. It seeks to explain what it is to have a hallucinatory experience in terms of a counterfactual condition. If a subject, *S*, has a hallucination of an *F*, *S* has an experience that *could not be* discriminated – by reflection alone – from a corresponding successful perception of an *F*.¹⁵ The concept of indiscriminability is to be understood in epistemic terms. The hallucination of an *F* is a case in which it is not possible to know 'that it is not one of the [successful] perceptions' of *F*s (Martin, 2006, p. 364). In other words, it is a case that is unknowably distinct from a corresponding successful experience (Martin, 2004, p. 77). This epistemic analysis enables the austere relationist to account for hallucinations without introducing perceptual contents.¹⁶

The epistemic conception of hallucination has been strongly criticized (Hellie, 2013; Siegel, 2008; Sturgeon, 2008). Although I am sympathetic to some of

these objections, I will assume – for the sake of the argument – that austere relationists could respond to them. Even in this happy scenario, however, the epistemic account of hallucination cannot be used to account for IOMs.

In his elaboration of the epistemic account, Michael Martin writes:

The disjunctivist is committed to saying that, at least when it comes to a mental characterization of the hallucinatory experience, nothing more can be said than the relational and epistemological claim that it is indiscriminable from the perception (Martin, 2004, p. 72).

If the epistemic analysis could be generalized to IOMs, it should explain why these experiences seem to present one object in motion just by invoking their indiscriminability from a corresponding successful experience. Unfortunately, this is implausible. The epistemic analysis explains the phenomenal character of hallucination by abstracting from any relation between the target hallucination and the actual world. This is inadequate in the present case, however, for the phenomenal character of IOMs is also determined by other factors: two mind-independent dots and their properties, their respective locations, and a specific temporal interval that mediates their presentation. Indeed, when scientists engineer their experiments, they do not directly activate the visual cortex of subjects. Instead, they intervene on some distal items in the world. If one treated IOMs as philosophers' hallucinations, one would have to assume that subjects who experience them are completely out of touch with reality. This is implausible, however, for subjects do get a number of things right: they successfully perceive the colors, sizes, and shapes of the dots, their initial and final location, and the temporal intervals. These successfully perceived features work as cues that lead their perceptual systems astray.¹⁷ Had subjects misperceived them, the phenomenal character of their experiences would change accordingly.

To sum up, the epistemic account was initially designed to deal with *total* hallucinations (Section 2). Unfortunately, IOMs are not total hallucinations, for they involve distal objects and properties that make a contribution to their phenomenal character. Therefore, the epistemic account cannot be generalized to IOMs.

Defenders of the epistemic analysis might want to resist this objection, though. They might grant that the world does make a contribution to the phenomenal character of IOMs but maintain that the epistemic analysis can be adapted. To this end, they might exploit an atomistic strategy hinted at by Martin:

To generalize the account, we would need to fix on the various aspects of a state of perceptual awareness, the ways in which it may be the same or different from other such states of awareness. Focusing just on cases of veridical perception, we can say that these aspects will all involve the presentation of that entity as it is. In turn, a sensory experience of that sort is the occurrence of a situation which is indiscriminable in this particular respect from a perception of the element in question (Martin, 2004, p. 81).

Consider IOMs. On the one hand, they are successful experiences of a number of features: the colors, sizes, and shapes of the dots, their initial and final location, and their temporal intervals. On the other hand, they are misleading experiences as of one object moving from one location to another. One might therefore treat the experience as a composite of successful perception and hallucination. Its hallucinatory dimension could be taken as indiscriminable from a corresponding perception of one object moving from one location to another.

Unfortunately, as Martin himself recognizes, this approach remains seriously incomplete. Indeed, the defender of the epistemic account should say more in order to 'accommodate aspects of the phenomenal character of experience which arise from global properties of the scene, the combination of elements, rather than just atomic elements of the presentation of objects or color points in a given scene' (Martin, 2004, p. 81).

Martin's strategy can only be generalized to partial hallucinations if one can treat the perceptual and hallucinatory components as *independent variation dimensions* of IOMs. Alas, this is not a plausible claim to make in relation to IOMs because the perceptual component of IOMs bears an explanatory relation to its hallucinatory component, and this explanatory relation is not captured by the atomistic strategy. Indeed, it is *because* subjects successfully perceive the features mentioned above that they have a misleading experience as of – let us say – one red dot becoming green. Hence, these successfully perceived features are not separable from the misleading character of the experience. If subjects failed to successfully perceive any of these features, the phenomenal character of the experience would change accordingly.

To sum up, the epistemic analysis of hallucination cannot be generalized to IOMs because the latter are not plausibly construed as total hallucinations. Besides, one cannot adapt the account by pursuing an atomistic strategy, for the phenomenal character of IOMs seems to be inextricably related to the successfully perceived features in the scene. This conclusion generalizes to *any* other attempt at assimilating IOMs to philosophers' hallucinations. The same considerations would hold even if one tried to replace the epistemic relation of indiscriminability with a non-epistemic relation (Pautz, 2010) or held that hallucinations lack phenomenal character (Fish, 2009, pp. 81, 93 ff.).

I conclude that the world makes a non-eliminable and non-atomistic contribution to the phenomenal character of IOMs. As a result, one might be tempted to analyze them on the model of philosophers' illusions. In the next section, I argue that the austere-relationist account of illusions cannot be generalized to IOMs either. With some additional assumptions, this conclusion undermines the austere-relationist account of the phenomenal character of perceptual experiences.¹⁸

6. *The epistemic account of illusions*

In this section, I argue that it is implausible to construe the contribution of the world to the phenomenal character of IOMS on the model of philosophers' illusions. The latter require that the subject successfully perceive mind-independent objects. Unfortunately, there is no plausible way of construing IOMS as grounded in object perception. I propose to focus on Brewer's (2011, forthcoming) view—one of the most sophisticated austere-relationist accounts of illusions. Later on, I generalize the conclusions to any other attempt at analyzing IOMS as philosophers' illusions.

Here is Brewer:

The core of the [Object View] account of *looks* is that an object of acquaintance, *o*, *thinly looks F* iff *o* has, from the point of view and in the circumstances of perception in question, appropriate *visually relevant similarities* with paradigm exemplars of *F*. [...] Furthermore, some, but not all, of these thin looks will be salient to us in any particular case, for example, as we switch between the duck and rabbit looks of the duck-rabbit figure. I say that an object, *o*, *thickly looks F* iff *o* *thinly looks F* and the subject *registers* its visually relevant similarities with paradigm exemplars of *F* (Brewer, forthcoming, p. 2).

Let us bracket the contrast between thin and thick looks in order to focus on the two-stage structure of Brewer's analysis, which is common to many other epistemic accounts of illusions.¹⁹ On this view, illusions have two components: First, subjects are perceptually related to objects in the world. Those objects stand in a *relevant similarity* relation to paradigm cases in which an item instantiates a relevant property. Second, the illusion arises because the subject cognitively reacts (or can react) to that similarity. Her reaction may consist in the formation of a corresponding judgment or belief.²⁰

Consider an example. In the Müller-Lyer illusion, the subject is first perceptually related to the lines in the diagram. These lines stand in a relevant similarity relation to other pairs of lines: 'one longer and more distant than the plane of the diagram, one shorter and less distant' (Brewer, 2011, p. 102). Because the perceiver was probably raised in a carpentered world where lines with inward-slanting slashes reliably indicate less distant planes than lines with outward-slanting slashes, she may judge or believe that the former lines are shorter than the latter.

There are two aspects to this account. First, perceptual relations to objects figure in the first stage. This enables Brewer to preserve the original claim that perceptual experience is fundamentally characterized by citing mind-independent objects. Second, the account introduces a post-perceptual stage in which the subject registers the relevant similarity. It is only at this level that representational contents are involved. Since those contents are post-perceptual, defenders of the two-stage analysis can avoid the introduction of perceptual contents to explain illusions.

The two-stage model requires that one first identify *what* is perceived. This is necessary in order to define the similarity relation to relevant paradigms. Let us call this the ‘perceptual basis’ of the illusion. There are two reasons why this perceptual basis ought to be characterized by means of perceived objects. First, this follows from philosophers’ definition of illusion as a case in which a perceived object seems to instantiate a property it does not instantiate (Section 2). Second, it follows from the definition of the object view, which conceives of perceptual relations to objects as ‘the most fundamental characterization of our experience’ (Brewer, 2011, p. 92; see also pp. 62–3) (Section 4). This raises the question: What objects constitute the perceptual basis of IOMs?

An easy answer would be: the illusion involves *one* non-existent object beside the two real dots. One has the impression of tracking one moving object because a non-existent object follows (or seems to follow) a spatiotemporal trajectory, and this trajectory is sufficiently similar to the trajectories followed by paradigmatic real objects in our world. Yet, introducing non-existent objects would be a high price to pay. Indeed, Brewer’s and Campbell’s formulations of austere relationism seek to avoid the introduction of mysterious entities like non-existent objects. This makes good sense in the present dialectical context. If one finds perceptual contents mysterious, one ought to find non-existent objects at least equally mysterious (Section 4). Therefore, the austere relationist has only three remaining options in order to analyze IOMs as traditional illusions:

- (1) Explain the illusion by means of a perceptual relation to the first object (e.g. a red dot at location l_a).
- (2) Explain the illusion by means of a perceptual relation to the second object (e.g. a green dot at location l_b).
- (3) Explain the illusion by means of a perceptual relation to both objects.

I propose to examine these three options by focusing on cases involving not only apparent motion but also apparent change. Suppose that a red dot is followed by a green dot. In this case, observers have an experience as of a red dot changing location and switching to green in midcourse. My claim is that options 1–3 do not offer plausible characterizations of the perceptual basis of these IOMs.

Option 1 holds that the perceptual basis of the illusion is nothing but the perceptual relation to the red dot. As Goodman (1978) and Dennett (1991) made clear, this solution is forlorn. Plausibly enough, the appearance of the second dot at location l_b is necessary to generate the experience as of one moving dot switching to green. Thus, this approach would only work if the visual system could predict that there would be a green object at location l_b . But this hypothesis lacks support. On the one hand, the experience of

qualitative change is equally robust when subjects are presented with IOMs for the first time. On the other hand, there are so many variations of IOMs that there is no reason to think that the brain ‘knows’ (either by evolution or prior training) which properties will be exemplified by the second item and where it will appear. For these reasons, Goodman (1978, p. 83) rejects approaches along these lines as involving ‘a belief in clairvoyance’ (see also Dennett, 1991, p. 120 and Grush, 2008, p. 155).

Option 2 posits a relation to the second dot as the sole basis to define a relevant similarity relation with a paradigm object. But this solution is implausible as well. If the second dot contributes to the experience as of a red dot becoming green, it is no less true that the first dot plays a non-eliminable role as well.

A preliminary conclusion is that the two dots must be taken into account in order to characterize the perceptual basis of IOMs. Hence, the austere relationist could develop an alternative proposal along the following lines. First, the subject sees dot A at l_a . Second, the visual system unconsciously registers B’s appearance at l_b . Upon registering B’s appearance at l_b , the subject is led to experience dot A as moving to l_b and switching to green in midcourse. The resulting proposal integrates the intuition behind option 1 that only the first dot is consciously perceived and the intuition that the second dot somehow contributes to the phenomenal character of the illusory experience.²¹

Unfortunately, this proposal raises a number of questions. Why should we treat dots A and B differently? What could justify the claim that dot A is consciously perceived while dot B is just unconsciously registered? Introspection alone does not seem to yield a clear verdict on this issue. In addition, it would be hasty to conclude that dot A is consciously perceived just because it was flashed *first*. After all, there seem to be cases in which the appearance of a second item prevents the first item from being consciously perceived. Thus, one might wonder whether this is not what occurs in the present case.²²

Suppose now that there is a satisfactory way of responding to these objections. Even in this case, the proposed account would face at least two additional problems: the iteration problem and the gap problem.

6.1.1 The iteration problem: In many experimental setups, observers are presented with alternating dots at two locations: $l_a, l_b, l_a, l_b, \dots$ (Wertheimer, 1912) Thus, observers have experiences as of one dot moving from l_a to l_b , then from l_b to l_a , and again from l_a to l_b , and so on. These iterated IOMs undermine the proposal under consideration. By hypothesis, dot A at l_a is consciously perceived at t_1 . By hypothesis, dot B at l_b is not consciously perceived at t_2 . Still, observers have an experience as of one dot moving from l_b at t_2 to l_a at t_3 . This leads the austere relationist to a dilemma: If dot B is not consciously perceived at l_b , then the conscious perception of the first dot in a given temporal interval is not necessary to explain IOMs. If dot B is consciously perceived at l_b , then the proposal under consideration is mistaken.²³

6.1.2 *The gap problem:* The present proposal presupposes the existence of a sharp divide between two levels: the conscious perception of dot A and the unconscious registration of dot B. This raises a problem: If there is a sharp distinction between the two levels, why is this sharp distinction not reflected in the phenomenology of the experience? If observers are consciously aware of the red dot at location l_a but merely unconsciously register the green dot at location l_b , why is there no gap between their conscious perception of a static red dot at location l_a and the unconscious registration of a green dot at location l_b ? The absence of any such gap in consciousness strongly suggests that, if dot A is consciously perceived, dot B is consciously perceived too.²⁴

The main lesson from the previous analysis is therefore that, if the austere relationist wants to treat IOMs as philosophical illusions, she should not only ascribe a causal role to the second dot in the generation of the illusion. She should also hold that both dots reach phenomenal consciousness. This leads us to option 3 above.

According to option 3, the subject is perceptually related to the red dot and the green dot.²⁵ In order to explain the illusory experience, it is necessary to depict the two dots as standing in a similarity relation to a paradigm. When the temporal interval between the two dots is from 10 to 45 milliseconds, subjects report an experience as of one moving dot. Thus, in order to experience the red dot and the green dot as one object, there must be a significant number of objects in the subject's environment that cover a similar distance in an interval of between 10 and 45 milliseconds. In other words, the red dot and the green dot must exemplify a spatiotemporal variation similar to the spatiotemporal variation exemplified by paradigms of pairs of object-phases like <object-phase 1, object-phase 2> covering the same distance.²⁶

Unfortunately, this solution faces two major problems: it departs from the letter of austere relationism and conflicts with some well-entrenched intuitions on successful object perception. Let me elaborate.

Notice that it is not sufficient to be perceptually related to a red dot and a green dot in order to have an experience as of a red dot becoming green. It is also necessary that the two dots be parsed in a specific order: the red dot firstly, the green dot secondly. After all, if one permutes the order, one obtains a different illusion: an experience as of a green dot becoming red. A traditional way of representing the ordering relation between two entities is by means of a set-theoretical representation. The observer is perceptually related to the ordered pair: <red dot, green dot> .

Moreover, being perceptually related to the ordered pair <red dot, green dot> is not sufficient in order to have an experience as of a red dot becoming green. After all, pairs of entities *by themselves* cannot stand in similarity relations to other pairs of entities. As Goodman (1972, pp. 473ff.) made clear, similarity is relative, variable, and highly context-dependent. Indeed, in order to compare a pair 1 with another pair 2, one must specify *in which respect* one is considering the entities in pair 1 and the entities in pair 2 respectively.

In other words, it is necessary to consider the red dot and the green dot in the pair <red dot, green dot> in a specific respect before one can compare them with a pair of object-phases in <object-phase 1, object-phase 2>. If one abstracts from the spatiotemporal relations between the two dots in the initial pair, one will be unable to ground the similarity relation between the perceptual basis and the two phases of a single object covering the same distance. After all, what generates IOMs is the spatiotemporal relation between the two dots, not the pair of dots itself.

This creates a problem, though. If the perceptual basis of the similarity relation is not the pair of dots itself but the pair of dots *as being related in a specific way*, we have something quite different from the objects listed in the original characterization of austere relationism (Section 4). We have an ordered pair of dots that stand in a specific spatiotemporal relation to each other. We can represent this entity as follows:

<<red dot, green dot>, being in *such and such* spatiotemporal relation>.

Unfortunately, this complex is not one of the physical objects Brewer and other austere relationists typically list as mind-independent physical objects, which include trees, tables, and stones. This complex is rather akin to a fact or state of affairs (Dokic, 2000; Fish, 2009; McDowell, 1996).

The previous argument shows that any account of IOMs would depart from the letter of austere relationism, for it would have to introduce entities other than bare mind-independent objects to ground their phenomenal character. Some might reply, however, that facts or states of affairs are still congenial with the spirit of austere relationism, for mind-independent objects still play a fundamental role in the characterization of perceptual experience. Unfortunately, the objects that constitute these facts or states of affairs *are not successfully perceived* in IOMs, or so I shall argue.

Brewer (2011, p. 71) insists that there must be 'limits on the nature and extent of any errors involved' in illusion. On his view, beyond some limits, the subject does not count as successfully perceiving the relevant object. Suppose you are looking at a square, and it seems to you that there is an elephant there. According to Brewer (2011, pp. 71–3), it would be wrong to say that you see the square and it looks elephantine to you. Rather, one should say that you do not see the square at all. The same holds if one tries to account for IOMs by means of facts or states of affairs. In order to perceive the complex <<red dot, green dot>, being in *such and such* spatiotemporal relation>, it is necessary to see the red dot as numerically different from the green dot. Unfortunately, observers do not see the red dot as numerically different from the green dot. Therefore, it is a mistake to hold that they perceive the complex <<red dot, green dot>, being in *such and such* spatiotemporal relation>, and that this complex grounds the phenomenal character of IOMs.

We can substantiate this conclusion by means of an intuitive constraint on successful object perception. Philosophers of all stripes have insisted that perceptual differentiation is a necessary condition for object perception (Campbell, 2002, pp. 7 ff.; Dretske, 1969, pp. 20–9). This plausible intuition has the following consequence:

If a visual scene contains objects o_i and o_j , then: If a subject, S , sees o_i and o_j , S differentiates o_i from o_j .

IOMs are cases in which subjects fail to differentiate the two objects present in a scene. The two dots seem to be ‘fused’ or ‘merged’ into a single, moving object. Therefore, subjects cannot be described as successfully perceiving the two dots.²⁷

It is therefore implausible to account for the phenomenal character of IOMs by positing a perceptual relation to the two dots, *even if the latter are construed as constituents of facts or states of affairs*. Since philosophers’ illusions require successful perceptual relations to at least one object, the present argument undermines *any* account of IOMs as philosophers’ illusions.

Let us bring together the results so far. We have good reasons to think that distal objects and their properties make a non-eliminable and non-atomistic contribution to the phenomenal character of IOMs (Section 5). Thus, IOMs are not cases in which subjects are completely out of touch with the world, as the hallucination account would predict. Nevertheless, we have also good reasons to think that the two relevant objects somehow reach conscious experience but are not successfully perceived (Section 6). Hence, if an austere relationist wants to provide an account of these cases, she should consider them as a counterexample to Brewer’s claim that physical objects are the direct objects of perception (Section 4). IOMs are cases in which direct perceptual relations to physical objects *do not provide, pace Brewer*, ‘the most fundamental characterization of our experience’ (Brewer, 2011, p. 92). In these cases, our perceptual experience reaches out into a world involving external objects, yet those objects are not successfully perceived.

Austere relationists might grant this point but hold that it does not undermine the *spirit* of their view. To this end, they might reason as follows. Although physical objects are not always the direct objects of perception, they *often* are. Thus, austere relationists could just broaden the class of mind-independent entities in order to accommodate IOMs. This is consistent with *some* formulations of naïve realism, such as Sturgeon’s (2008, p. 116): ‘Good [or successful phenomenal] character derives from bits of the physical world standing in an explanatorily basic relation to percipients’. On this view, the list of mind-independent objects can include, not only

paradigmatic objects like trees, tables, and stones, but also *whatever* bits of the physical world one might need in order to account for IOMs and other puzzling cases.

Alas, this line of reply raises a problem. Recall that subjects report an experience as of one moving object in IOMs (Sections 2–3). In other words, their experiences seem to present one object. If one posits relations to entities other than objects in order to account for IOMs, one has thereby conceded that perceptual relations to mind-independent objects need not be taken as fundamental for an account of experiences that seem to present mind-independent objects. After all, if one can explain IOMs by introducing perceptual relations to entities other than mind-independent objects, there is no reason not to generalize this conclusion to *all* other experiences as of mind-independent objects.

There are at least two ways of motivating the proposed generalization. First, it would deliver a more parsimonious account of experiences as of mind-independent objects. Second, the resulting account would not be prey to Robinson's (1994, p. 154) famous argument against naïve realism. If naïve realists wanted to provide different accounts of the phenomenal character of IOMs and successful experiences of objects, they should assume that the brain could mysteriously know whether the case is one of successful perception (so that it stands in a perceptual relation to an object) or one in which an entity other than a mind-independent object is mistaken for an object (so that the seeming relation to an object is derivative from a relation to something else). Unfortunately, there is no good reason to think that the brain has this mysterious knowledge.

The importance of the present challenge might be obscured by the fact that naïve realists are rather unclear on what they mean by objects. If we take seriously their paradigm examples – i.e. trees, tables, and stones – then mind-independent objects are the sorts of things that persist over time.²⁸ Given the description offered in Sections 2–3, IOMs are plausibly characterized as illusions of persistence. After all, subjects report experiences as of one object changing qualities and location. Hence, these illusions cannot be explained by invoking primitive relations to mind-independent entities whose persistence is immediately appreciated by the observer.

The representationalist can therefore use IOMs to provide a fundamental characterization of perceptual experiences that does not invoke perceptual relations to objects *considered as persisting entities*. She can construe experiences of objects as persisting over time as derivative from perceptual relations to more primitive, non-persisting entities. These entities might be short-lived events or object-phases (see, e.g., Smith, 1996, pp. 117–35).

I explore this suggestion in the next section. To this end, I sketch an account of the representational contents required to experience objects as persisting over time, and apply them to IOMs.

7. *Object-directed experiences and perceptual content*

In this section, I develop an account of perceptual content designed to explain IOMs and, more generally, experiences of objects as persisting over time. The proposed account builds on two ideas: Evans' (1981) insight that perceptual tracking requires dynamic modes of presentation and Fine's (2007) relational semantics for identity.

7.1 DYNAMIC MODES OF PRESENTATION

IOMs have two salient features: they involve apparent motion and are illusory. Hence, in order to use them to draw general lessons on the structure of perceptual experiences, we should generalize from IOMs in two ways. First, we ought to show that IOMs may teach us something about the fundamental nature of *successful* perceptual experiences of objects as persisting over time. Second, we ought to show that these illusions are revelatory, not only of the nature of experiences as of *moving* objects, but also of experiences as of *static* objects. I consider each generalization in turn.

7.1.1 First generalization: Imagine a subject who is keeping track of a woman over time. Barring occluders or momentary distraction, visual experience could put our subject in a position to form the following series of thoughts:

- (A) P1 That woman is running.
- P2 That woman is jumping.
- C Therefore, that woman is running and jumping.

As Campbell (2002, p. 129) comments: 'Recognizing the validity of the inference requires that your experience should make the sameness of the object transparent to you' (see also Campbell, 2014, pp. 34–5). Following Evans (1981), we could say that the numerical identity of the woman is transparent to you because it is perceived under the same 'dynamic mode of presentation'. A dynamic mode of presentation fixes the reference to the woman and enables the observer to keep track of that woman as persisting over time.²⁹

We can generalize this account to IOMs by saying that dynamic modes of presentation not only capture cases in which numerical identity is perceptually obvious but also cases in which one *merely* seems to be presented with one object as persisting over time. We can flesh out this suggestion by comparing cases of type A with IOMs. Cases of type A are scenarios in which the co-reference of the two demonstratives is perceptually manifest to the observer. IOMs are cases in which one has an experience as of co-reference but this is an error.

Recall that, in some experimental setups, observers are presented with alternating dots at two locations: $l_a, l_b, l_a, l_b, \dots$ (Section 6) Suppose now that an observer who is unfamiliar with the setup is watching these alternating presentations. In this case, it would be natural for her to produce the following series of thoughts:

- (B) P1 That dot was at location l_a .
- P2 That dot was at location l_b .
- C Therefore, that dot (at l_a) is the same as that dot (at l_b).

In case B, the observer takes the occurrences of ‘that dot’ as co-referential. Indeed, the experience that seems to justify the move from P1-P2 to C seems to present a single object moving from one location to the other. Hence, it shares a phenomenal feature with cases of type A. Still, contrary to cases of type A, the two occurrences of ‘that dot’ are not co-referential.

It is reasonable to interpret the similarities between cases of type A and IOMs as an argument to introduce a representationalist analysis of our perceptual experience of objects as persisting over time. Indeed, the representationalist might reason as follows: the subjective impression that the occurrences of ‘that dot’ co-refer is grounded in how things are perceptually represented; different dot-phases are perceptually represented *as* one moving dot. The similarity between IOMs and successful tracking is therefore explained: both cases involve representations of different phases *as* one moving object. In successful tracking, the phases represented as phases of one object are in fact phases of one object. In IOMs, by contrast, they are phases of numerically different objects.³⁰

7.1.2 Second generalization: Our second question was whether we could generalize the present analysis to experiences as of *static* objects. I do think so. Indeed, our understanding of objects is parasitic on our understanding of the way they move. This assumption underlies some of the most successful studies on object perception in cognitive science. Developmental psychologists have examined infants’ perception of objects by evaluating their ability to parse some wholes as keeping their parts bound together *while following relatively continuous trajectories through space*. Another reason why infants are thought to perceive objects is that they count these wholes as the same even when they fail to register changes in qualities like size, shape or color (Carey, 2009).

A number of philosophers have made similar points. Evans (1981, p. 311) famously held that ‘the static notion of “having hold of an object at t ” is essentially an abstraction from the dynamic notion of “keeping track of an object from t to t' ”’. In addition, one might hold that the ability to keep track of objects over time is constitutive of the ability to perceive objects *tout court* because tracking is what enables us to distinguish persistent objects from

other entities. Indeed, Burge (2010, pp. 80, 198–9, 444–7, 459, 469) has persuasively argued that we distinguish objects from events and shapes because we expect the former – but not the latter – to keep their boundary integrity over time. One might therefore claim that IOMs are incorrect representations of two events or shapes as one persisting object. In what follows, I present a formal analysis that captures the gist of Evans' and Burge's remarks, avoids some problems, and locates the present proposal within the wider family of neo-Fregean accounts of perceptual content.

7.2 THE COMMON CONTENT OF OBJECT-DIRECTED EXPERIENCES

On a common-factor analysis, the visual system represents some phases as bearing some spatiotemporal relations to each other. *Ceteris paribus*, if the visual system represents m object-phases as standing in spatiotemporal relations to each other that are sufficiently similar to the relations that n phases of one object bear to each other when it is following a relatively continuous trajectory, the perceptual experience is as of *one* object. The content of this experience is correct when the m object-phases are appropriately caused by m object-phases of *one* object. It is incorrect otherwise. If these spatiotemporal relations are different, the perceptual experience is as of *two* objects. This will occur when the interval is too brief or too long. We can articulate this proposal by introducing the following, relational semantics for object-directed experiences (Fine, 2007):

The perceptual content of an object-directed experience $|E|$ is the function $f(|P_1, P_2, \dots, P_m|)$ of the sequence $|P_1, P_2, \dots, P_m|$ on the phases P_1, P_2, \dots, P_m .³¹

The argument of this function is a sequence of phases. In order to be part of this sequence, the phases must be parsed as standing in some spatiotemporal relations to each other. One could generalize this analysis to experiences as of static objects by substituting static object-parts for object-phases (Echeverri, 2016).

More could be said on what makes the relevant causal relation appropriate. Since appropriate causal relations are invoked by any representationalist theory, I propose to focus on the main theoretical innovation of the present analysis. This will enable us to see how the present proposal accommodates Evans' and Burge's remarks, how it avoids some problems, and how it relates to the wider family of neo-Fregean accounts of perceptual content.

The relational function has a 'relational semantics': the arguments are not the phases *taken individually* but *sequences* of phases. This accommodates Evans' (1981, p. 311) idea that 'the static notion of "having hold of an object at t " is essentially an abstraction from the dynamic notion of "keeping track of an object from t to t' "'.³² In his development of semantic

relationism, Fine (2007) interprets each element of the sequence as standing for one object. However, this would not enable us to preserve Burge's (2010) insight that a subject's perceptual appreciation of something as an object persisting over time may be derivative from – not prior to – a temporally extended tracking episode (Section 7.1). For this reason, I propose to depart from Fine and interpret the arguments of the function in a more austere way.³³ On my view, the visual system initially represents various phases in a neutral way as to whether they are phases of one object. It is the value of the relational function that yields a committal representation, i.e. a representation of these phases *as* phases of one object. This representation might be construed as an object file, i.e. a mental representation that has the function of representing objects as numerically identical over time (Carey, 2009; Echeverri, 2016). The committal representation is tokened only if the various phases stand in some spatiotemporal relations to each other.³⁴

Fine's interpretation would also have two undesirable consequences. First, it was already pointed out that subjects fail to differentiate the two dots in IOMs (Section 6.). Thus, the two dot-phases should not appear *as differentiated* in the arguments of the function. Second, Fine's account would lead us to introduce an impossible content into the phenomenology of the experience. A content *c* is impossible just in case there is no possible world in which *c* is true. On a standard view, contradictory contents are impossible in this sense. Now, if numerically different objects o_i and o_j figure as arguments of the relational function, there is a sense in which the experience represents an impossible content: the dots are represented *as two* in the argument of the function and *as one* in the value of the function. The trouble here is that IOMs do not seem to present an impossible state of affairs, contrary to what occurs in other well-known cases like the waterfall illusion, in which a stationary object seems to move and stand still at the same time (Pautz, 2010, p. 274).

These problems should not arise if we carefully distinguish the way the dots are given in the argument of the function from the way they are represented in the value of the function. The two dots are not represented as differentiated in the argument of the function. Instead, they figure as elements of a sequence that is indiscriminable from the sequences formed by object-phases of *one* object. This explains why it is tempting to hold that the two dots appear to be 'fused' or 'merged' into a single, moving object (Section 6). This approach also enables us to distinguish IOMs from illusions that seem to present impossible states of affairs. The subject can experience two numerically different dots as phases of one moving dot without being aware of the impossible character of that state of affairs because the two dot-phases fall under the same dynamic mode of presentation. This dynamic mode of presentation masks the impossibility from the subject's perspective. In a nutshell: even though it is metaphysically impossible that two numerically different objects be one object, this metaphysical impossibility does

not reach phenomenal consciousness because the two dots are given as mere dot-phases and these dot-phases fall under the same dynamic mode of presentation.

The above analysis should also make clear why the relational function differs from two other Fregean accounts of content: *de dicto* and *de re* modes of presentation.

De dicto modes of presentation impose some conditions that the *object* of perceptual experience must satisfy in order to be the referent of that experience. The relational function, by contrast, imposes some conditions that *phases* must satisfy in order to be experienced as phases of the same object (see Echeverri, 2016, for discussion).

‘[D]e re modes of presentation are inherently relational in that what object or property instance the subject is related to makes a constitutive difference to the nature of the ensuing content’ (Schellenberg, 2013, p. 303; see also Peacocke, 1981). In this framework, either the mode of presentation is ‘filled’ by one object or it is gappy. The relational function differs from *de re* modes of presentation because it makes room for a third possibility. There are cases of referential failure that do not arise from the absence of objects – as in the hallucinatory case – but from the presence of different objects within a spatiotemporal range that is normally filled by phases of a single object. Hence, those are cases in which the relational function is ‘filled’ by phases of numerically different objects, the experience involves one object file, but that object file fails to refer to one object.

8. Concluding remarks

It has often been claimed that, whereas representationalism treats perceptual experiences as object-independent, naïve realism takes mind-independent objects as constituents of experiences. The arguments from this article suggest that these claims are ambiguous. Since the contents of object-directed experiences may be defined over object-phases, they need not be construed as object-independent. Nevertheless, there are reasons to treat perceptual experiences as independent from objects *considered as persisting over time*. After all, we may need to posit perceptual contents in order to account for the phenomenal character of misleading experiences as of persisting objects. Consider now the naïve-realist claim that objects figure as constituents of experiences. If we read it as the claim that our perceptual appreciation of object persistence is fundamental, it is an unwarranted claim. After all, one can introduce dynamic modes of presentation ranging over more primitive entities in order to elucidate our perceptual appreciation of objects as persisting over time.

These remarks are directly relevant to a series of recent attempts at reconciling representationalism with naïve realism (see, e.g., Hellie, 2013;

Kennedy, 2013; McDowell, 2013; Schellenberg, 2014; Siegel, 2010; Soteriou, 2010). Before one tries to build relations to mind-independent objects into perceptual contents, one ought to be clear on what it means for perceptual experiences to have objects as constituents.

IOMs certainly raise many other interesting issues. My aim in this article was to examine the prospects of austere relationism to account for these intriguing cases and to formulate an alternative, representationalist account. I hope austere relationists will take this challenge as an opportunity to respond to my objections. If the arguments presented here are correct, IOMs compel us to get rid of the procrustean dichotomy of hallucination and illusion. Besides, they cast doubt on the priority given to mind-independent objects in the characterization of the phenomenal character of perceptual experiences.³⁵

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NOTES

¹ I have borrowed the phrase 'austere relationism' from Schellenberg (2014). There are also *compatibilist* accounts that combine relationism and representationalism (e.g. Hellie, 2013; Kennedy, 2013; McDowell, 2013; Schellenberg, 2014; Siegel, 2010; Soteriou, 2010). I make some remarks on compatibilism in footnote 13 and Section 8. So-called sense datum theories (e.g. Robinson, 1994; Russell, 1912) do not fall into this dichotomy, for they neither analyze perceptual experiences as involving relations to mind-independent objects, nor posit perceptual contents. I will not examine these theories here.

² I shall use 'misleading experiences' to denote illusory and hallucinatory perceptual experiences and 'successful experiences' to denote non-illusory, non-hallucinatory perceptual experiences. Thus, I will not examine so-called 'veridical' illusions and hallucinations. These phrases are also meant to be neutral on whether perceptual experiences fundamentally involve representational contents.

³ For an on-line demonstration, see: <http://www.michaelbach.de/ot/col-colorPhi/index.html>. There is some confusion on what is meant by the ϕ phenomenon. It is often taken to refer to what I am calling 'optimal motion'. Others use it to refer to 'perceived motion without objects being perceived as moving' (Wagemans *et al.*, 2012, p. 1206). For a useful discussion, see Hoerl, 2015.

⁴ In what follows, I only offer *prima facie* considerations for the claim that IOMs do not clearly fit into the philosophical dichotomy of hallucinations and illusions. I substantiate these considerations in Sections 5 and 6.

⁵ See also Brewer (2011, p. 64), Fish (2009, p. 80), Martin (2006, p. 394), and Pautz (2010, p. 280), among others.

⁶ See also Fish (2009) and Smith (2002, p. 23), among others.

⁷ I will come back to this point in Section 6. Some austere relationists have criticized representational accounts of illusions by arguing that many ordinary illusions and hallucinations do not fit into the traditional dichotomy (Campbell, 2014; Genone, 2014; Kalderon, 2011). I share the spirit of the criticism but not the anti-representationalist conclusion. My view is that a descriptively correct account of illusions may lead us to revise our views on the representational structure of perceptual experiences but not to reject perceptual representations altogether.

⁸ For some relevant studies, see Kolers, 1972; Kolers and von Grünau, 1976; Palmer, 1999, ch. 10; and Sekuler, 2012.

⁹ Genone (2014, p. 359) mentions the ϕ phenomenon as a potential counterexample to the traditional dichotomy of hallucinations and illusions but does not offer an anti-representationalist account thereof. Hoerl (2015) offers an analysis of illusions of *pure* motion within austere relationism. By this he means a sub-class of illusions of *imperfect* motion in which the subject has the impression that there *is* movement, without any awareness of a single bearer of that movement. Unfortunately, Hoerl does not account for either experiences of *dual* motion, or experiences of *optimal* motion.

¹⁰ Burge (2010) argues that perceptual constancy is sufficient for objectivity.

¹¹ See Carey (2009, pp. 72ff.), Pylyshyn (1999, p. 356), Sigman and Rock (1974), Wertheimer (1912), among others. There are also many philosophers who grant the description in terms of numerical identity. See Burge (2010, p. 463), Genone (2014, p. 359), Goodman (1978), and Matthen (2012, pp. 55–6).

¹² See also Shepard and Zare (1983) and Sigman and Rock (1974).

¹³ There are different characterizations of naïve realism in the literature. Some rely on the concept of essence, others on the concept of fundamentality, and still others on the concept of constituency. While some of them will lead to the conclusion that naïve realism is anti-representationalist, others will make room for compatibilist accounts. By qualifying perceptual experiences as fundamentally involving relations between subjects and mind-independent entities I mean to remain neutral on whether the naïve realist may introduce representational contents to account for some aspects of perceptual experiences. Fortunately, taking sides on this issue is not decisive for the main goal of this article, which concerns the role of perceptual contents in a philosophical account of the structure of perceptual experience.

¹⁴ Most versions of naïve realism also introduce relations to mind-independent property-instances or tropes in their fundamental characterization of perceptual experiences. I come back to the role of property-instances in Section 6.

¹⁵ For ease of exposition, I will ignore the qualification ‘by reflection alone’.

¹⁶ Although Martin has criticized some arguments in favor of perceptual content, it is not entirely clear whether he is an austere relationist. In Martin (2004, p. 71), he leaves open the possibility of accounting for imperfect hallucinations in terms of representational contents or sense data. Nevertheless, in the same paper, he also suggests that his epistemic account of hallucination could be generalized to other misleading experiences (2004, pp. 81 ff.). Be that as it may, the epistemic analysis has been invoked to account for misleading experiences within an austere-relationist framework. See Brewer (2011, pp. 101 ff).

¹⁷ I am using the word ‘feature’ in a theory-neutral way to denote any bit of the world that may contribute to the phenomenal character of IOMs.

¹⁸ It is worth stressing that some naïve realists reject the epistemic analysis of hallucination. See Campbell (2014, pp. 92ff.) and Johnston (2014).

¹⁹ See also Anthony (2011, p. 40), Campbell (2014, pp. 85–90), Fish (2009, pp. 172–7), Genone (2014) and Travis (2004). Although these views differ in important respects, the problems I shall formulate generalize to any analysis of illusions that posits a similar two-stage structure.

²⁰ It is not always clear whether the cognitive reaction is constitutive of the illusory experience. Although this point is philosophically important, it will not affect the arguments to follow.

²¹ I owe this suggestion to a referee of this journal.

²² I have in mind the phenomenon of metacontrast (Breitmayer, 1984). Suppose that the first stimulus is a disc and the second one a ring that fits closely outside the space where the disc was displayed. In this case, observers report that they did not see the disc but only the ring. This phenomenon is standardly interpreted as a case in which the disc was ‘masked’ by the ring (Dennett and Kinsbourne, 1992, pp. 193 ff.).

²³ To be sure, defenders of austere relationism could try to treat simple and iterated IOMs differently. But this would yield an *ad hoc* and extremely complex account.

²⁴ I do not mean to imply that unconscious perceptual processing cannot have behavioral and cognitive effects on us. Indeed, priming effects are examples of the effects of unconscious perceptual processing. The trouble here is that the effects required to vindicate the approach under consideration seem very different from other well-known effects of unconscious processing. When one experiences an IOM, it is not as if one could guess (as in a forced choice paradigm) that the red dot was followed by a green dot. Instead, it *appears* to become green just in the midpoint that separates locations l_a and l_b .

²⁵ Soteriou (2010, p. 234) argues that relationists can posit acquaintance with occurrences with temporal extension.

²⁶ Although I am using the word 'phase' to describe these cases, I am neutral on any theory of persistence. The reader is invited to substitute the relevant expressions with her preferred ones.

²⁷ Some readers might insist that the subject *does see* the two dots as numerically different but is unable to *report* them as numerically different. Unfortunately, this reply would be self-defeating. If verbal reports are not taken as reliable means to determine what is perceived, naïve realists are not entitled to rely on their own verbal reports to motivate the claim that mind-independent objects are constituents of their successful experiences.

²⁸ That objects are experienced as persisting over time plays a central role in Brewer's (2011, pp. 69–70) arguments against representationalism. It also plays a decisive role in Campbell's (2002, 2009) work of perceptual tracking.

²⁹ Since Campbell is an anti-representationalist, he cannot introduce dynamic *modes* of presentation. Instead, he introduces 'manners of presentation' that do not fix the reference to the object but only capture the transparency of the co-reference of the two occurrences of 'that woman'. As will become clear later, Campbell (2002, pp. 79, 129; 2014, pp. 46–7) is wrong to think that representationalists cannot account for tracking over time.

³⁰ Pautz (2010, p. 284) has argued that a common-factor analysis of phenomenology does not entail a common factor analysis of perceptual reference (see also Kennedy, 2013). The previous considerations suggest that phenomenology is not orthogonal to perceptual reference. Indeed, a common-factor analysis of *some specific forms* of phenomenology seems to go hand in hand with a factorization of perceptual success. The phenomenological commonalities between cases of type A and cases of type B suggest that perceptual reference to objects *considered as persisting over time* is not primitive. In IOMs, there is a perceptual misrepresentation of two dot-phases as phases of one dot. It is natural to hold that this misrepresentation is a byproduct of a referential mechanism that works well in cases of type A.

³¹ This function only considers the object side of perceptual content. Thus, it should be supplemented with an account of perceptual attribution of color, shape, size, and so on. See Echeverri (2016), for discussion.

³² It might turn out that some of the arguments of the function consist of phases that are merely anticipated by the visual system (Burge, 2010).

³³ This is not intended as a criticism of Fine's framework, which was designed to account for co-reference in language and thought. My point is that the framework should be revised in order to account for our experience of objects as persisting over time.

³⁴ The relational function should not be construed as a *sufficient* condition for the experience of various phases as phases of one object. After all, IOMs can be cancelled by background events, such as the appearance of virtual occluders (Sigman and Rock, 1974). Thus, a more detailed analysis should make room for contextual modulations of the relational function. I will examine this issue in future work.

³⁵ I presented earlier versions of this paper at the 21st Meeting of the European Society for Philosophy and Psychology (9–12 July 2013), the 5th Graduate Summer School in Cognitive Sciences and Semantics: Perception (19–29 July 2013), the XVII Inter-American Congress of Philosophy (7–11 October 2013), the Workshop: Abilities in Perception (29–30 November 2013), and the Colombo-Brazilian Meeting of Analytic Philosophy (5–6 December 2013). I am grateful to the audiences for their comments, especially to Tom Crowther,

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