Philosophical Issues
A Supplement to NOÛS

Philosophical Issues, 20, Philosophy of Mind, 2010

ATTENTION AND MENTAL PAINT[1]

Ned Block
New York University

Abstract

Much of recent philosophy of perception is oriented towards accounting for the phenomenal character of perception—what it is like to perceive—in a non-mentalistic way—that is, without appealing to mental objects or mental qualities. In opposition to such views, I claim that the phenomenal character of perception of a red round object cannot be explained by or reduced to direct awareness of the object, its redness and roundness—or representation of such objects and qualities. Qualities of perception that are not captured by what one is directly aware of or by representational content are instances of what Gilbert Harman has called "mental paint" (Block, 1990; Harman, 1990). The claim of this paper is that empirical facts about attention point in the direction of mental paint. The argument starts with the claim (later modified) that when one moves one's attention around a scene while keeping one's eyes fixed, the phenomenology of perception can change in ways that do not reflect which qualities of objects one is directly aware of or the way the world is represented to be. These changes in the phenomenology of perception cannot be accounted for in terms of awareness of or representation of the focus of attention because they manifest themselves in experience as differences in apparent contrast, apparent color saturation, apparent size, apparent speed, apparent time of occurrence and other appearances. There is a way of coping with these phenomena in terms of vague contents, but vague contents cannot save direct realism or representationism because the kind of vagueness required clashes wth the phenomenology itself.

1. Introduction

Are phenomenological characters of perception—e.g. what it is like to experience redness or roundness—philosophically reducible to the redness

or roundness of the objects one sees or to representation of redness or roundness? If there is no such reduction, then there can be said to be mental paint[2]. The mental paint issue cross-cuts the metaphysical dispute between physicalism and dualism. I am friendly to reductive physicalism in the sense of a *scientific* reduction of phenomenological qualities to biological properties of the brain, a reduction thesis comparable to the "micro-reduction" of water to H_2O, light to electromagnetic waves, and heat to molecular kinetic energy (Nagel, 1961; Oppenheim & Putnam, 1958), where micro-reduction is a reduction of properties of a whole to conglomerations of properties of the parts of that whole. Though I am open to reductive physicalism in that sense, I reject any *philosophical* reduction of the phenomenological qualities of perception to properties of objects such as redness or roundness or representations of redness or roundness and in this I am in agreement with some dualists (Burge, 2005; Chalmers, 2004). Philosophers may disagree about what the difference is exactly between scientific reduction and philosophical reduction. Perhaps it is the difference between an a posteriori reduction and an a priori reduction. I will not be discussing this issue further here.

One aim of this paper is to argue that philosophical reductions of phenomenological properties to direct awareness of properties of objects or representations of those properties are wrong. A second aim is to present evidence for some surprising phenomena involving attention against can be explained better with mental paint than without it. A third aim is to argue that certain kinds of indeterminacy in perception can be accommodated in terms of an indeterminacy in representational content without any corresponding indeterminacy in phenomenology.

It has been widely recognized that shifts of attention can affect the phenomenology of perception (Block, 1995; Chalmers, 2004; James, 1890; Macpherson, 2006; Nickel, 2007; Peacocke, 1993). What is controversial is whether such attentional changes in the phenomenology of perception can be accounted for in terms of what properties one is directly aware of or what properties one's phenomenological state represents. The dialectic of this paper starts with a preliminary claim that a difference in attention can produce a difference in phenomenology without any difference in what properties one is directly aware of or what properties one's experience represents. More specifically, two non-illusory percepts of the same feature of an object can differ in respect of, for example, perceived size or contrast. Later, I will suggest that indeterminate contents or awareness of indeterminate properties can accommodate the phenomena, but that experience is not indeterminate in the way it would have to be to save direct realism or representationism.

This may seem paradoxical: two percepts can differ in respect of say perceived size or perceived contrast, yet neither be illusory. How can that be? By way of understanding why there is no paradox, it might be useful to consider, briefly, loudness. Loudness—the perceived intensity of a sound[3]—is

a function of a number of variables, aside from actual intensity, namely frequency, bandwidth and the duration of the sound. Although loudness in some sense presents intensity and is experienced as presenting intensity, the same intensity can sound differentially loud depending on other variables. Analogously, although perceived size presents actual size, perceived size is a function not only of the actual size but of other variables notably the distribution of attention. Just as there can be two phenomenally different but non-illusory presentations of the same sound intensity, there can be two phenomenally different but non-illusory presentations of the same size. Despite this analogy between perceived size and loudness, there are are some disanalogies between the two cases that will be mentioned later.

I will argue that empirical facts concerning attention point in a direction incompatible with direct realism, and then move to arguing that the same points conflict with forms of representationism like that advocated by Alex Byrne, Peter Carruthers, Fred Dretske, Gilbert Harman, Chris Hill, William Lycan, Adam Pautz, John Searle and Michael Tye[4] according to which the phenomenal character of perception is or supervenes on its representational content (how it represents the world to be). Similar points apply to Colin McGinn's "cluster of properties" view (1999, p. 319) and Mark Johnston's (2004) "sensory profiles" account. In previous papers, I have argued that the phenomenal character of perception goes beyond its representational content. Here the argument is importantly different: that there is something about the representational content of perception (and direct awareness) that is actually incompatible with the phenomenal character of perception. The paper will end with a brief discussion of a respect in which the mental paint view argued for here is less radical than what I have argued for previously.

But first, I will briefly characterize the direct realist and representationist opposition and the sense in which these views reject and I embrace mental paint.

2. Direct Realism and Representationism

According to direct realism, the phenomenal character of perceptual experience is "object-involving" in the following sense: an experience of the redness of the tomato depends for its existence and individuation on the tomato and (on some versions) its color. Any experience, even a possible experience, that is of a different tomato or no tomato or of a tomato that is not red is not an experience with that particular phenomenal character. Thus (surprisingly, counterintuitively) even an experience of a perfect duplicate of the tomato is bound to be different in phenomenal character.

This claim is often justified by appeal to introspection. C.D. Broad (1951) famously said: "In its purely phenomenological aspect seeing is ostensibly saltatory. It seems to leap the spatial gap between the percipient's body and

a remote region of space. Then, again, it is ostensibly prehensive of the surfaces of distant bodies as coloured and extended . . . It is a natural, if paradoxical, way of speaking to say that seeing seems to "bring one into direct contact with remote objects" and to reveal their shapes and colours." (Quoted in (Fish, 2009; Hellie, 2007)). This "openness to the world" seems to be expressed by Martin Heidegger (1977, p. 156): "Much closer to us than any sensations are the things themselves. We hear the door slam in the house and never hear acoustic sensations or mere sounds." (Quoted in Smith, 2002).

G.E. Moore's (1903) idea of the diaphanousness of experience is taken to combine the positive claim of openness with the negative claim that one cannot be aware of the experiences themselves (Crane, 2006; Martin, 2002; Siewart, 2003; Stoljar, 2004). Moore says ". . . the moment we try to fix our attention upon consciousness and to see what, distinctly, it is, it seems to vanish: it seems as if we had before us a mere emptiness. When we try to introspect the sensation of blue, all we can see is the blue; the other element is as if it were diaphanous . . ."[5]. I accept the positive introspective claim of openness. However, I will be arguing that, ironically, when combined with facts of attention, it dooms the very direct realist and representationist perspectives that it has been used to support.[6]

The object-involving view of perceptual experience is often explained in terms of constitution. As Bill Brewer (2004) puts it, "the subjective qualities of experience . . . are constituted by the actual spatial distribution of the various displays as these are accessible to the subject." John Campbell (2002, p. 116) describes a similar constitution view, according to which "the phenomenal character of your experience, as you look around the room, is constituted by the actual layout of the room itself: which particular objects are there, their intrinsic properties, such as colour and shape, and how they are arranged in relation to one another and to you." The point of direct realism is to capture the phenomenological differences among different percepts in terms of the world, specifically the direct pickup of worldly objects, properties and relations rather than any *mental ways* of perceiving those items that go beyond the objects and properties that are perceived. Note that the difference between a percept as of green and a percept as of red can be acknowledged by all sides to be *normally caused* by the difference between red and green in the world. The controversial issue is whether this relation is constitutive rather than causal.

The second of the two views opposed to mental paint is representationism. Representationism (also called 'representationalism' and 'intentionalism') assumes that perceptual experiences have accuracy conditions (Siegel, 2008a) and holds (in one form) that the phenomenal character of experiences can be identified with the representational contents defined by those conditions (Tye, 1995). Or alternatively, what it is for a subject to have a certain phenomenal character is to have a certain representational

content (Byrne, 2001; Crane, 2007). Representationism is sometimes described as a supervenience doctrine: phenomenal character supervenes on representational content (no difference in phenomenal character without a difference in representational content). As has often been noted (Kim, 1991; McLaughlin, 1995), supervenience is too weak a relation to ground a form of reductionism. My case against representationism depends on a version of it in which phenomenal character is determined by or flows from representational content rather than merely supervening on it.

On certain views of the content of perception (for example, Tye, 2009), representationism can be a version of direct realism–for example, if the contents of perception are just the objects and properties perceived rather than something more like a proposition. Confusingly, the term 'representationalism' is used for what I call representationism and also used for indirect or representational realism, the view that one is aware of the apple only by being directly aware of something mental, for example a sense datum.[7] The mental paint view I will be defending here is opposed to representational realism, so it rejects representationalism in both senses of the term.

If we hold that a veridical perceptual state is individuated by what it is a direct awareness of, it we may be led to the disjunctivist view (Fish, 2009; Hinton, 1973; Martin, 2002; McDowell, 1982; Putnam, 1999; Snowdon, 1979–80) that veridical, illusory and hallucinatory cases share "no positive mental characteristics other than their epistemological properties of not being knowably different from some veridical perception" (Martin, 2004, p. 82). This is an epistemic conception of hallucination (Siegel, 2008b) in that no further mental properties are supposed to underlie the indiscriminability. (See Susanna Siegel's (2008b) critique.) Tyler Burge (2005) has refuted disjunctivism in a way that suggests that the direct realist intuition and the disjunctivist view that grows from it derives ultimately from a type/token error. Burge points out (see also Burge, 1991; Siegel, 2008a) that particular (datable) *token* perceptual states could be said to have object-involving contents (contents individuated in relation to actual existing things). For after all the veridicality condition of my percept of the whiteness of this page is that this page itself—not some other qualitatively similar page–is white. Since my perception could not have that content without the existence and presence of that particular page, the perceptual content could be described as object-involving. But as Burge notes, token perceptual states may be object-involving in this way even though there are *non-object-involving perceptual types* that apply both to the veridical perception of this page and equally to indistinguishable illusory perceptual states. These non-object involving types would constitute a mental similarity among indistinguishable veridical and non-veridical perceptions.

I won't be discussing disjunctivism explicitly in this paper except in a few side remarks such as that of the last paragraph.

Figure 1. Attending to the face rather than the house changes the phenomenal character of experience. From (Tong, Nakayama, Vaughan, & Kanwisher, 1998), where it was used for a different purpose.

3. Selective Attention

I say that facts about attention point away from direct realism and representationism. But there are some attentional phenomena that direct realism and representationism are well equipped to accommodate.

It is well known that differences in attention can make for differences in which aspects of the environment the subject is aware of. Many people have noticed what is often called the "cocktail party effect" (Cherry, 1953) in which people at a cocktail party focus on one conversation while at least partially losing conscious awareness of other conversations. Colin Cherry tested this idea using the "dichotic listening" paradigm in which subjects wearing headphones are instructed to listen to, say, the left channel and ignore the right. Such subjects were often unable to tell what language the speech in the unattended channel was in or even whether the speech was forwards or backwards. Later work showed that at least some information from the unattended channel was processed to a high level unconsciously, but still it was at least partially gated out of conscious awareness.

The reader can experience an example of selective attention via Figure 1. Attending to the face makes the house recede, phenomenally speaking and conversely for attending to the house.

According to direct realism, one role of selective attention is to shift within a single scene from direct awareness of some properties to direct awareness of other properties (Campbell, 2002). So direct realism can easily accommodate the role of attention in selecting some objects, locations and properties rather than others. A similar point can be made using Christopher Peacocke's (1992) adaptation of Ernst Mach's (1959) famous example: one can see a 45° tilted square either as a tilted square or as an upright diamond. (See also the discussion in (Macpherson, 2006).) The direct realist can accommodate the phenomenal difference by noting that the actual layout instantiates *both* properties and one's awareness of the layout is constituted by which of the actually instantiated properties are the ones that are selected by attention and are the properties the perceiver is directly aware of.

What I am calling direct realism is often called naïve realism (Smith, 2002), but the more naïve form of the view is that the phenomenal character of your experience as you look around the room, is constituted by the actual objects and properties instantiated in the room, including their spatial locations and relations to you. This view leaves no room for two observers at the same location to have different experiences and so does not allow for the role just described for selective attention. Unfortunately, statements of direct realism often do not distinguish sharply between this genuinely naïve form of realism and what I am calling direct realism.[8]

David Chalmers (2004) notes that if one shifts attention back and forth between two pinpoint red lights, one's phenomenology changes. He mentions however, that the change in phenomenology may be treatable as a representational change in which one's experience represents with varying specificity or else represents salience.[9] (I will be discussing salience later. For now, I will just mention that the direct realist may prefer not to allow that we are directly aware of salience, since salience is mental.) The world certainly contains properties of varying levels of abstractness, specificity or determinacy—for example, red in addition to vermilion and crimson– and changing attention can be a matter of changing which properties one is directly aware of.

Alex Byrne (cited in Tye, 2005, 2006) has noted that a grid of 9 dots in a 3 by 3 matrix can be seen either as 3 rows or as 3 columns, and arguably these shifts are at least in part a matter of shifting attention. Michael Tye (2005, 2006) replies that the experiential change is a matter of change of which properties are represented in the experience. When we see the square/diamond as a square, we visually represent its symmetry about an axis that bisects two sides, whereas when we see it as a regular diamond, we represent its symmetry about an axis that connects two angles. In the case of Byrne's matrix, we can represent 3 rows or 3 columns and that makes a phenomenal difference. (The difference may involve attention to one axis of symmetry rather than another.) Opinions differ as to the adequacy of these replies. (See Macpherson (2006); and see Nickel (2007) for a version of the Byrne example that may be less susceptible to Tye's reply.) But I will assume

for the sake of argument that selection of the sort discussed can save direct realism (and representationism) from these problems.

Both realism and representationism have an "anti-mentalistic" feel to them, and it is important to get a bit clearer about it. We should distinguish between two questions a theory of conscious experience may wish to answer: (1) What is the difference—constitutively rather than causally—between consciously perceiving red and green? (2) What is the difference between conscious perception (say, as of green) and unconscious perception (as of green)? *The direct realist and the representationist are opposed to any appeal to conscious mental properties in the answer to the first question but not the second.* The answer to the first question for the direct realist is: the difference between red and green, that is, the difference between the two colors in the world; and for the representationist it is: the difference between representing red and representing green. Direct awareness and *conscious personal level mental representation* come into the 2nd question, not the first—for we can perceive (and represent) red and green and other properties unconsciously and sub-personally.[10]

The representationist view of the difference between perception of red and green is the same for both conscious and unconscious perception, namely the difference between representing red and representing green. Representationists differ among themselves in answering the 2nd question. Tye (1995) says that unconscious perceptual representations differ from conscious representations in that the unconscious ones are not appropriately poised for use by the cognitive system. Lycan (1996) combines this sort of functionalism with an appeal to higher order states.[11] On both views, representation comes in to the answer to the first question but not the second.

As mentioned, the direct realist answer to the second question is: direct awareness; that is, the difference between conscious and unconscious perception of a face is the presence/absence of direct awareness of the face. A question may have occurred to the reader: what is the direct realist account of unconscious perception? Suppose the direct realist says unconscious perception of red is a matter of perceptual representation of red without direct awareness of it. But that answer rather undermines the opposition of direct realists to conscious representation. I have never seen a direct realist discussion of this issue, even a brief one. It is one more sign of the profound disconnect between direct realism and the science of perception (Burge, 2005), especially since most conscious perception also involves unconscious perception (Debner & Jacoby, 1994; Jacoby & Whitehouse, 1989).

The upshot then is that opposition to mental paint centers on the first rather than the second question. What the mental paint view denies is that the difference between conscious perception of red and of green is just the difference between red and green or representing red and representing green.

This point will figure in what follows because the direct realist response to the points I will be making about attention may be to appeal to attentive

vs inattentive direct awareness or more generally to degrees of attentive direct awareness. Similarly, the representationist may want to appeal to degrees of attentive representation. What I will be arguing is that these moves are not true to the phenomena because the effect of attention on phenomenology is to change perceived contrast, perceived size, perceived hue saturation and so on for certain other perceived properties. That is, the difference between one degree of attentive direct awareness and another is experienced by the subject as a difference in specific phenomenological properties such as perceived size or perceived hue saturation. I will argue that this puts the direct realist in a box—the direct realist has to say either that the subject is experiencing an illusion (an option I claim to be able to close off) or that the real properties of objects that the subject is directly aware of are changing—another option that I claim to close off.

This point may be thought to be fatal to direct realism while at the same time rescuing representationism, since the representationist can respond by postulating a representational content that corresponds to the change in perceived contrast, perceived size, perceived hue and so on. However representationists cannot postulate contents at will; rather the contents they appeal to must be grounded in normal veridical perception. And I will argue that the move just canvassed fails that test.

But before I get to these points, I will mention an attentional phenomenon that does *not* require mental paint. I regard selection as what happens when because of the joint effect of amplifying some represention and suppressing others, some things that could be seen are not seen. Other attentional phenomena are non-selectional.

4. Non-selective Attention 1

There are many convincing examples of attention changing appearance in a way that does not involve selecting some properties and de-selecting others. The effect I will be appealing to requires a small amount of practice in moving one's attention without changing fixation, but once one manages this it is a strong effect.

To get the effect, fixate (that is: aim your eyes at) any one of the 4 squarish dots in Figure 2A. Then move your attention around from one disk to another without moving your eyes. This appears to be much easier for some people than others. Still, every one of sixteen observers in Peter Tse's (2005) experiment said that the attended disk darkened and that they could darken a circle by shifting their attention to it. Tse argues convincingly that the visual system constructs the interpretation which minimizes the number of transparent (or translucent) layers seen. I won't go through the reasoning, but the reader can see one piece of evidence that seeing the disks as transparent is necessary for the effect by noting that the effect does not

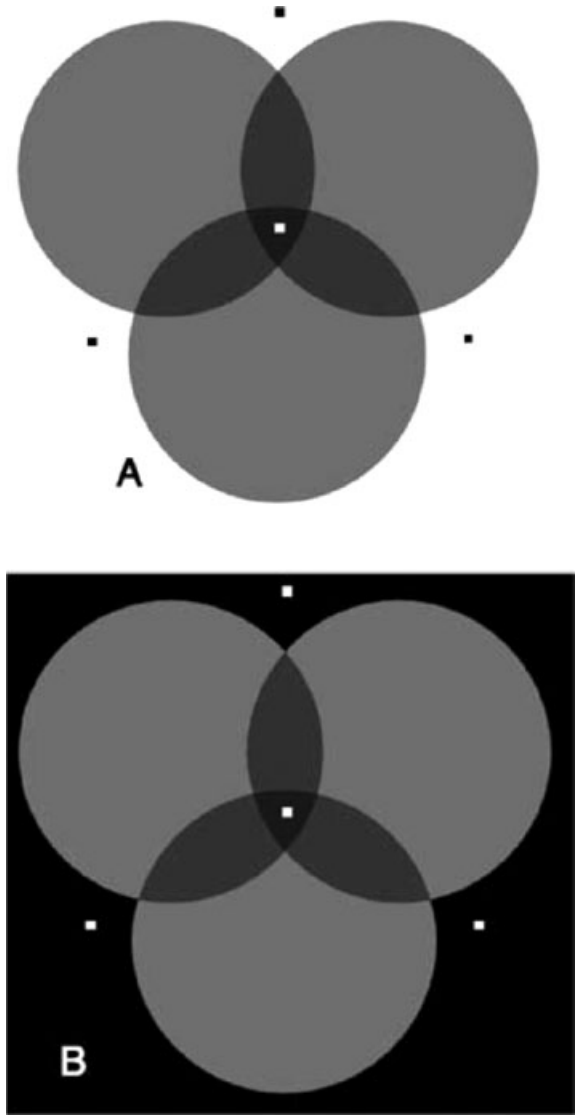

Figure 2. The Tse Illusion. In A, you can alter the brightness of a disk by attending to it while keeping your eyes fixated on one of the dots. This does not work for B.

work for the stimulus in 2B. (Zero of sixteen subjects reported darkening disks in that experiment.) Because the background of B is seen as black, the disks do not look like transparent or translucent disks. The effect involves grouping and is selective in that sense, but it is not selective in the sense described in the last section, the sense that lends itself so easily to treatment by the direct realist.

I mention the Tse Illusion here for three reasons. First, in case any holdouts denied that change of voluntary attention can change phenomenology, this example should put that view to rest for once and for all. Second, it is useful by way of contrast to the next phenomenon I will be presenting, to see why this phenomenon does not pose an immediately obvious problem for direct realism or representationism. The reason is that it is an illusion. The three disks are really equally bright and what the moving of attention does is make one of them, illusorily, darker. Direct realism says that in veridical perception one is directly aware of actually instantiated properties, and that view is not challenged by an illusion. (Later, I will be discussing one direct realist attempt to provide a theory of illusion.) The representationist's representational contents are grounded in veridical perception and those contents can misrepresent in illusion so they will have no problem with this case.

Finally, as I mentioned, moving attention independently of fixation takes practice, and I hope the reader's practice with Figure 2 will allow a better appreciation of Figure 4 to come.

5. Non-selective Attention 2

I will now present the evidence that supports my challenge to direct realism and representationism. Let me go over the empirical facts that I will be appealing to.

1. As I mentioned in connection with Figure 2, when one's eyes are pointed straight at a thing or a place, one is said to be "fixating" it. However, and this is fact number one, one can consciously see something without fixating it, as when in Figure 2 one fixates one of the dots but nonetheless sees disks that one is not fixating. (I add "consciously" here to make it clear that I am not talking about subliminal perception or other sorts of unconscious perception. I will omit the word 'consciously' in what follows, but talk of seeing in this paper should be understood as conscious seeing, unless otherwise indicated.) Sometimes we speak in this connection of looking at something out of the corner of one's eye.
2. One can see something without focally attending to it as well as without fixating it.
3. Most importantly: Focal attention *changes* perceptual qualities such as perceived contrast, perceived color saturation, perceived object size, perceived spatial frequency (a measure of stripe density), perceived gap size, perceived speed and perceived flicker rate. As with most results concerning consciousness, the experimental evidence for this conclusion has some loose ends that I will describe. Terminological note: contrast[12], saturation, size, spatial frequency, gap size and flicker

rate are objective properties of objects or events. When I talk of perceptual qualities such as perceived contrast, perceived saturation, etc., I mean the relevant phenomenological qualities of the perceptual states that ground the perceiver's knowledge of objective contrast, saturation, etc.

4. Attentional effects, both excitatory and suppressive, pervade the visual field (Datta & DeYoe, 2009; Downing & Pinker, 1985; Hopf et al., 2006).

The first three of these points were appreciated by William James (1890, p. 425): "... to some extent the relative intensity of two sensations may be changed when one of them is attended to and the other not." Although he emphasizes attention to sensations in this passage, the examples James uses to illustrate it include distributions of attention to colors and sounds in the environment. Hermann Ebbinghaus (1908a, 1908b) appears to have had a similar view. James also recognizes that "The subject is one which would well repay exact experiment, if methods could be devised," something that has now been done in experimental psychology, notably by Marisa Carrasco and her colleagues. The experiments to be described provide strong evidence for the claim that the phenomenal appearance of a thing depends on how much attention is allocated to it.

Figure 3 diagrams one of Carrasco's paradigms (Carrasco, 2009; Carrasco et al., 2004). The subject is instructed to look at the "fixation point" throughout each trial, never moving the eyes. (Obedience is often checked with an infra-red camera, but in any case in most versions of Carrasco's paradigm for involuntary attention there is not enough time for the subject's eyes to move.) The fixation point is presented for half a second, then a dot can appear (randomly) on the left, right or center. The subject is instructed to ignore the dot and informed that the dot does not indicate or predict the orientation or side of the higher contrast stimulus. However, low level attention mechanisms ensure that the subject cannot ignore the dot. The results of the experiment reveal that a dot on one side attracts the subject's attention to that side. The subject then is shown another brief fixation point, then two "Gabor patches", small grids (made up of sinusoidal luminance stripes) each of which can face in one of two directions. The subject's task is to report the orientation of the Gabor patch that is higher in contrast (see footnote 12 for a definition of 'contrast') by pressing one of the keys pictured in the lower right of Figure 3. The subject is supposed to press one of the keys on the left if the left Gabor patch is higher in contrast and one of the keys on the right if the right Gabor patch is higher in contrast. The subject is prepared for this judgment by being shown examples of comparisons of contrast. (If the subject is to judge e.g. color saturation, the subject is showed examples of differential color saturation.) The idea of the procedure is to avoid bias by placing the contrast judgment at one level of remove from what the subject

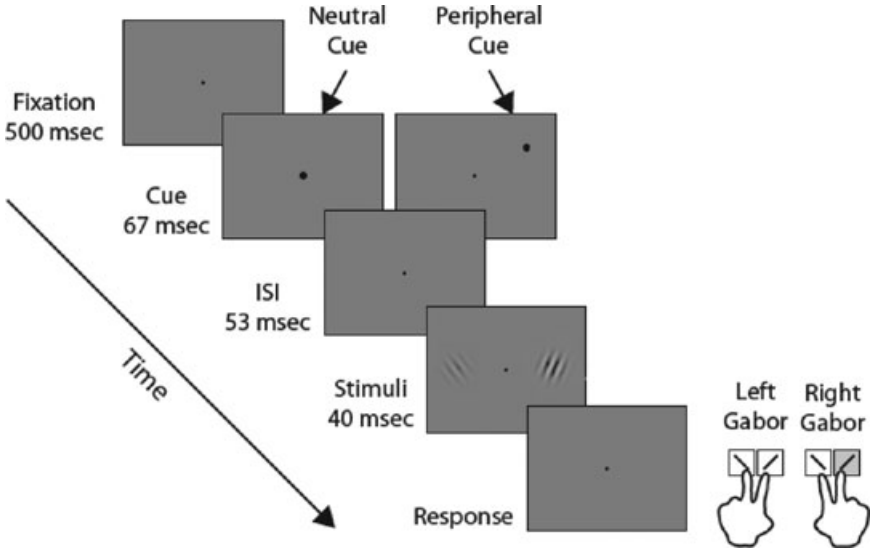

Figure 3. This diagram of an experiment reported in Carrasco, Ling & Read (2004) is to be read from left to right, starting with the presentation of a fixation point for half a second that the subject is supposed to look at and ending with the fixation point, at which time the subject is supposed to respond, either by pressing one of the pair of keys on the left or one of the pair of keys on the right (pictured in the lower right hand corner). ISI = inter-stimulus interval. The subject's task is to report the orientation of the grid-like patch (called a Gabor patch). Further details are presented in the text.

is officially judging, namely angle. Of course the experimenter is interested in the apparent contrast, not the angle.

The result is that if an attended Gabor patch is slightly lower in actual contrast, attention can boost its apparent contrast to the point of apparent equality of contrast between the two patches. (This effect no doubt involves decreased apparent contrast of the less attended patch.) If the two Gabor patches are the same in actual contrast, an attended patch looks higher in contrast. Carrasco was able to map out the effect quantitatively for a wide range of contrasts. In Figure 4, the square dot between the two patches is a fixation point. If one is attending to the fixation point, one can still see both Gabor patches. (Try it!) The patch on the left looks lower in contrast than the one on the right, a veridical perception. However, if one is attending to the patch on the left, that patch looks equal in contrast to the patch on the right. The combination of increased attention to the left patch and decreased attention to the right patch makes for a 6 point boost in apparent contrast to the left figure relative to the right in Figure 4. (The boost effect increases with increasing average contrast.)

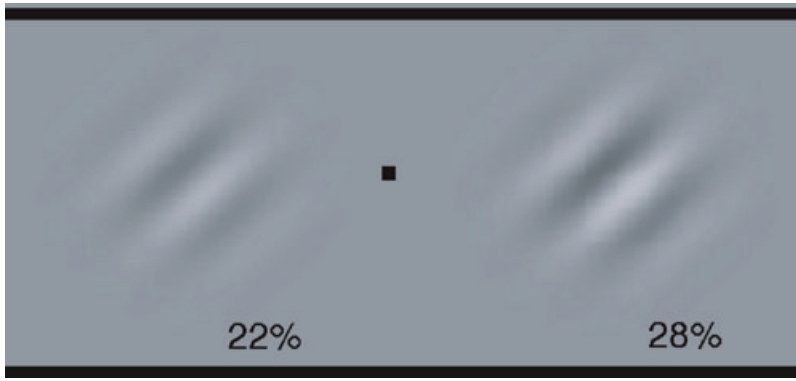

Figure 4. The Gabor patch on the left has 22% contrast. The patch on the right has 28% contrast. A 6% contrast difference is easy to detect as the viewer can confirm. The effect described in the text is one in which involuntary attention attracted to the left increases the apparent contrast of the 22% patch (and decreases apparent contrast of the 28% patch) to the point of subjective equality between the two patches. With a bit of practice, one can voluntarily shift attention to the left or to the right and experience the increase from this diagram.

Figure 5 reports four comparisons of the sort just discussed. For example: If the subject fixates the upper right square dot, and attends to the dot, the Gabor patch on the left of the fixation point (6% contrast) looks, veridically, to be lower in contrast than the one on the right; but if the subject attends to the 6% contrast patch it looks equal to the 8.5% contrast patch. So at this level of contrast, attention is worth 2.5 points of contrast. An especially interesting comparison is that on the upper left because a 3.5% patch is invisible if one is not attending to it. So, fixating the square dot on the upper left, the difference between attending to the left and attending elsewhere makes for a difference between seeing the patch and not seeing it.

The kind of attention involved here is involuntary, attracted by the appearance of a dot, but Carrasco and her colleagues have recently shown (Liu, Abrams, & Carrasco, 2009) that the same effect occurs with voluntary attention. Subjects were asked to fixate on a cross and to attend to the right if the right side of the cross thickened. Likewise for the left. Although voluntary attention is deployed much more slowly than involuntary attention, the boost to perceived contrast was about the same as for involuntary attention.

Interestingly, some perceptible features showed the effect and others did not. For example, color saturation shows the effect but hue does not. The effect works for gap size (Gobell & Carrasco, 2005), size of moving objects, flicker rate and spatial frequency (more stripes in a Gabor patch of a given size constitutes a higher spatial frequency). Further, building on earlier work (Golla, Ignashchenkova, Haarmeier, & Thier, 2004; Shiu & Pashler, 1995),

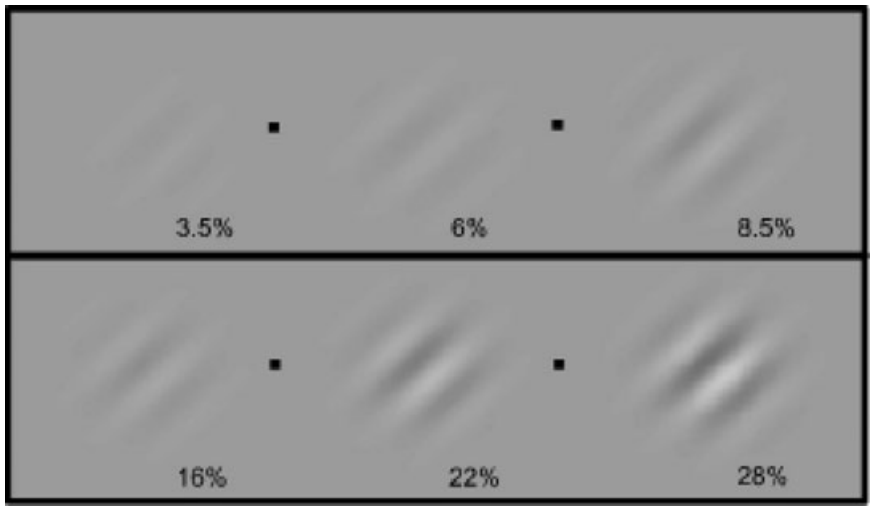

Figure 5. The previous figure comes from the lower right of this diagram.

Carrasco and her colleagues showed (Montagna, Pestilli, & Carrasco, 2009) that attention increases acuity at the attended location. One of the underlying neural mechanisms of this fundamental feature of vision appears to be that attention shrinks the relevant receptive fields of neurons in the visual system, the receptive field of a neuron being the area of space that the neuron responds to (see references in Montagna et al., 2009).

6. The Effect is Perceptual

Although there has been some controversy over what exactly these results show (Anton-Erxleben, Abrams, & Carrasco, 2010; Carrasco, Fuller, & Ling, 2008; Prinzmetal, Long, & Leonhardt, 2008; Schneider, 2006; Schneider & Komlos, 2008), it has been settled beyond any reasonable doubt that the effect is a genuine perceptual effect rather than any kind of cognitive effect. To begin, consider the idea that there is a cognitive bias to categorize the side where the dot appears as higher in contrast or that there is a tendency to find the orientation of the cued patch easier to judge. Both are made improbable by the fact that the boost to the attended side persisted *to the same degree* even when the instruction was to report the orientation of the *lower* contrast patch rather than the *higher* contrast patch (i.e. the ISI or interstimulus interval). Further, the attentional boost disappeared when the temporal gap between the dot and the patch was increased from 53 ms to 500 ms, which is what one would expect from the decay of transient attention in a perceptual effect but not what one would expect if a slow cognitive effect is governing the result.

Figure 6. if the subject adapts to A (by looking at it for a minute), then looks at the vertical grating in B, it will look slightly tilted to the left as depicted in an exaggerated form in C.

Attention has in general been shown to operate via a number of neural effects in the perceptual system. Attention to a stimulus boosts the firing rate of neurons that respond to that spatial area and suppresses the firing rate of neurons that respond to other spatial areas. Further, the degree of enhancement and suppression reflects the degree of attention (Chen et al., 2008; Kastner, 2009; Reynolds, 2008). In general, increasing attention has a similar effect in the visual cortex as increasing contrast itself.

This picture is further supported by purely psychological experiments. One impressive psychological effect involves something called the "tilt after-effect": if one looks at a visible tilted grating for, say, one minute, then gratings presented immediately afterward that are close in orientation to the original grating appear somewhat rotated away from the original grating. One version is diagrammed in Figure 6. The subject looks at the tilted grating in Figure 6A for a period, say one minute. When the subject looks at the vertical grating of Figure 6B, it will look slightly tilted in a counter-clockwise direction as depicted in an exaggerated form in Figure 6C. The explanation is to be found in the perceptual phenomenon known as "adaptation", present in all or virtually all sensory systems. In the first few minutes of exposure to a stimulus, receptor response decreases to the orientation, contrast, direction of motion and other perceptual parameters of the stimulus, decreasing the perceptual performance on subsequent stimuli with respect to these parameters (Seriés, Stocker, & Simoncelli, 2009). In the case of tilt, receptors sensitive to the orientation of the stimulus undergo a raising of the threshold

of activation. When the subject adapts to 6A, then looks at the vertical bars (in B), receptors that register a slight tilt to the right are firing more weakly than receptors that register a slight tilt to the left, making the vertical bars look titled to the left.

One interesting feature of adaptation to a grating is that within limits, a higher contrast grating raises the threshold for firing more and, further, that raised threshold lasts longer than would be produced by adaptation to a lower contrast grating (Langley, 2002). So, within limits, the higher the contrast of A, the bigger and longer lasting the effect on the tilt depicted in C. Ling and Carrasco (2006) compared the increased size and length of the tilt after-effect accomplished by increasing the contrast of the adapter grating with the increased size and length of the tilt after-effect accomplished by *directing voluntary sustained attention to the adapter grating* (for periods up to 16 seconds). They found that attention to a 70% contrast grating increased the size and length of the tilt-after-effect just the same as if the actual contrast of the grating had been increased between 11% and 14%. (Different subjects showed slightly different sizes of effect.) That is, a 70% grating plus focal attention had the equivalent adapting effect as an 81%–84% grating without focal attention. Increasing the contrast of a particular orientation of a grating has a benefit in making that orientation easier to see, but then after a few seconds it has a cost in making that orientation harder to see because of adaptation. And so Ling and Carrasco were able to show that sustained attention confers a benefit in the first few seconds, then a cost. The article is called "When sustained attention impairs perception" because it demonstrates, surprisingly, that a focally attended stimulus can be harder to see (after a few seconds) because of adaptation. The upshot is that since the attentional effect on perceived contrast affects adaptation, it is a perceptual effect.[13]

Another study I find impressive in demonstrating the perceptual nature of the effect involves the basic Carrasco paradigm with one major change: attention is cued by a sound on one side or the other instead of by a visible event (Störmer, McDonald, & Hillyard, 2009). A sound cue rather than a visual cue also vitiates the allegation that the effect is due to a sensory interaction (Schneider, 2006). Using this paradigm with some other minor changes, Störmer et. al. got slightly smaller effects than Carrasco (5% rather than 6% elevation of perceived contrast at the 22% level). They found that the effect correlated with increased activity in the first stages of visual processing (using a brain imaging technique involving a mesh of wires on the scalp). Further, the increase in cortical activity occurred in the same cortical areas found to be sensitive to actual differences in contrast in the stimuli. And the larger the cortical effect, the larger the effect on subjects' judgments of increased contrast.

To sum up: there are strong reasons to suppose that the effects of attention on contrast documented by Carrasco and her colleagues are perceptual.

Where are we? Does the attended Gabor patch look to be higher in contrast as a result of the attention or not? The upshot of the studies I have been talking about is that the effect of attention on perceived contrast is a perceptual effect, not a cognitive effect or due to a response bias. So what? Given that the effect is perceptual, one can ask whether it is a *conscious* perceptual effect or an unconscious effect or has both a conscious and an unconscious component. One way to get evidence on whether an effect is conscious is to ask the subjects. That works for the Tse Illusion mentioned earlier and indicated in Figure 2. But there is a problem that will be familiar to anyone who has thought about experimental work on consciousness: one cannot simply ask subjects to compare an attended with an unattended stimulus since the question itself would induce attention to the supposedly unattended stimulus.

There has been controversy about the issue of whether or to what extent the Carrasco effect is a conscious effect (though the participants are not always as clear as they should be that this is the issue they are discussing), centering around methodological problems involved in asking subjects to make same/different judgments as opposed to "forced choice" judgments in which subjects indicate which item is higher on a given parameter (Schneider, 2006; Schneider & Komlos, 2008; Turatto, Vescovi, & Valsecchi, 2007). This issue has now been resolved by Anton-Erxleben, Abrams and Carrasco (2010) which explores the methodological issues involved in same/different judgments, showing that when properly done, the perceptual effect can be demonstrated with both methodologies.

However, the possibility still exists that the effect, though perceptual, is partly unconscious. In order to control the subjects' attention and eye movements, experimenters have tended to use very brief stimuli (40 msecs-100 msecs), which may decrease the conscious component of the effect relative to the unconscious component.

We can get a bit of illumination on this issue using a different paradigm. There is considerable evidence that when events are simultaneous, attention to one of them can make it appear to occur before the other (Spence & Parise, 2009; Stelmach & Herdman, 1991; Van Der Burg, Olivers, Bronkhorst, & Theeuwes, 2008)[14]. Steimach & Herdman showed subjects a screen containing 3 sets of 4 dots arranged in a square. They asked the subjects to attend to the left, or alternatively to the right, or to the center, always fixating the central square. Dots then appeared inside the 4 dot outline in the leftmost square and the rightmost square. The dots were sometimes simultaneous and other times slightly asynchronous (separated by a brief period). In one experiment, subjects were asked to choose which dot appeared earlier. This was a forced choice between left earlier and right earlier with no option for saying they occurred simultaneously. They found that the dot on the attended side was perceived to occur about 40 msecs earlier than the other dot. For example, the subjects' point of maximum temporal uncertainty—that is, when

they were unable to discriminate which came first—came when the dot on the unattended side led by about 40 msecs. Then the experimenters added a third possible response—simultaneity. They found that when attention was to the center, subjects tended to judge simultaneity accurately, but when they attended to either the right or to the left, their judgments of simultaneity dropped precipitously both in absolute number (35% to 4%) and although they trended in the direction of the earlier judgments, the results were weak. This result suggests that there is a substantial unconscious component to the forced choice result. But what about a conscious component?

The experimenters then asked the subjects to adjust the difference between times of appearance of the dots in 5 msec increments. They were allowed to go back and forth as many times as they wished until they were satisfied that the dots appeared simultaneously. I really like this procedure because it allows for subjects to make *considered* phenomenological judgments. Anyone who has been a subject in an experiment in which brief stimuli have to be compared knows that subjects are often uncertain—the stimulus goes by so fast the subjects often feel as if their responses are partly a matter of guessing. Allowing the subjects to try the judgment repeatedly with the ability to change the timing is a way of boosting the credibility of the conscious source of the judgment.

The result was that subjects regarded the attended side as simultaneous with the unattended side when the unattended side led by about 40 msecs. The authors give a model of subjects' behavior which I won't describe, but the upshot for our purposes is that same/different judgments provide a less adequate indicator of conscious perceptual state than other methods such as the ones described that indicated the 40 msec difference.

The issue of the size of a conscious effect for these very brief stimuli can, however, be sidestepped because the attentional effect is visible in the sample stimuli printed on the page. You can see it yourself using Figure 4! In the case of a one-off illusion like the Tse Illusion, the scientific community accepts the illusion because 16 subjects all said they got it and because the reviewers for *Vision Research* got it, but for a general phenomenon—attention alters perceived contrast—journals have a different perspective.

In what follows, I will simply assume that attention does in fact affect consciously perceived contrast, gap size, etc., as Carrasco's paradigm suggests.

Is the phenomenal effect of attention a matter of salience or vividness rather than perceived contrast? First, as the Stelmach experiment just described shows, attention can affect perceived simultaneity as well as contrast. And as I also mentioned, perceived gap size, speed, flicker rate, speed, color saturation and spatial frequency are also affected. The attended item looks bigger, faster, earlier, more saturated, stripier. No doubt increased salience is a result of these changes, but it is not a substitute.

7. The Argument

How can the opponents of mental paint explain these results? I'll start with the issue as it affects direct realism, though as we will see, the arguments are similar for representationism. Let us begin by assuming that there is no relevant illusion, that is, that the two different percepts of the 22% patch in Figure 4 (the patch on the left) are both veridical or at least non-illusory. I will argue that on the assumption of no illusion, direct realism has no reasonable way of accomodating the results. Then I will argue that there is no relevant illusion.

It will be useful to run the entire argument with respect to Figure 4 (and a slight modification of it in Figure 7). Let me first review the facts. The subject's eyeballs are pointed at the fixation point in the center and in the Carrasco experiments described earlier, the subject attends either to the fixation point or to the figure on the left. (Let's ignore the cases in which the subject attends to the right.) When the subject attends to the fixation point, the experience of the *relative* contrasts—that the figure on the right has higher contrast—is veridical. When the subject attends to the figure on the left, the contrast of the figure on the left looks—non-veridically—to be the same in contrast as the figure on the right. There is no difference in the spatial position of the subject with respect to the two patches and no difference in the state of the sense organs or the relation between the sense organs and the layout. The difference between these two percepts of the 22% patch is entirely mental.

Consider the subject's perceptual experience of the 22% patch itself (the one on the left) in the two cases (rather than the perceptual experience of the comparison between the two patches). You may wonder whether the effect of attention really applies to a single patch as opposed to a comparison, where there is competition for the viewer's attention. Carrasco (Carrasco, Cigdem, & Eckstein, 2000) shows that the increase in sensitivity that underlies the effects reported occurs—though slightly decreased in magnitude—for a *single* Gabor patch rather than two competing patches.[15] *To repeat: we are talking about the percept of the 22% Gabor patch itself, not the comparative percept*. In the two cases (attention to the left, attention to the center) there are two different phenomenal experiences of the same item with the same relevant instantiated property, i.e. 22% contrast, yet the experiences are different. This is the challenge to direct realism. Attentively seeing and less attentively seeing the same thing—the 22% patch—are experiences that differ phenomenally but not in the item seen or in its instantiated properties.

Earlier, I mentioned cases in which opponents of mental paint appealed to differences in actually instantiated properties selected by attention, e.g. face vs house in Figure 1, axes of symmetry in the square/diamond case, rows vs columns in the matrix case. It is not obvious how any such selection of properties can apply here, but it is worth considering whether there are

properties in the display of different levels of specificity, grain or determinacy that could be appealed to (cf. Chalmers, 2004, and Tye, 2005, 2006). For example, any scarlet patch is also red, and perhaps a perceiver can have different experiences of the same color patch depending on which is attended to, red or scarlet. A shift between awareness of red and awareness of scarlet might be phenomenologically significant. In the case of contrast, one could take the corresponding determinable/determinate relation to be, for example, that between medium-low contrast and 22% contrast. However, the results cannot be explained by appeal to a shift between direct awareness of 22% contrast in one case and medium-low contrast in another. For the subject experiences the difference as a difference in contrast *at the same level*, for example, as a higher specific contrast or specific size, rather than as a move to a more generic or abstract level of contrast or size.

There is a related objection in which the two percepts involve different ranges of vagueness. I will take that up in due course.

Another line of objection would be to suppose that the subject is directly aware of the focus of attention in the layout, and since the focus of attention shifts, so does the phenomenology. In speaking of the focus of attention, I am indicating the thing or area of space that is attended to, and suggesting that it can be seen as a property of the layout. I think that allowing awareness of such mind-dependent properties of the layout would be a significant concession in direct realist thinking. Direct realists often try to capture aspects of appearance by appeal to a variety of types of relations to the subject. But these are normally characterized non-mentally. (For example, Campbell's 2002 book mentions spatial relations and jaundice. Noë (2004) treats appearances as spatial projections on a plane perpendicular to the line of sight.) Relations to a focus of attention or to a center of salience might fit the letter but not the spirit of these views. Recall the summaries quoted earlier by Brewer ("the subjective qualities of experience . . . are constituted by the actual spatial distribution of the various displays as these are accessible to the subject,") and Campbell ("the phenomenal character of your experience, as you look around the room, is constituted by the actual layout of the room itself: which particular objects are there, their intrinsic properties, such as colour and shape, and how they are arranged in relation to one another and to you"). It would be as if they were allowing one kind of mental paint, attentional mental paint.

A better form of the idea for the direct realist would be to think of attention as coming into the direct awareness relation itself. But this idea in either of its forms will not help the direct realist, for a highly significant reason, one that I will be returning to again and again. Recall that subjects experience the effects of attention as alterations of perceived contrast, earliness, size, speed, flicker rate and spatial frequency. Appealing to direct awareness of the focus of attention or, alternatively, attentional vs less attentional awareness of the patch is inadequate to explaining that

phenomenology. Attending makes the item attended look, for example, *bigger*, so it is inadequate to say that it looks more attended to even if it *does* look more attended to. The same point applies to salience conceived as a phenomenal property of the layout—as mentioned earlier. It is certainly true that an increase in perceived earliness, size, flicker rate, spatial frequency and contrast bring with them an increase in salience. But looking bigger is not *just* a matter of looking more salient even if it *involves* looking more salient.

Earlier I said that the positive thesis of Moorean transparency was important to my case. This is one place where it comes in. The effect of attention is experienced in terms of appearance of contrast, speed, size, color saturation, etc. Attended things look bigger, faster, more saturated and higher in contrast even if they also look more attended and more salient.

So far, I have been bracketing the issue that is most significant, whether one or both experiences of the 22% patch are illusory. Just what this comes to and how it avoids the problem depends on the direct realist's theory of illusion, which is the topic of the next section.

The discussion to follow concerns the question of whether there is an illusory percept of the 22% patch when the subject attends to the fixation point—or, alternatively to the 22% patch itself. I always mean the issue of whether there is an illusory percept of the 22% patch (not the other patch). As before, I am ignoring the cases in which the 28% patch is attended, and I will speak of the attended patch and the unattended patch for brevity when what I really have in mind is the more attended vs less attended patch. There are a number of different views that finger one or the other patch as seen illusorily. The percept of the unattended patch can be accused of being illusory, or the percept of the unattended patch can be exonerated, the percept of the attended patch being accused instead.

There is a straightforward problem with both views, namely that they only make sense on what one might call a "steady spotlight" model of attention and that model is false. The model has both a spatial and a temporal dimension. I'll start with the spatial aspect, the idea of attention as a spotlight (Posner, Snyder, & Davidson, 1980). The spotlight model was known to be oversimple in the 1980s because it was shown that attentional effects are substantial far from the center of one's attentional field, but it was thought that attentional effects could be thought of in terms of a "gradient of attention" (Downing & Pinker, 1985), which would be compatible with a fuzzy spotlight. However, more recent work shows that the spotlight model is in far worse shape than previously thought. One basic failure is that there are two attentional fields, an excitatory field and a suppressive field. A second basic failure is that both fields are quite large and irregular (Datta & DeYoe, 2009; Hopf et al., 2006). How large? Hopf, et al. show an excitatory effect from targets in one quadrant of the visual field (varying in strength) over perhaps half of the visual cortex and a suppressive field, also quite

variable, that is only slightly smaller. Datta & DeYoe were able to tell which of 18 areas subjects were attending to with 100% accuracy just by eyeballing the scans, but for some areas, attention spread radially for distances up to more than half the width of the stimulus grid, which itself occupied 56° of visual angle. (The fovea, the central high density part of the retina, responds to only about 2° of visual angle.) Datta & DeYoe note that "... attention is actively modulating visual processing throughout the field of view, not just in the local vicinity of the target" (2009, p. 1044). They suggest that the replacement of the spotlight metaphor by the "gradient of attention" metaphor is inadequate, and we should think in terms of the "landscape of attention."

That was the spatial point. The temporal point is that attentional resources available to the supposed spotlight are to some extent shared among other aspects of perception, for example, other modalities, and with executive control mechanisms (Brand-D'Abrescia & Lavie, 2008) and cognition. Nilli Lavie and her colleagues have demonstrated many kinds of cases in which demanding cognitive or perceptual tasks siphon attention away from other perceptual tasks. One experiment (Cartwright-Finch & Lavie, 2007) contrasted a difficult perceptual task (Which arm of a cross is longer?) with an easy perceptual task (Which arm of a cross is green?) In the harder task, subjects were much less likely to consciously see an unexpected stimulus—so called "inattentional blindness." To take an example more connected to everyday life, talking on a cell phone can foment "inattentional blindness" (Scholl, Noles, Pasheva, & Sussman, 2003; Strayer, Drews, & Johnston, 2003). It is as if electricity for the spotlight shares limited power with the air conditioning and public address systems, causing brownout for one if the other is making more demands.

You may object "OK, so there are borderline cases and the borderline is more uneven and larger and more varying in time than one might have thought. So what?" This response seriously underestimates the problem for the idea that there is any distribution or level of attention that entails either veridicality in normal circumstances or illusion. The problem for this view is that there is no way to pick which distribution of attentional resources engenders veridical perception and which engenders illusion.

For concreteness, let us consider the claim that when one attends to the fixation point, one's percept of the 22% patch is illusory, but when one attends to the patch itself, one's percept of it is (normally) veridical. Is it the absolute value of attention that is supposed to be crucial to attention making for veridicality? It can't be absolute value since that would have the consequence that if the subject were speaking on a cell phone, *nothing* would be veridically perceived! So the claim must be based on relative allocation of attention. But the points about the landscape of attention show that many points in the visual field will be very close in amount of attention allocated to them as the supposed focus of attention. How could these very small differences be—in

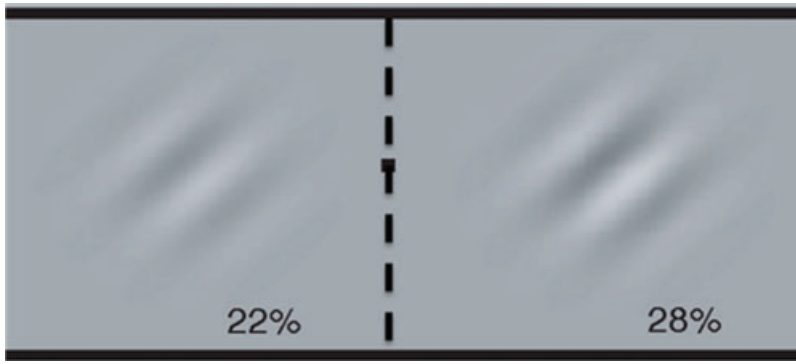

Figure 7. Every point on the dashed line is equidistant from the two Gabor patches.

normal circumstances—the difference between veridicality and illusion? An arbitrary cutoff—which some have proposed for baldness—would make no sense for veridicality.

To avoid misunderstanding: I agree that the terms 'veridical' and 'illusory' are as vague and context relative as many other terms. And I also agree that we can use the phrase 'attend to' in an acceptable but loose and context-relative way. My point is rather that the claim that only the attended patch is seen veridically requires a non-context-relative kind of veridicality that cannot be justified.

In my view, these points counts decisively against any illusion proposal, but I will mention one other point briefly. Consider the proposal that the supposed attentional spotlight engenders illusion. One motivation for this idea is that areas that are differentially attended are sometimes seen in an illusory manner as in the Tse Illusion mentioned earlier. Also, veridical comparison depends on the supposed spotlight of attention being in between the items compared, not directly on them. However, this advantage would apply to any point equidistant between the items being compared: in the example of the two patches, attending to *any point on the vertical line through the fixation point* in Figure 4, as shown in Figure 7. Every point on that line is equidistant between the 22% and the 28% patch and within the zone in which one can still see both (if the diagram is the right distance away from the eyes), so every point on that line is one such that attending to it might be predicted to yield a veridical comparison. Yet these different percepts of the 22% patch itself—the ones in which one is attending to different points on the line—*would be different phenomenologically from one another*, and so the refutation would be regenerated. Attending to the different points on that line would yield different phenomenal experiences of the 22% patch that are equally veridical. And that is the very situation that led to the problem for views opposed to mental paint in the first place.

If one wants to compare two patches, one does best for the supposed spotlight of attention to be aimed at a point equidistant from the two of them (unless someone has a handy map of one's landscape of attention), but one cannot conclude that only then do the patches look the way they actually are, since the way they look will depend on *which* of the points that are equidistant from them one chooses to attend to. The vertical line through the square dot in the middle may contain a myriad of such points. Given the landscape of attention, there may be points on that line or elsewhere that yield correct comparisons but are phenomenally different from one another.

The facts about the visual system discussed here are not oddities but rather are closely related to the evolutionary purpose of perceptual systems, which is to get information about the world that is relevant to the organisms' other purposes, which of course include acting (Churchland, Ramachandran, & Sejnowski, 1994). Attention is attracted by movement or change in the environment. This "exogenous" attention is transient and involuntary and happens much faster than the eyes can move, so the experimental situation described earlier in which attention is directed somewhat differently from fixation is a common occurrence. The evolutionary point of the increased acuity and contrast at the attended location is to get more information about what is at that location. Because the effect of increasing acuity at one point inevitably reduces acuity at another (Montagna, et. al. say: "There was no benefit without a cost"), there is no way of making all perceptual comparisons accurate at once. Still, as Carrasco (2006) shows, the increased contrast sensitivity at the locus of attention improves performance on a variety of tasks. (See also Treue, 2004.)

These points are directly relevant to disjunctivism, as can be brought out by comparing the attended 22% patch with the seen but unattended 28% patch. There is at least one well defined mental property in common to these two percepts, perceived contrast. Neither of these individual percepts (as opposed to the comparative percepts) are illusory but that same perceived contrast will be shared by various kinds of illusions as well. (See Burge's (2005) Proximality Principle.) The disjunctivists who claim "no common mental factor" are flouting what perceptual science tells us about the case.

It might be thought that the way to decide whether attended (or alternatively unattended) items are seen illusorily would be to consult behavioral tests of veridical perception. Since the heady and methodologically suspect days of the New Look in perception (Bruner & Goodman, 1947), there have been studies that have been taken to suggest that desired objects look closer. Recently, Emily Balcetis and David Dunning (2010) have used a variety of behavioral tests to argue for this conclusion. Most interestingly, when subjects toss a bean bag at objects that differ in subjects' conative attitudes towards them they tend to come up shorter for objects to which they have a positive conative attitude.

Attended objects look larger, so one might speculate as follows: (1) desired objects are more likely to be attended; (2) They look larger and therefor closer; so (3) the phenomenon is grounded in illusory perception of attended objects. If so, the argument I gave still stands, since, you will recall, even if the attended object is seen illusorily, the point is reinstated by *comparing one unattended object with another*. (See the discussion connected with Figure 7.)

However, I think more would have to be done to show that the "bean bag" test taps a genuine conscious perceptual phenomenon. In the case of the Carrasco phenomenon, I indicated some of the kinds of evidence that show it is a genuine perceptual effect. (For example, it affects perceptual adaptation.) The behavioral measures just mentioned do not reach that kind of standard of evidence and there have been some dramatic cases recently in which such effects appear to reflect "judgmental biases that result from the social, not physical, demands of the experimental context" (Durgin et al., 2009, p. 964).

Finally, to conclude this part of the discussion of illusion, I described a number of the alternatives just discussed as unmotivated (for example the idea of drawing an aribitrary cutoff of illusion, a border between illusion and veridicality). These proposals are unmotivated—unless one of your motivations is saving direct realism! I will be satisfied if my argument convinces a neutral reader.

8. The Direct Realist Account of Illusion

The points made in the last section count against an illusion in the attentional phenomena I have been talking about independently of any particular theory of illusion. But the point is strengthened when one sees just how implausible any direct realist theory of illusion would have to be.

I find direct realists evasive on the topic of illusion, but Bill Brewer (2004, 2008) has advanced a straightforward positive account of illusion from a direct realist perspective. Brewer's view (2008, p. 172) is that all perception, including illusory perception is veridical perception *of something*. According to Brewer, in illusory perception, the something is a similarity to a situation which is not the one the subject is viewing. "Illusions are simply cases in which the direct object of experience has such visually relevant similarities with paradigms of a kind of which it is not in fact an instance." Consider the Müller-Lyer illusion: two lines (one with arrowhead endings, the other with reverse arrowheads) are actually equal in length but look unequal. Brewer's account is that the subject is directly aware of an actually instantiated property, the similarity between the equal lines and *other lines that are not present but are actually unequal*. As Brewer puts it (p. 176): "Suppose that someone has the diagram visually presented to her, from head-on, and in good lighting conditions, with eyes open and a

normally functioning visual system. According to OV [Brewer's version of direct realism the "object view"], the core subjective character of her visual experience is simply constituted by that diagram itself. From that viewpoint, and given the circumstances of perception, it has visually relevant similarities with a paradigm pair of unequal lines at different depths. In this sense, the concept of inequality in length is intelligibly applicable to its main lines: the lines look unequal in length."

But what is that visually relevant similarity or similarities that a pair of equal lines has to a pair of unequal lines? *Of course the direct realist cannot say it is that they look the same*, since that would be to reintroduce unreduced phenomenology. It might help to see just how empty Brewer's proposal is to consider Wittgenstein's (Rhees, 1968; Wittgenstein, 1993) supposition—far short of an inverted spectrum—that someone might wake up and find that red things look blue and vice versa.[16] The person Wittgenstein is imagining is having an illusory experience: red things look blue. On Brewer's account, he is seeing the visually relevant similarity or similarities between red and (paradigms of) blue. What are those similarities? Red and blue are both colors, they are both primary colors, and they are both colors of many flags and of Superman's costume, but none of these similarities will help Brewer's case. It is very difficult to see how to spell out that similarity between red and blue without appealing to how things look or to a representational content involving a representation of blue. In my view, direct realism is an unstable position for which there is no good account of illusion, whose motivations better support representationism, a subject to which I now return.

9. Representationism and Vagueness

As you will recall, representationism holds that the phenomenal character of a perceptual state is or is determined by its representational content. Representationism has an obvious advantage over direct realism: it has a better account of illusion. If a man has the phenomenology of seeing his wife as a hat (Sacks, 1985), he sees his wife, visually representing her as a hat. Direct realists see representationism as scanting "openness to the world", but as I mentioned I am doubtful about such theoretical introspections. Representationism has another major advantage over direct realism, an account of the difference between conscious and unconscious perceptual representation that gets to first base. The very "openness to the world" that direct realists like in an account of conscious perceptual representation makes it difficult to see what their account of unconscious perception could be, as noted earlier, whereas for representationism, the difference lies in some aspect of function.

My argument against direct realism was based on the fact that the way the 22% patch looks depends on where the subject is attending, so there can

be more than one phenomenal character of experience of the same instantiated properties, even if nothing about the environment or the non-mental relations between the subject and the environment differs. An advocate of representationism might suppose that even if my argument vanquishes direct realism, representationism escapes unharmed, since the representationist can simply say that different distributions of attention to the same layout yield different representational contents: if an attended item looks bigger, faster, higher in contrast, higher in saturation, more stripy or earlier, the representationist can, it may seem, handle that fact simply by adjusting the representational contents. The great strength of representationism after all is its ability to handle appearances in representational terms.

A similar point might be made on behalf of Colin McGinn's (1999) and Mark Johnston's (2004) views of the phenomenology of perception, views that combine elements of both representationism and direct realism. According to McGinn, the phenomenology of perception is determined by a "cluster of properties" ascribed by the percept. The same role is given to Johnston's "sensible profiles," which are structured properties. These views are more like representationism than direct realism in one respect: McGinn and Johnston do not require that the cluster of properties/sensible profiles be actually *instantiated*. The phenomenal character of the visual experience of the man who mistook his wife for a hat could be captured by uninstantiated properties/profiles involving a hat shape, color, texture, etc. And a hallucinator and a veridical perceiver could be aware of the same cluster of properties/sensible profiles, uninstantiated in one case, instantiated in the other, and thus have identical experiences. So McGinn & Johnston could give a response similar to the representationist response just mentioned: different distributions of attention can involve the same object, the 22% patch, but awareness of different clusters of properties/sensible profiles, and these different items could be said to explain the different phenomenologies.[17]

However, if I am right that none of the different percepts of the 22% patch are illusory, these proposals fall flat. Representationists are not free to postulate representational contents at will so as to reflect appearances—rather *these contents have to be grounded in veridical perception*. If the representationist says that changing the distribution of attention changes the representational contents (cluster of properties/sensible profiles) without changing or selecting any different property of the actual layout, the upshot is that at least one of those representational contents is illusory, and if my argument against illusion is right, that claim is wrong. In short, if there is no illusion in either of the two percepts of the 22% patch, the extra degree of freedom buys the representationist nothing.

However, the representationist has a resource in addition to content: there is also the *mode* of the representation (Crane, 2007). A belief and a desire can have the same content—e.g. that world peace obtains, but with

different relations to that content. Similarly there may be different modes of representation in perception. One might, for example, hold that vision and audition are such different modes. As mentioned in a slightly different form with respect to direct realism, the mode of representation could be more or less attentive, more or less determinate, more or less specific, more or less vivid, more or less salient. What is the difference between indeterminacy in mode and indeterminacy in content? We can get some illumination by considering a recent dispute.

An objection to representationism that has been much discussed (Block, 1996, 2003; Boghossian & Velleman, 1989; Peacocke, 1993; Tye, 1995; Tye, 2002) is that there is a phenomenal difference between blurry vision as of something, say a movie, whose lines may be clear and crisp, and (the contrasting case) a clear and crisp visual experience of a blurry movie—even when the same colors, shapes and textures are represented with the same degrees of determinacy. The first could be produced by taking off one's glasses in a normal movie theater, the second by defocusing the projector while the viewers keeps their glasses on. Tye (2002) regards the difference as one between experience *indeterminately representing* (glasses are off) and having an *indeterminate content* (glasses are on but the movie is blurred). One could argue about whether these categories are exactly right, but they will do for the analogy. The glasses off case (indeterminately representing) is a matter of indeterminacy in mode, whereas the glasses on case is a matter of indeterminacy in content. The point of the analogy is that in both cases, indeterminacy of mode and indeterminacy of content, there is the same attribution to points of space of light and dark and color. If we were to capture these two different percepts in terms of digital pixel arrays, the pixel arrays appropriate to the two cases could be exactly the same. The phenomenal difference consists in whether the blur captured in the pixels is attributed to the display or to the mode of perception.

Now consider a specific proposal for accommodating the experimental results in terms of indeterminacy. One option would be to regard the contents that differ but are equally veridical as having different *ranges of indeterminacy that include 22%.* So in the case of attending to the fixation point (in which case you will recall the 22% patch looks less contrasty than the 28% patch), the content of the percept of the 22% patch might be, say, 16%–28% contrast, whereas in the case of attending to the 22% patch itself (in which case you will recall, it looks equal to the 28% patch), the content might be a higher range in which 22% is at one end, say, 22%–34% contrast. (Specific numbers are useful for concreteness. Since attention shifts perceived contrast at this level by about 6%, I am imagining that there is an "uncertainty" of plus or minus 6%.) Thus both representational contents would be veridical—since they both attribute a range that *includes the true contrast, 22%*—and they would also be different. The idea here is that the change of representational content imposed by a change of attention is the equivalent of seeing different

indeterminate contrast levels. In the case of McGinn's & Johnston's versions, the clusters/profiles would include 16%–28% contrast in one case, and 22%–34% in the other.[18]

The problem with this proposal is that it if the phenomenology of perception flows from representational content, then indeterminacy in content would have to be reflected in an indeterminacy of *look*. But there need be no such indeterminacy. The Gabor patches used in the contrast experiments are designed to transition between light and dark in a smooth way, but this is not necessary for attentional effects and is not true of many other stimuli. For example, some size stimuli are shaped like the letter 'C', where the relevant parameter is the distance from tip to tip. These are not in any reasonable sense fuzzy stimuli, but the subject sees the gap size as bigger if attended. Attention makes attended items bigger, faster, more contrasty, more saturated and earlier, as I have repeatedly noted. These effects do not depend on—and are not reflections of—any sort of fuzziness.

The representationist may retort that the point is not that the contents are fuzzy or represented indeterminately but that they are abstract relative to other contents, as determinables are to determinates, for example as red is to scarlet. But this line of thought runs into the following difficulty: the variation of 6% due to attention is way above the "just noticeable difference" threshold, which for stimuli at these levels is approximately 2%. (Or so I am told. In any case, just looking at the stimuli in Figure 4 shows that the difference is easily detectable. And you may recall that in the discussion of the tilt aftereffect, there was evidence that at higher levels of contrast, the increase due to attention was as much as 14%.) The point is that there is no single "look" that something has if it is 22% plus or minus 6% in contrast. By analogy, consider the supposition that something looks as follows: rectangular or triangular or circular. That disjunctive predicate does not describe *one* way that something can look—at least not in normal perceptual circumstances.

Now I have been considering an indeterminacy in content rather than mode. But the same point applies to both! Consider the cinema case just flagged. The mode version of the case (glasses off) and the content version (glasses on, but projector defocused) involve the same level of "fuzziness".

Versions of all these points apply equally to direct realism. The direct realist can suppose that we are directly aware of a property of objects that is constituted by a range of contrasts, a higher range when one attends than when one does not attend. My objection to direct realism is that direct awareness of an indeterminate property or indeterminate direct awareness of a non-indeterminate property would have to be realized in perception either in the form of a phenomenal indeterminacy or in the form of a disjunctive awareness that does not correspond to any particular look.

To avoid misunderstanding: I like the vagueness proposal as a theory of *the representational content of perception*. What I insist on is that this representational content does not capture the phenomenology of perception.

I am happy with the vagueness proposal so long as the phenomenology is treated as a *mode of presentation of that representational content*. Thus the percept of the 22% patch when one attends to it could be said to have a representational content a major component of which is something like this: <That; 22%–34%>. (Burge (2010) argues persuasively that the content of perception should be understood demonstratively rather than propositionally.) *What I am arguing against is that this content is determinative of the phenomenology of the perception*. As I mentioned at the outset of the paper, in previous publications I have argued that the phenomenology of perception goes beyond its representational content, but here I am arguing for something a bit different, that the representational content of perception cannot determine the phenomenology of perception.

Of course representationists often emphasize that their view is that one kind of content of perceptual states (e.g. non-conceptual content) is determinative of phenomenology even if there are other types of content that are not so determinative. So the argument could be regarded as a challenge to representationists to put up or shut up: what kind of content of perception could determine the phenomenology of perception yet not have the problem just described?[19]

On my story, one could describe the perceptual content of the percept of the 22% patch when one is attending to it this way: {*Phenomenal component P; Referential component: <That; 22%–34%>*}. That is, the percept has both a phenomenal mode of presentation (Burge, 2003; Chalmers, 2004) and a representational content. (Elsewhere (2003, 2007c), I claim to have shown that the phenomenal mode does not supervene on the representational content or conversely).

I said that the 22% patch attended (i.e. with more attention) is the same in perceived contrast as the 28% patch unattended (i.e. with less attention). And on the proposal that I have just been considering, both would be captured by {*Phenomenal component P; Referential component: <That; 22%–34%>*} where P is the same for both percepts. "Wait—how could that be? How could the percept of the 22% patch attended be exactly the same as the 28% patch unattended? Since the two patches are in fact different, at least one of those perceptions must be illusory!" This conclusion does not follow. One reason is the one already mentioned: that the actual contrast of both patches lie within the specified range. One is 22% and the other is 28%, both of which are in the range of 22%–34%. But there is another factor that has not come up yet in my discussion.

The change invoked by changing attention does not *look like a change in the world*—at least not to me. Take a look at Figure 4, fixating at the fixation point and moving your attention around. It does not look as if anything is *really* changing in contrast. That is, these changes don't have what Burge (2009) calls the phenomenology of objectivity. The change looks unreal (to me). Its unreality is similar to the unreality in the way an afterimage grows

and shrinks as the surface you project it on moves further away or closer. If you look at a colored shape for two minutes and then look at a piece of paper, you see an afterimage as of the same shape in the complementary color. As you move the paper further away, the afterimage grows. (See any textbook on Emmert's Law, which describes this change of size.) But its growth looks somehow unreal or unobjective (cf. Masrour, 2010). The subjective unreality of these changes has not as far as I know received any empirical investigation. The subjective unreality of the effect of attention was noted by William James. He said (1890, p. 426) "... whatever changes the feeling of attention may bring we charge, as it were, to the attentions' account, and still perceive and conceive the object as the same ... The intensification which may be brought about by attention seems never to lead us astray" (p. 426). James quotes Gustav Fechner (1882) (in English) saying, similarly that when one increases attention, one "feels the increase as that of his own conscious activity turned upon the thing."[20] The upshot is that it is a mistake to treat the change in phenomenology wrought by the change in attention as equivalent in its effect on phenomenology of a change in contrast in the world.

If I am right that the distribution of attention does not produce an illusory percept of any single patch, whether attention is focused on that patch, on the fixation point, or on the other patch, then the visual system must in some way track where attention is focused and this information must be in some way reflected in the phenomenology of perception. Intuitively, it seems that this information is realized visually in the phenomena described, although it could be realized phenomenally in some other way. (Subjects can be wrong about which modality is the source of perceptual information.) If it is visual, then there is something phenomenally different between the way the attended 22% patch looks and the way the unattended 28% patch looks, even if they are the same in perceived contrast.

Let us think of the attentional tracking as a little voice that says where attention is directed and also that the range of contrasts attributed to the world should be adjusted to reflect reality because of that distribution of attention. Then we could think of the percept of the 22% patch attended as {*Phenomenal component P; Referential component: <That; 22%–34%>, Little Voice component: attended, so adjust downward*} whereas the percept of the 28% patch unattended might be {*Phenomenal component P; Referential component: <That; 22%–34%>, Little Voice component: unattended, so adjust upward*}. Further research might lead to evidence that the little voice should be partly absorbed into the phenomenal component or the representational component or both.

Many experiments on perception in effect encourage the subject to judge appearance. If subjects are asked to judge size in afterimages at different distances, apparent size will be reflected in the judgments. A different kind of experimental paradigm—say betting—might encourage a focus on reality instead of appearance.

At the beginning of the paper I mentioned an apparent paradox: two percepts can differ in respect of perceived contrast, size, etc., yet neither be illusory. I mentioned that although loudness presents sound intensity, loudness is a function not only of intensity but also frequency, bandwidth and duration. Two sounds of different intensities can sound the same in loudness and two sounds of the same intensity can sound different in loudness. One might wonder why there isn't a dimension of perceived size (or contrast or speed or saturation or earliness) that bears the same relation to actual size as loudness bears to actual intensity? Part of the answer is that it would not be very fruitful to project such an evanescent aspect of experience onto the world. That is a functional explanation but there is a more proximate explanation: the auditory system is built to register loudness and that is revealed in the fact that there is loudness constancy. A sound maintains its loudness as you move closer to the source and as its intensity increases. But the phenomena I have been describing involving attention have a kind of *anti-constancy* in that the perceived size changes even when the actual size is constant. A similar point applies to the behavior of afterimages as indexed in Emmert's Law. I would be surprised if this anti-constancy feature were not related to the subject's sense that these changes are not objective, and this idea fits with Burge's (2009) view of perceptual objectivity as grounded in constancies.

10. Mental Paint

I have argued elsewhere that the inverted spectrum (and other related thought experiments) support mental paint. (These arguments are presented in (1990, 1999, 2003) and in a version I am much happier with, in (2007c).) The view of mental paint argued for here is in one respect much less radical than the one argued for in those papers.

If things we both call 'red' (and think of as red) look to you the way things we both call 'green' (and think of as green) look to me, then we have phenomenal qualities that represent ripe tomatoes as red, but do so very differently: your mental paint represents differently than mine. Further, we can have experiences that are the same in respect of mental paint, but represent differently, for example when I am looking at a red thing and you are looking at a green thing. The relation between mental paint and representational content is many-many.

However, the argument presented here does not allege any *extensional* gap between mental paint and representational content. I have not exhibited a case of same representational content/different phenomenology or same phenomenology/different representational content. I did present the argument as *roughly* having that form at the outset, but the final view just presented is that vague representational contents may be right. The focus here has

been on a different kind of gap between mental paint and representational content: that to cope with attention, perceptual representation must be vague in content or mode in a way that the phenomenology of perception need not be.

Ironically, what sinks direct realism and representationism is the very aspect of perception that advocates of these views often take as their founding insight, the positive thesis of Moorean diaphanousness. Shifting attention makes items in the world look, non-illusorily, different in contrast, size, saturation, stripiness, speed, and time of occurrence. In order to cope with that fact, anti-mental paint views are forced to postulate kinds of vagueness that are not reflected in ways the world looks to be.

Notes

1. I am grateful to the following audiences for responses to earlier versions of this paper, starting in October 2008: the University of California at Berkeley, the University of California at Santa Barbara, the University of Warwick, the Australian National University, the NYU Consciousness Project discussion group, the Rutgers cognitive science group, the UCLA Philosophy Department, the University of Victoria Philosophy Department, the Searle conference at Santa Clara University, the NYU Mind & Language Seminar, Brown University and the Royal Institute of Philosophy. My thanks to Tyler Burge, Imogen Dickie, Geoffrey Lee, Farid Masrour, Chris Peacocke, Jesse Prinz, Frédérique de Vignemont and Sebastian Watzl for comments on earlier drafts.
2. I am not assuming that if there is mental paint, it is non-relational ("intrinsic") or has no representational aspect. Since I favor physicalism, I allow that mental paint may be a relational neural property. To avoid misunderstanding: I do not claim that there is anything red or round in the head when one veridically sees a red or round thing in the world as when red pigment in a painting represents a red barn.
3. The *American Heritage Dictionary* (3rd edition) defines 'loud' as 'characterized by high volume and intensity'.
4. (Byrne, 2001; Carruthers, 2000; Dretske, 1995; Harman, 1990; Hill, 2009; 2001; Lycan, 1996; Pautz, 2010; Searle, 1983; Tye, 1995, 2000, 2009) Closely related views: (Anscombe, 1965; Armstrong, 1968; Pitcher, 1970). I am not counting as representationist points of view such as that of Tyler Burge (2003) and David Chalmers (2004) in which modes of presentation are explicitly characterized in phenomenal terms or views such as that of Sydney Shoemaker (1994; 2001, 2003) and Chalmers (2006) in which the properties attributed by perception are characterized phenomenally.

   There is a case for counting Daniel Dennett (1991) as a representationist as well, given his picture of the content of perception in terms of perceptual judgments and the contents of beliefs that one is disposed to form.
5. As is less often noted, Moore follows this remark with what in my view is an equally significant truth, "Yet it can be distinguished if we look attentively

enough, and know that there is something to look for." See (Kind, 2003; Stoljar, 2004).

6. It is worth noting that this use of introspection allows for introspective determination of a highly theoretical conclusion. Benj Hellie (Hellie, 2006, 2007) makes the reasoning explicit (2007, p. 267): "If a judgment ascribes a property to an experience, and that judgment is the result of expert phenomenological study under ideal circumstances, then that property is among the experience's phenomenal characters." Ideal circumstances are familiar: not drunk, taken time, etc. Anyone who has read the writings of the highly trained expert practitioners of introspectionist psychology of the 19th Century such as Wundt and Külpe will be reluctant to accept such a principle. Phenomenological judgments are *the highly fallible starting point* (Block, 2007a) of any inquiry into consciousness.
7. For this reason, 'representationism' is a better term than 'representationalism' for the view that phenomenal character is representational content. See Wright and Robinson (Robinson, 2008; Wright, 2008).
8. See Campbell's (2002), p. 114–115, 116, 119 for formulations that do not do enough to distinguish naïve realism from direct realism. Tim Crane (2006) ascribes this view to Campbell and others, and with some justification expresses it as "the phenomenal character of a genuine perception is determined by how the perceived world is." Of course on that formulation there is no room for phenomenal character to be modulated by selective attention.
9. I have also claimed (1995, p. 241) that "attention makes the experience more fine-grained" (2007b, p. 192).
10. For example, a "subliminal" presentation of an angry face can affect skin conductance and heart rate without the subject having any conscious inkling of what he or she has seen and similar results are obtained with angry faces in the blind field of a blindsight subject (de Gelder, Morris, & Dolan, 2005). An unconscious presentation of a photograph "primes" both a photograph and the name of an "associated" person. For example, a photograph of Lady Diana made English subjects of the 1990s faster in recognizing a picture and the name of Prince Charles (Block & Young, 1996; Young, 1994a, 1994b).
11. As Daniel Stoljar (2007) notes, representationism is only plausible as a reductionist view to the extent that unreduced consciousness does not sneak into the representation relation.
12. There are a number of somewhat different notions of contrast used for different purposes; the reader can think of contrast in terms of the higher luminance (of the lighter tilted areas) minus the lower luminance divided by the average luminance. Luminance is itself an objective property though one that takes into account the response of an idealized human eye.
13. Philosophers have been interested in the question of whether vision represents only properties like shape, size, contrast, color and texture (Prinz, 2006) or whether vision also repesents "high level" properties such as facial expression, causation or number (Siegel, 2006). (The same issue can be put in direct realist terms: are we visually directly aware of facial expression, causation, number?) There is however, a powerful line of evidence that philosophers engaged in this debate have not noticed as far as I know: whether perception of a property shows *adaptation* of the sort described in the text. A very strong argument for supposing that vision represents facial expression is that if subjects look at an angry face for

one minute, then at a mixed face that has some aspects of both anger and fear, subjects report that the mixed face looks scared. But if subjects start off staring at a scared face for one minute, then they say the mixed face looks mainly angry (Martinez-Conde & Macknik, 2010).

Moving to numerosity, the apparent numerosity of a display is increased if one stares at a low numerosity display for one minute, and apparent numerosity is decreased if one stares at a high numerosity display for one minute. This is strong evidence that we visually represent numerosity (Burr & Ross, 2008).

14. Titchener's (1908, p. 251) "law of prior entry" said "the object of attention comes to consciousness more quickly than the objects which we are not attending to." (Quoted in (Spence & Parise, 2009)).
15. Of course the methodology used cannot be the same as the experiments described since with a one item stimulus there cannot be two items to compare. She (Yeshurun & Carrasco, 1999) gets similar results for gap size.
16. "Consider this case: someone says "it's queer/I can't understand it/, I see everything red blue today and vice versa." We answer "it must look queer!"" He says it does and, e.g., goes on to say how cold the glowing coal looks and how warm the clear (blue) sky. I think we should under these or similar circumst[ances] be incl[ined] to say that he saw red what we saw [blue]. And again we should say that we know that he means by the words 'blue' and 'red' what we do as he has always used them as we do."
17. McGinn's and Johnston's views do have the same problem as direct realism in accomodating unconscious perception though, since as with direct realism, their views do not allow for different relations to the clusters of properties/sensible profiles. The common flaw is a "one factor" account, a special direct relation to a cluster of properties/structured properties that is supposed to reflect openness to the world. By contrast, the representationist can appeal both to the representation relation and to the function of the representation.
18. I am indebted in this paragraph to discussion with Christopher Peacocke.
19. The challenge concerns determination rather than the weaker supervenience relation.
20. This point is noted by Geoffrey Lee (2009) in criticizing the transparency thesis with regard to temporal phenomenology. He says that moving our attention just does not seem like an external change. The same point is made in an unpublished paper by Sebastian Watzl. My point and the use of the quotations from James and Fechner are independent of Lee, Masrour and Watzl.

References

Anscombe, G. E. M. (1965). The Intentionality of Sensation: a Grammatical Feature. In R. J. Butler (Ed.), *Analytical Philosophy: First Series*. Oxford: Blackwell.

Anton-Erxleben, K., Abrams, J., & Carrasco, M. (2010). Evaluating comparative and equality judgments in contrast perception: Attention alters appearance. *Journal of Vision*.

Armstrong, D. M. (1968). The headless woman and the defense of materialism. *Analysis*, *29*, 48–49.

Balcetis, E., & Dunning, D. (2010). Wishful seeing: Desired objects are seen as closer. *Psychological Science*, *21*, 147–152.

Block, N. (1990). Inverted Earth. In J. Tomberlin (Ed.), *Philosophical Perspectives 4*. Atascadero, CA: Ridgeview.
Block, N. (1995). On a confusion about a function of consciousness. *Behavioral and Brain Sciences*, *18*(2), 227–247.
Block, N. (1996). Mental Paint and Mental Latex. *Philosophical Issues*, *7*, 19–49.
Block, N. (1999). Sexism, Racism, Ageism and the Nature of Consciousness. *Philosophical Topics*, *26*(1 & 2).
Block, N. (2003). Mental Paint. In M. Hahn & B. Ramberg (Eds.), *Reflections and Replies: Essays on the Philosophy of Tyler Burge* (pp. 165–200). Cambridge MA: MIT Press.
Block, N. (2007a). Consciousness, accessibility, and the mesh between psychology and neuroscience. *Behavioral and Brain Sciences*, *30*, 481–548.
Block, N. (2007b). *Functionalism, Consciousness and Representation*. Cambridge MA: MIT Press.
Block, N. (2007c). Wittgenstein and Qualia. *Philosophical Perspectives*, *21*(1), 73–115.
Block, N., & Young, A. (1996). Consciousness, *Unsolved Mysteries of the Mind* (pp. 149–179). Hove: Erlbaum.
Boghossian, P., & Velleman, J. D. (1989). Color as a secondary quality. *Mind*, *98*, 81–103.
Brand-D'Abrescia, M., & Lavie, N. (2008). Task Coordination between and within sensory modalities: Effects on distraction. *Perception & Psychophysics*, *70*(3), 508–515.
Brewer, B. (2004). Realism and the Nature of Perceptual Experience. *Philosophical Issues*, *14*, 61–77.
Brewer, B. (2008). How to Account for Illusion. In A. Haddock & F. Macpherson (Eds.), *Disjunctivism: Perception, Action, Knowledge*. Oxford: Oxford University Press.
Broad, C. D. (1951). Some Elementary Reflexions on Sense-Perception. *Philosophy*, *27*(100), 3–17.
Bruner, J., & Goodman, C. C. (1947). Value and need as organizing factors in perception. *Journal of Abnormal and Social Psychology*, *42*, 33–44.
Burge, T. (1991). Vision and Intentional Content. In E. LePore & R. van Gulick (Eds.), *John Searle and his Critics* (pp. 195–213). Oxford: Blackwell.
Burge, T. (2003). Qualia and Intentional Content: Reply to Block. In M. Hahn & B. Ramberg (Eds.), *Reflections and Replies: Essays on the Philosophy of Tyler Burge* (pp. 405–416). Cambridge MA: MIT Press.
Burge, T. (2005). Disjunctivism and Perceptual Psychology. *Philosophical Topics*, *33*(1), 1–78.
Burge, T. (2009). Perceptual Objectivity. *Philosophical Review*, *118*(3), 285–324.
Burge, T. (2010). *Origins of Objectivity*. Oxford: Oxford University Press.
Burr, D., & Ross, J. (2008). A Visual Sense of Number. *Current Biology*, *18*, 425–428.
Byrne, A. (2001). Intentionalism Defended. *The Philosophical Review*, *110*, 199–240.
Campbell, J. (2002). *Reference and Consciousness*. Oxford: Oxford University Press.
Carrasco, M. (2006). Covert attention increases contrast sensitivity: psychophysical, neurophysiological and neuroimaging studies. In S. Martinez-Conde & S. L. Macknik & L. Martinez & J.-M. Alonso & P. U. Tse (Eds.), *Progress in Brain Research, Vol. 154: Visual Perception, Part 1*: Elsevier.
Carrasco, M. (2009). Attention, cognitive models of. In P. Wilken & T. Bayne & A. Cleeremans (Eds.), *Oxford Companion to Consciousness*. Oxford, UK: Oxford University Press.
Carrasco, M., Cigdem, P.-T., & Eckstein, M. (2000). Spatial covert attention increases contrast sensitivity across the CSF: support for signal enchancement. *Vision Research*, *40*, 1203–1215.
Carrasco, M., Fuller, S., & Ling, S. (2008). Transient attention does increase perceived contrast of suprathreshold stimuli: A reply to Prinzmetal, Long and Leonhardt (2008). *Perception and Psychophysics*, *70*(7), 1151–1164.
Carrasco, M., Ling, S., & Read, S. (2004). Attention alters appearance. *Nature Neuroscience*, *7*, 308–313.

Carruthers, P. (2000). *Phenomenal Consciousness: A Naturalistic Theory*. Cambridge: Cambridge University Press.
Cartwright-Finch, U., & Lavie, N. (2007). The role of perceptual load in inattentional blindness. *Cognition*, *102*, 321–340.
Chalmers, D. (2004). The Representational Character of Experience. In B. Leiter (Ed.), *The Future for Philosophy*. Oxford: Oxford University Press.
Chalmers, D. (2006). Perception and the Fall from Eden. In T. Gendler & J. Hawthorne (Eds.), *Perceptual Experience*. Oxford: Oxford University Press.
Chen, Y., Martinez-Conde, S., Macknik, S. L., Bereshpolova, Y., Swadlow, H. A., & Alonso, J.-M. (2008). Task difficulty modulates the activity of specific neuronal populations in primary visual cortex. *Nature Neuroscience*, *11*(8), 974–982.
Cherry, E. C. (1953). Some experiments on the recognition of speech, with one and with two ears. *Journal of the Acoustical Society of America*, *25*, 975–979.
Churchland, P. S., Ramachandran, V. S., & Sejnowski, T. (1994). A critique of pure vision. In C. Koch & J. Davis (Eds.), *Large-scale neuronal theories of the brain*. Cambridge: MIT Press.
Crane, T. (2006). Is there a perceptual relation? In T. Gendler & J. Hawthorne (Eds.), *Perceptual Experience* (pp. 126–146). Oxford: Oxford University Press.
Crane, T. (2007). Intentionalism. In A. Beckermann & B. McLaughlin (Eds.), *Oxford Handbook to the Philosophy of Mind*. Oxford: Oxford University Press.
Datta, R., & DeYoe, E. (2009). I know where you are secretly attending! The topography of human visual attention revealed with fMRI. *Vision Research*, *49*, 1037–1044.
de Gelder, B., Morris, J. S., & Dolan, R. J. (2005). Unconscious fear influences emotional awareness of faces and voices. *Proceedings of the National Academy of Sciences*, *102*(51), 18682–18687.
Debner, J. A., & Jacoby, L. L. (1994). Unconscious perception: Attention, awareness and control. *Journal of Experimental Psychology: Learning, Memory and Cognition*, *20*, 304–317.
Dennett, D. C. (1991). *Consciousness Explained*. Boston: Little Brown.
Downing, C. J., & Pinker, S. (1985). The spatial structure of visual attention. In M. Posner & O. S. M. Marin (Eds.), *Attention and Performance XI* (pp. 171–187). London: Erlbaum.
Dretske, F. (1995). *Naturalizing the Mind*. Cambridge MA: MIT Press.
Durgin, F. H., Baird, J. A., Greenburg, M., Russell, R., Shaughnessy, K., & Waymouth, S. (2009). Who is being deceived? The experimental demands of wearing a backpack. *Psychonomic Bulletin & Review*, *16*(5), 964–969.
Ebbinghaus, H. (1908a). *Abriss der Psychologie*. Leipzig: Veit & Co.
Ebbinghaus, H. (1908b). *Psychology: An Elementary Text-book*. Boston: Heath.
Fechner, G. (1882). *Revision der Hauptpuncte der Psychophysik* Leipzig: Breitkopf und Härtel.
Fish, W. (2009). *Perception, Hallucination and Illusion*. Oxford: Oxford University Press.
Gobell, J., & Carrasco, M. (2005). Attention alters the appearance of spatial frequency and gap effect. *Psychological Science*, *16*, 644–651.
Golla, H., Ignashchenkova, A., Haarmeier, T., & Thier, P. (2004). Improvement of visual acuity by spatial cueing: a comparative study in human and non-human primates. *Vision Research*, *44*(13), 1589–1600.
Harman, G. (1990). The Intrinsic Quality of Experience. *Philosophical Perspectives*, *4*, 31–52.
Heidegger, M. (1977). The Origin of the Work of Art. In D. F. Krell (Ed.), *Martin Heidegger: Basic Writings*. New York: Harper and Row.
Hellie, B. (2006). Beyond Phenomenal Naivete. *The Philosophers' Imprint*, *6*(2), 1–24.
Hellie, B. (2007). Factive Phenomenal Characters. *Philosophical Perspectives*, *21*(1), 259–306.
Hill, C. S. (2009). *Consciousness*. Cambridge: Cambridge University Press.
Hinton, J. M. (1973). *Experiences*. Oxford: Oxford University Press.

Hopf, J.-M., Boehler, C. N., Luck, S. J., Tsotsos, J. K., Heinze, H.-J., & Schoenfeld, M. A. (2006). Direct neurophysiological evidence for spatial suppression surrounding the focus of attention in vision. *Proceedings of the National Academy of Sciences*, *103*(4), 1053–1058.

Jacoby, L. L., & Whitehouse, K. (1989). An illusion of memory: false recognition influenced by unconscious perception. *Journal of Experimental Psychology: General*, *118*, 126–135.

James, W. (1890). *Principles of Psychology*. New York: Henry Holt.

Johnston, M. (2004). The Obscure Object of Hallucination. *Philosophical Studies*, *120*, 113–183.

Kastner, S. (2009). Attention, neural basis of. In T. Bayne & A. Cleeremans & P. Wilken (Eds.), *The Oxford Companion to Consciousness*. Oxford: Oxford University Press.

Kim, J. (1991). Supervenience as a philosophical concept. *Metaphilosophy*, *21*, 1–27.

Kind, A. (2003). What's so Transparent about Transparency. *Philosophical Studies*, *115*(3), 225–244.

Langley, K. (2002). A parametric account of contrast adaptation on contrast perception. *Spatial Vision*, *16*(1), 77–93.

Lee, G. (2009). *"Inner Time" in Consciousness and the Passing of Time*. New York University PhD Thesis, New York.

Ling, S., & Carrasco, M. (2006). When sustained attention impairs perception. *Nature Neuroscience*, *9*(10), 1243–1245.

Liu, T., Abrams, J., & Carrasco, M. (2009). Voluntary Attention Enhances Contrast Appearance. *Psychological Science*, *20*(3), 354–362.

Lycan, W. (2001). The Case for Phenomenal Externalism. *Philosophical Perspectives*, *15*, 17–35.

Lycan, W. G. (1996). *Consciousness and Experience*. Cambridge, MA: MIT Press.

Mach, E. (1959). *The Analysis of Sensations*. LaSalle: Open Court.

Macpherson, F. (2006). Ambiguous Figures and the Content of Experience. *Nous*, *40*(1), 82–117.

Martin, M. G. F. (2002). The Transparency of Experience. *Mind and Language*, *17*, 376–425.

Martin, M. G. F. (2004). The Limits of Self-Awareness. *Philosophical Studies*, *120*, 37–89.

Martinez-Conde, S., & Macknik, S. L. (2010). What's In a Face? *Scientific American Mind*, *20*(1), 26–36.

Masrour, F. (2010). Phenomenal Objectivity and Phenomenal Intentionality: in Defense of a Kantian Account. In T. Horgan & U. Kriegel (Eds.), *The Phenomenal Intentionality Research Program*. Oxford: Oxford University Press.

McDowell, J. (1982). Criteria, Defeasibility and Knowledge. *Proceedings of the British Academy*, 455–479.

McGinn, C. (1999). *Knowledge and Reality*. Oxford: Oxford University Press.

McLaughlin, B. P. (1995). Varieties of supervenience. In E. Savellos & U. Yalcin (Eds.), *Supervenience: New Essays*: Cambridge University Press.

Montagna, B., Pestilli, F., & Carrasco, M. (2009). Attention trades off spatial acuity. *Vision Research*, *49*, 735–745.

Moore, G. E. (1903). The Refutation of Idealism. *Mind*, *12*, 433–453.

Nagel, E. (1961). *The Structure of Science: Problems in the Logic of Scientific Explanation*. New York: Harcourt, Brace & World.

Nickel, B. (2007). Against Intentionalism. *Philosophical Studies*, *136*(3), 279–304.

Noë, A. (2004). *Action in Perception*. Cambridge MA: MIT Press.

Oppenheim, P., & Putnam, H. (1958). The Unity of Science as a Working Hypothesis. In H. Feigl & M. Scriven & G. Maxwell (Eds.), *Concepts, Theories and the Mind-Body Problem: Minnesota Studies in Philosophy of Science, Volume 2* (Vol. 2, pp. 3–36). Minneapolis: University of Minnesota Press.

Pautz, A. (2010). Why Explain Visual Experience in terms of Content? In B. Nanay (Ed.), *Perceiving the World: New Essays on Perception*. New York: Oxford University Press.

Peacocke, C. (1992). *A Study of Concepts*: MIT Press.

Peacocke, C. (1993). Review of M. Tye, The Imagery Debate. *Phiosophy of Science*, *60*, 675–677.
Pitcher, G. (1970). *A Theory of Perception*. Princeton: Princeton University Press.
Posner, M., Snyder, C., & Davidson, B. (1980). Attention and the detection of signals. *Journal of Experimental Psychology: General*, *109*, 160–174.
Prinz, J. J. (2006). Beyond Appearances: The Content of Perception and Sensation. In T. Gendler & J. Hawthorne (Eds.), *Perceptual Experience* (pp. 434–459). Oxford: Oxford University Press.
Prinzmetal, W., Long, V., & Leonhardt, J. (2008). Involuntary attention and brightness contrast. *Perception and Psychophysics*, *70*, 1139–1150.
Putnam, H. (1999). *The Threefold Cord: Mind, Body and World*. New York: Columbia University Press.
Reynolds, J. H. (2008). Mapping the microcircuitry of attention. *Nature Neuroscience*, *11*(9), 861.
Rhees, R. (1968). Notes for Lectures on "Private Experience" and "Sense Data": Note on the Text. *The Philosophical Review*, *77*(3), 271–275.
Robinson, H. (2008). Why Frank Should not have Jilted Mary. In E. Wright (Ed.), *The Case for Qualia* (pp. 223–246). Cambridge MA: MIT Press.
Sacks, O. (1985). *The Man who Mistook his Wife for a Hat*. New York: Touchstone: Simon & Schuster.
Schneider, K. A. (2006). Does attention alter appearance? *Perception and Psychophysics*, *68*, 800–814.
Schneider, K. A., & Komlos, M. (2008). Attention biases decisions but does not alter appearance. *Journal of Vision*, *8*(15), 1–10.
Scholl, B. J., Noles, N. S., Pasheva, V., & Sussman, R. (2003). Talking on a cellular telephone dramatically increases 'sustained inattentional blindness'. *Journal of Vision*, *3*(9).
Searle, J. R. (1983). *Intentionality*: Cambridge University Press.
Seriés, P., Stocker, A. A., & Simoncelli, E. (2009). Is the Homunculus "Aware" of Sensory Adaptation? *Neural Computation*, *21*, 1–33.
Shiu, L.-P., & Pashler, H. (1995). Spatial attention and vernier acuity. *Vision Research*, *35*, 337–337–343.
Shoemaker, S. (1994). Self-knowledge and "inner sense". *Philosophy and Phenomenological Research*, *54*, 249–314.
Shoemaker, S. (2001). Introspection and Phenomenal Character. *Philosophical Topics*.
Shoemaker, S. (2003). Content, Character and Color. *Philosophical Issues*, *13*, 253–278.
Siegel, S. (2006). Which Properties are Represented in Perception? In T. Gendler & J. Hawthorne (Eds.), *Perceptual Experience* (pp. 481–503). Oxford: Oxford University Press.
Siegel, S. (2008a). The Contents of Perception. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy* (Vol. Winter, 2008). Stanford: Center for the Study of Language and Information.
Siegel, S. (2008b). The Epistemic Conception of Hallucination. In A. Haddock & F. Macpherson (Eds.), *Disjunctivism: Perception, Action and Knowledge*. Oxford: Oxford University Press.
Siewart, C. (2003). Is Experience Transparent? *Philosophical Studies*, *117*, 15–41.
Smith, A. D. (2002). *The Problem of Perception*. Cambridge MA: Harvard University Press.
Snowdon, P. F. (1979–80). Perception, Vision and Causation. *Proceedings of the Aristotelian Society*, *81*, 175–192.
Spence, C., & Parise, C. (2009). Prior-entry: A review. *Consciousness and Cognition*.
Stelmach, L. B., & Herdman, C. M. (1991). Directed Attention and Perception of Temporal Order. *Journal of Experimental Psychology: Human Perception and Performance*, *17*(2), 539–550.

Stoljar, D. (2004). The Argument from Diaphanousness. In M. Ezcurdia & R. Stainton & C. Viger (Eds.), *New Essays in the Philosophy of Language and Mind* (Vol. Supplemental volume of The Canadian Journal of Philosophy, pp. 341–390). Calgary: University of Calgary Press.

Stoljar, D. (2007). Consequences of intentionalism. *Erkenntnis*, *66*(1–2), 247–270.

Störmer, V., McDonald, J., & Hillyard, S. A. (2009). Cross-modal cueing of attention alters appearance and early cortical processing of visual stimuli. *Proceedings of the National Academy of Sciences*, *106*(52), 22456–22461.

Strayer, D. L., Drews, F. A., & Johnston, W. A. (2003). Cell phone-induced failures of visual attention during simulated driving. *Journal of Experimental Psychology: Applied*, *9*, 23–32.

Titchener, E. B. (1908). *Lectures on the elementary psychology of feeling and attention*. New York: Macmillan.

Tong, F., Nakayama, K., Vaughan, J. T., & Kanwisher, N. (1998). Binocular Rivalry and Visual Awareness in Human Extrastriate Cortex. *Neuron*, *21*(4), 753–759.

Treue, S. (2004). Perceptual enhancement of contrast by attention. *Trends in Cognitive Sciences*, *8*(10), 435–437.

Tse, P. U. (2005). Voluntary attention modulates the brightness of overlapping transparent surfaces. *Vision Research*, *45*, 1095–1098.

Turatto, M., Vescovi, M., & Valsecchi, M. (2007). Attention makes moving objects be perceived to move faster. *Vision Research*, *47*, 166–178.

Tye, M. (1995). *Ten Problems of Consciousness*. Cambridge MA: MIT Press.

Tye, M. (2000). *Consciousness, Color, and Content*: MIT Press.

Tye, M. (2002). Representationalism and the Transparency of Experience. *Nous*, *36*(1), 137–151.

Tye, M. (2005). On the Nonconceptual Content of Experience. In M. E. Reicher & J. C. Marek (Eds.), *Experience and Analysis*. Wien: Obvahpt.

Tye, M. (2006). Nonconceptual Content, Richness, and Fineness of Grain. In T. Gendler & J. Hawthorne (Eds.), *Perceptual Experience*. Oxford: Oxford University Press.

Tye, M. (2009). *Consciousness Revisited*. Cambridge: MIT Press.

Van Der Burg, E., Olivers, C. N. L., Bronkhorst, A. W., & Theeuwes, J. (2008). Audiovisual events capture attention: Evidence from temporal order judgments. *Journal of Vision*, *8*(5), 1–10.

Wittgenstein, L. (1993). Notes for Lectures on "Private Experience" and "Sense Data". In J. Klagge & A. Normann (Eds.), *Ludwig Wittgenstein: Philosophical Occasions 1912–1951*. Indianapolis: Hackett Publishing Company.

Wright, E. (2008). Introduction. In E. Wright (Ed.), *The Case for Qualia* (pp. 1–42). Cambridge MA: MIT Press.

Yeshurun, Y., & Carrasco, M. (1999). Spatial attention improves performance in spatial resolution tasks. *Vision Research*, *39*, 293–306.

Young, A. (1994a). Neuropsychology of awareness. In M. Kappinen & A. Revonsuo (Eds.), *The Neuropsychology of Higher Vision: Collected Tutorial Essays*. Hillside NJ: Erlbaum.

Young, A. (1994b). Recognition and reality. In E. Critchley (Ed.), *Neurological boundaries of reality*. London: Farrand Press.