The Centre and Periphery of Conscious Thought

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Abstract:

This paper is about whether shifts in attention can alter what it is like to think. I begin by taking up the hypothesis that attention structures consciousness into a centre and a periphery, following Watzl's (2014, 2017) understanding of the distinction between the centre and periphery of the field of consciousness. Then I show that introspection leads to divided results about whether attention structures conscious thought into a centre and a periphery – remarks by Martin (1997) and Phillips (2012) suggest a negative answer, whereas remarks by Maher (1923) and Chudnoff (2013) suggest a positive answer. Lastly, I argue that there is *behavioral* evidence that lends weight to the "yes" side of the introspective dispute. My argument makes use of Garavan's (1998) study of forming and maintaining two mental counts at once.

Introduction[1]

We can ask a wide variety of interesting questions about the relationship between *perceptual* attention and *perceptual* consciousness. For example, we can ask whether directing our perceptual attention towards an object can cause our perceptual consciousness of the object to change in certain distinctive ways.[2] According to William James, the answer to that question is "yes". Here is his description of the way that perceptual attention seems to alter perceptual consciousness:

> … it must be admitted that to some extent the relative intensity of two sensations may be changed when one of them is attended to and the other is not... in listening for certain notes in a chord, the one we attend to sounds probably a little more loud ... (James 1890 p. 425).

According to Gustav Fechner, however, the answer is "no". Here is his description of the phenomenology of conscious perceptual attention:

> A gray paper appears to us no lighter, the pendulum-beat of a clock no louder, no matter how much we increase the strain of our attention upon them (in James 1890 p. 426).[3]

A great deal of recent work in philosophy, psychology, and neuroscience has increased our understanding of their dispute.[4] However, I think that this recent work has mostly neglected

[1] For comments on this paper, and/or earlier work that this paper is based on, thanks to: Ben Bronner, Diana Raffman, Eli Shupe, Gurpreet Rattan, Jill Cumby, Luke Roelofs, Nate Charlow, Wayne Wu, William Seager, Zachary Irving, and two anonymous referees for this journal.

[2] Throughout, I will use "consciousness" to refer to phenomenal consciousness rather than access consciousness (see Block 1995 for this distinction).

[3] I follow Watzl (forthcoming) in thinking that juxtaposing these two quotations is a useful way of introducing debates about how best to characterize the phenomenology of attending.

[4] See Wu 2014 Chapter 4 for a recent review of some of these developments (as well as positive contributions).

a closely related and very interesting question. The question is whether the *cognitive* kind of attention - what William James called "intellectual attention" - can alter the phenomenology of conscious *cognition* (James 1890 p. 419).[5]

In this paper, I will answer that question positively. In particular, I will argue that, *contra* Michael Martin (1997) and Ian Phillps (2012), shifts in intellectual attention can cause some cognitive experiences to become more central than others in the field of consciousness. In so doing, I will move beyond merely introspective considerations, which are the only considerations taken into account by Martin and Phillips, and bring some behavioral evidence to bear on the question. My argument makes use of Hugh Garavan's (1998) study of forming and maintaining two mental counts at once. On my view, his study shows that we can consciously and attentively think of one count while consciously and inattentively thinking of another count. Paired with the assumption that it's in virtue of the attentive mode of thought that an experience becomes more central in the field of consciousness than other experiences (which I defend in the final section of the paper), this result lends some weight to the claim that attention can alter the phenomenology of conscious cognition.

In distinguishing between perceptual kinds of processing and cognitive kinds of processing, I use "cognitive" to refer to the non-perceptual kind of mental processing, and not in the broader way that it is used when we say something like "the subject matter of cognitive science". Clearly, the subject matter of cognitive science includes perceptual processing as well as (*e.g.*) memorial processing. But there is also a narrower use of "cognitive". Paradigm cases of this narrower kind of cognition include deliberation, judgment, and memory.

There is a hard question to ask about how to precisely mark the boundary between perception and this narrower kind of cognition. In what follows, by "cognitive", I will mean "stimulus-independent" (See Camp 2009, Burge 2010 p. 378, Beck 2012 p. 586, and Beck

[5] Recently, "internal" and "reflective" have become more popular terms than "intellectual", but the psychologists using these terms say explicitly that they intend to mark the same distinction that James did (see, e.g. Chun, Golomb, and Turk-Browne 2011 p. 77 and Backer and Alain 2014 p. 439).

2017 for discussion and/or refinement of this way of marking off cognitive processing from perceptual processing). A stimulus-independent mental representation does not require an active causal link with the object that it is about to continue existing. A visual representation of an apple is, therefore, stimulus-dependent, while a memory of an apple is stimulus-independent.

Note that such a cognitive representation of the apple is, *in a sense*, dependent on the apple. But the sense in which it is dependent on the apple is attenuated and unimportant for our purposes here. You can't have a memory of an apple without having perceived the apple first, and this is the sense in which many cognitive representations ultimately do depend for their existence on a stimulus. But the cognitive representation does not depend for its existence, in a moment-to-moment way, on an active causal connection with the apple. *That* is the sense in which the cognitive representation is stimulus-independent.

With those remarks about cognition on hand we can move on to asking my question about intellectual attention and the phenomenology of conscious cognition. Just as it is plausible to assume that there is often something it is like to perceive, it is plausible to assume that there is often something it is like to engage in cognition.[6] Declan Smithies has helpfully provided the following list of examples of cognition that seem phenomenally conscious:

- Considering a hypothesis
- Judging that a hypothesis is true
- Recalling a fact learned in the past
- Recognizing that the conclusion of an argument follows from its premises
- Inferring the conclusion of an argument from its premises
- Drifting aimlessly in thought

[6] Note also that to say that there is conscious thought is not to make the presumption that there is a *sui generis* phenomenology of thought (see Pitt 2004 for a defense of such a view and Tye & Wright 2010 for a criticism of such a view). It is just to say that sometimes there is something it is like to engage in a cognitive process.

- Calculating the solution to a problem
- Deliberating about what to do
- Grasping a metaphor
- Getting a joke
- Understanding a sentence
- Having an unarticulated thought on the tip of your tongue
- Feeling confident, or certain, or doubtful, or incredulous
- Having a suspicion or a hunch (Smithies 2013 p. 2)

Once this plausible assumption about cognition has been made salient, it should be obvious that we can ask some interesting questions about the way that attention can alter *these* kinds of experiences, and not *just* the perceptual kinds of experiences.[7]

In the rest of this paper I aim to address one of those interesting questions – whether shifts in intellectual attention can cause some thoughts to become more central in the field of consciousness than other thoughts. First, I articulate my question about attention and consciousness a bit more clearly, and design a method to answer it grounded in Sebastian Watzl's (2014, 2017) understanding of the distinction between "centre" and "periphery" in the field of consciousness. Next, I show that using this method, which is grounded in introspection, leads to conflicting results. Finally, I introduce some behavioral evidence to help us move past the introspective deadlock. The evidence in question is Hugh Garavan's (1998) examination of what happens when we try to simultaneously form and maintain two

[7] This list of mental processes is meant to give a rough idea of the kind of process that I am referring to when I talk about stimulus-independent mental processing. One consequence of thinking of cognition in terms of stimulus independence is that it categorizes the imagination as cognitive rather than perceptual, although Smithies himself does not assert that imagination is a cognitive process. This way of thinking about cognition seems to be presupposed by psychologists and philosophers in the recent literature on cognitive penetration and, more broadly, the demarcation between perception and cognition. Fiona MacPherson, for example, explicitly categorizes the mental states we occupy while imagining, dreaming, and hallucinating as non-perceptual (i.e., presumably cognitive) mental states (Macpherson 2012 pp 50-51). On this way of thinking, stimulus-independence is more important than phenomenal similarity or relatedness when it comes to marking the divide between perception and cognition. This approach seems to be shared by psychologists including Chun, Golomb, and Turk-Browne (2011) and Backer and Alain (2014).

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mental counts at once. My analysis of the evidence, I argue, gives us new, additional reason to think that intellectual attention *can* alter the structure of conscious cognition.

§1. What does it mean for attention to alter consciousness?

"There are at least two ways to understand the question of whether a particular kind of attention alters consciousness. The first way, as we saw in the disagreement between James and Fechner above, amounted to a question about whether attention alters the apparent qualities of stimuli, like intensity or loudness. In the perceptual case, James and Fechner seem to come to different introspective judgments about how to answer the question.

But there is also a second way of understanding the question about whether a particular kind of attention alters consciousness. This second way amounts to a question about whether attention alters the *relations* that hold between particular experiences, rather than the individual experiences themselves. For example, when we shift our visual attention to different crosses on the figure below, while our gazes remain fixed on the centre cross, our experiences of some of the crosses seem to become more peripheral (or backgrounded) than others:

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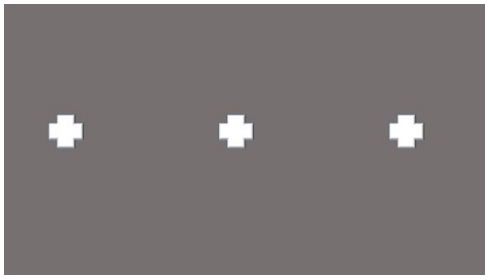

Figure 1: Three crosses

According to Christopher Mole, the introspective verdict about how to describe cases like this one is less contentious than the introspective verdict about the non-structural question about phenomenology that James and Fechner were arguing about (2008 pp. 88-89). On his

view, most people think that as we shift our perceptual attention from one cross to another, while keeping our gaze fixed on the centre cross, perceptual attention does seem to alter perceptual consciousness, in this structural sense.[8]

Whether there is a connection between the ways we must answer these two questions about attention and consciousness is itself an open and interesting question (i.e., the structural question and then non-structural question). It might, for example, be the case that the facts about the structure of consciousness can explain the facts about which objects are presented as having certain properties to a certain degree, or vice versa, or it might be that these sets of facts are independent of each other.

In this paper I restrict the scope of my investigation to just one of those questions: the question of whether intellectual attention can alter conscious cognition in a *structural* way. I leave open the question of whether intellectual attention to an object can alter what properties the object seems to have, and and I leave open the question of what the relationship between our answers to those two questions might be.

But before going on to actually answer the structural question about intellectual attention and consciousness, I'll discuss in some more depth what I mean when I say that attention might alter the *structural* features of consciousness.

§1.1 What is phenomenal structure?

A stream of consciousness, as I use the term, is a temporally extended experience that is itself composed of experiences. For example, the experience of writing a paper in a cafe might be composed of the experience of feeling the seat beneath oneself, the experience of tasting coffee, the experience of coming to various conclusions about what to write next, etc. Total conscious states are sets of experiences that are all a part of the same stream of

[8] See, however, De Brigarde (2010) and Wu (2014) for criticism – I address Wu's method of criticism in more depth at the end of the paper.

consciousness and that all occur at the same moment.[9] A total conscious state that is a part of the temporally extended experience of writing a paper in a café, for example, might involve simultaneously making a judgment about an argument and hearing some music.

Sebastian Watzl (2014, 2017), among others, has argued that consciousness is aptly described as a "field" of experiences, and that the field has "structure". To be more precise, what he seems to mean is that *total conscious states* are aptly described as field-like. For example, on this sort of view, when you're sitting in an audience in front of an orchestra your field of experiences will probably include a visual experience of the members of the orchestra and an auditory experience of the piece that they are playing.

Moreover, many of these philosophers seem to think that the field of experiences has at least two parts – a "centre" and a "periphery". On this way of thinking, one experience, or small group of experiences, can be said to be at the "centre" of the field of experiences, while all the rest of the experiences can be said to be further out, in some sense, at the "periphery". Here are some representative examples of how philosophers and psychologists articulate the idea that the field of experiences seem to have this kind of structure:

> In most of our fields of consciousness there is a core of sensation that is very pronounced. You, for example, now, although you are also thinking and feeling, are getting through your eyes sensations of my face and figure, and through your ears sensations of my voice. The sensations are the centre or focus, the thoughts and feelings the margin, of your actually present conscious field. (James 1890 p. 18)

> Perhaps the best general description of the effect of attention is afforded by Wundt's comparison of consciousness to the field of vision. As in the eye there is a point of clearest vision, where all impressions are very distinct as opposed to the vagueness of the

[9] I follow James (1890) in this use of "stream of consciousness" and Bayne (2010) in this use of "total conscious state".

objects seen with other parts of the retina, so in the mind there are always a few processes which stand out clearly while the others are blurred and indefinite... Attention may wander over the mental field as the eye may wander over a surface in the outside world. (Pillsbury 1907 p. 2)

It might be helpful if I were to give some more definite idea of the manner in which I conceive a thought or an element of consciousness to occupy the foreground of consciousness... When speaking about an object in the vicinity it is usually possible to point to it. The visual field, the auditory field, or whatever sense-field it is, then organizes itself about the object. It becomes the centre of attention. Very much of a parallel situation is found, I suggest, in consciousness generally. When I have a thought, for instance, the thought becomes the cognitive referent around which consciousness organizes itself. (Evans 1970 p. 91)

… imagine you are in a room with dark gray walls, ceiling, and floor and a single source of dim overhead light. In that room is sitting a cushion and a small table. On the table is a steaming pot of tea. Imagine that you are sitting on the cushion facing the teapot with your eyes open, fixated on the teapot, breathing steadily and slowly. To yield the phenomenal contrast, imagine that you are interested in observing the steam from the pot of tea. In the second version of this experience, imagine that you are interested in observing your breath, as in a session of yogic meditation…. I suspect that most experience the stimulus of interest to be in the foreground when interested in the steam, and the breath in the foreground when interested in the breath. This is not to say that most people experience the stimulus of interest to be in the spatial foreground; the stimulus of interest is experienced as though in the foreground of the mind. (Jennings 2015 p. 1268).

As these passages demonstrate, the view that it is correct to describe parts of the field of consciousness as more central than others is a popular and enduring one.

Sebastian Watzl's account of the distinction between centre and periphery seems to be the most extensive and explicit, and so in what follows I will work with his view in particular (his account is developed in Watzl 2010, Watzl 2011a, Watzl 2014, and Watzl 2017). Here is what Watzl has to say about what makes one experience "further" from the centre of the field of consciousness than another experience:

> The idea that the field of consciousness has attentional structure is highly intuitive. When I focus attention on an itch there seems to be a sense in which the itch experience is central in the field of consciousness, while the feeling of elevation, the experience of the jazz, and the experience of the letters become a mere periphery to that central experience. By contrast, when I start focusing on the melody being played by the saxophone, the itch experience moves from the centre to the fringe or margin of my field of consciousness. (Watzl 2014 p. 65)

So according to Watzl's introspective observations, when we consciously focus our attention on one thing and then another, what it is like to be us seems to change in a distinctive and systematic way. Our experiences of what we focus our attention on seem to move to the centre of the field of experiences, and our experiences of many other things that we were already experiencing seem to move further from the centre.

To put things a bit more precisely, Watzl thinks that a particular phenomenal property – "being in the centre of the field of experiences" – is to be explained with reference to various instances of a particular phenomenal relation – the "peripheral-to" relation (Watzl 2014 p. 66). On his view, the centre of the field of experiences is the experience (or experiences) that are not peripheral to any other experiences. Additionally, on his view,

one's "object of attention" is the object that the experience at the centre of the field of experiences is about (Watzl 2010 p. 150, 2014 p. 67).

Watzl's account of the peripheral-to relation generates, therefore, a method of trying to find out whether a shift in a particular kind of attention (e.g. perceptual or intellectual) can cause the structure of part of the field of experiences to change. The method is this: you deliberately shift the direction of either variety of attention, and then you ask yourself questions of the form: "Did that series of experiences reveal to me that the shift of my attention altered the structure of my field of consciousness?". If "yes" seems to be the answer, one can then move to conclusions of the form "Well then: directing that kind of attention can change the structure of the field of experiences".

Reflection on Watzl's case above seems to generate the conclusion that perceptual attention can alter the structure of the perceptual part of the field of consciousness. This conclusion is also in line with Mole's articulation of the common-sense picture of the relationship between attention and consciousness, which I discussed above.

In the next section, I attempt to apply this methodology to answering my question about intellectual attention and conscious cognition. As we'll see, there's a problem: on the basis of introspection, Michael Martin (1997) and Ian Phillips (2012) would answer "no", but Michael Maher (1923) and Elijah Chudnoff (2013) would answer "yes".

§2. Introspecting on the structure of conscious cognition

If we think of the field of experiences as a set of experiences, it is easy to talk about parts of the field. Parts of the field are subsets of the set of experiences that constitutes the field. In fact, I've already mentioned two parts of the field in this paper: the centre and the periphery. Another interesting part of the field of experiences is the *cognitive* part of the field

– that is, the part composed of the experiences that you have when you engage in cognitive activities like judging and remembering.

We should expect the methodology I discussed above to enable us to answer questions about the centres of *parts* of the field of experiences, just as we should expect it to answer questions about the centre of the field *as a whole*. Here's the particular question about a part of the field of experience that I'm interested in addressing in this paper: "Can the way we direct our intellectual attention structure our cognitive experiences into a centre and a periphery? Or are all of our cognitive experiences equally central?". Note that precisely what it means for attention to "structure" experience into a centre and a periphery will depend on what the metaphysical relationship between attention and consciousness consists in. If attention is something distinct from consciousness (as it is according to, e.g. Wu 2014) then my question is about the causal impact that intellectual attention can have on consciousness. If attention is an aspect or mode of consciousness, then my question is about how that aspect or mode of consciousness alters as we engage in shifts of attention.

In the rest of this section, I'll review some answers that philosophers have given to this question on the basis of introspection (i.e., the method suggested by Watzl's remarks on the centre and periphery of the field of consciousness).

Michael Martin and Ian Phillips have given introspective reports in favour of a negative answer to the question of whether intellectual attention seems to alter the structure of conscious cognition, but their treatment of the question *was* relatively brief. Martin's and Phillips's claim actually occurs within an argument about a separate debate – the debate about how best define or otherwise give an account of intellectual attention. They think that intellectual attention *constitutes* cognitive consciousness, while perceptual attention *structures* perceptual consciousness.[10]

[10] An even deeper problem with their view is that it seems to rule out the possibility of unconscious intellectual attention from the start. But this is an unacceptable result, given the widespread presumption that it is intelligible to search for empirical evidence that unconscious attention exists – see e.g. Kentridge (2011), Norman, Heywood, & Kentridge (2013), and Mole (2014).

This is their argument in favour of accepting that way of distinguishing perceptual attention from intellectual attention (Martin 1997 p. 78; Phillips 2012 p. 288):

> (1) Initial reflection on ordinary perceptual experiences shows that it seems to be the case that we are currently having experience of a plenitude of items beyond what we are currently focusing our attention on.
>
> (2) Initial reflection on ordinary cognitive experiences seems to show that there is no such array of items for us to shift our attention across.
>
> (3) Therefore we can distinguish between perceptual and intellectual attention in the following way: perceptual attention is a *modification* of the perceptual stream of consciousness, but intellectual attention *just is* the cognitive stream of consciousness.

(1) is relatively uncontroversial. As Christopher Mole (2008) argues, introspective reflection on day-to-day perceptual experiences seems to reveal that the relationship between perceptual attention and perceptual consciousness is as of a spotlight of attention ranging over field of experiences of which one is already conscious. Above, I used a figure with three crosses to help illustrate Mole's point.

But (2), I will argue, is more controversial than Martin and Phillips seem to think. This is how they describe what their own conscious cognition seems to be like when they argue in favour of (2):

> [P]erceptual attention seems to range over an array of objects of which we are already aware. Internal attention does not range over contents, some of which were already objects of thought… (Phillips 2012 p. 288).

> In [the perceptual case] it is tempting to think of experience in terms of a whole array of items stretching beyond what I have focused my attention on at a time - an array over which I could move my attention, as a beam or a spotlight. It is as if I am aware of the whole array at a time ... whether I now focus my attention on one part of it or not ... There seems to be no corresponding array of items to shift one's attention over in thought… (Martin 1997 p. 78).

So Martin and Phillips seem to think that structure plays less of a role in conscious cognition. That is, they seem endorse (2) because they think that all of our cognitive experiences seem to be in the focus of attention. On this way of thinking, all of our cognitive experiences are equally central, and consequently shifts in attention would not cause shifts in the way that the peripheral-to relation obtains in a given subject's field of experiences.

(2) would be undermined if other theorists have come to different conclusions about what cognitive experience seems to be like, and indeed, other theorists *have* come to that kind of conclusion. For example, Elijah Chudnoff has claimed that the phenomenology of performing a geometrical proof can involve having some cognitive experiences in the foreground of consciousness and some in the background:

> You consider the proposition that circles are symmetrical about their diameters... What you do is imagine an arbitrary circle, and imagine folding it over various chords that divide it into equal parts. These chords are its diameters, and it is clear from your imaginative endeavor that the circle is symmetrical about them… In [this case] you differentiate the property of being a diameter from its background. This background consists of other properties… To say that you are thinking about all the different sorts of chords on a circle is not to say that each one stands out clearly before your mind. Only one does: the diameter (Chudnoff 2013, pp. 717-718).

On Chudnoff's view, therefore, thinking about something does not entail that it is an object of our intellectual attention: it might be in the background of cognitive consciousness. An alternative explanation of this apparent dispute between Martin and Phillips and Chudnoff is that Chudnoff is describing an episode of visual imagination, which is not a process that is "cognitive" in the sense that Martin and Phillips intended. This gives us some reason to investigate the phenomenology of cognitive processes that are more obviously cognitive in the sense that they intended, as I do below in my discussion of the phenomenology of forming and maintaining mental counts.

And here is a second description of the phenomenology of thought that problematizes (2), from Michael Maher's book *Psychology: Empirical and Rational*:

> ... intellectual attention, even when engaged in comparison, apprehends its objects in the form of a unity of some sort. The focus of attention seems to be at any moment a single thought, though that thought may carry a fringe of relations and a nucleus of elements dimly felt to be distinct from each other… (Maher 1923 p. 349).

Maher seems to think any attentive cognitive experience we have is accompanied by a "fringe" which is felt in a different way than the thought that we are attending to. And it seems plausible to suggest that various parts of this fringe are items that we could direct intellectual attention towards, and cause to become more central in our fields of consciousness. So on Maher's way of thinking, there *does* seem to be an array of items in conscious thought that attention can range over.

Maher and Chudnoff may well be wrong about what the phenomenology of conscious thought is like. My goal in quoting their introspective reports is just making it evident that Martin's and Phillips's argument is much more controversial than it might first appear, and that in fact there are theorists who would dispute their claim about the phenomenology of conscious thinking.

The core problem is that introspective judgments about how to characterize phenomenology notoriously vary from person to person.[11] Thus, these initial moves based on introspection doesn't seem sufficient to answer my question about whether intellectual attention alters cognitive consciousness, or to provide Martin and Phillips adequate reason to distinguish perceptual attention from intellectual attention in the way that they do. Martin's and Phillips's argument for their definition of intellectual attention seems to rest on the hope that this particular introspective judgment will not be variable in that way, but, as I've shown, this introspective judgment is variable in just that way.

For all that, (2) might be true. One way to make some headway would be to make some more sophisticated introspective arguments – e.g., to provide a debunking argument for the introspective judgments of either Martin and Phillips or Maher and Chudnoff. Such an argument would provide an explanation of why one of the pairs of philosophers is incorrectly describing the phenomenology of their own conscious cognition. Another potential way would be to attempt to make use of introspective data from specially trained subjects rather than relatively naïve subjects.[12]

Alternatively, another way to make some progress on the question of whether (2) is true would be to advert to some behavioral or neurological evidence. Behavioral or neurological evidence that there were two modes of consciously thinking (one attentive, the other inattentive) would lend some weight to the conclusions of Maher and Chudnoff. Behavioral or neurological evidence to the contrary would lend some weight to the conclusions of Martin and Phillips.

In the next section of this paper, I investigate the option of moving this debate forwards with behavioral evidence.

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[11] See, e.g., Schwitzgebel (2008) for a vivid discussion of this point, as well as a discussion of introspection's (un)reliability.

[12] See, e.g., Schwitzgebel (2004) and Heavey, Hurlburt, and Lefforge (2010) for discussions of what that sort of training might entail. The training involves learning to use specific terms to describe what it is like to have various specific kinds of experiences.

§3. How to find behavioural evidence that there is structure in conscious cognition

I think it's reasonable to assume that theorists in both camps of this dispute would accept the claim that we can consciously think of more than one thing at once. What Martin and Phillips take issue with is the claim that in so doing we could *also* think attentively about one of them and inattentively about the other. So the kind of evidence that would be compelling to Martin and Phillips, or someone who agrees with them about how to describe the phenomenology of conscious cognition, would be some *non-introspective* evidence that we can attentively think of one thing while inattentively thinking of another. Paired with the assumption that it's in virtue of the attentive mode of thought an experience becomes more central in the field of consciousness than others (which I defend in the final section of the paper), that result would corroborate the introspective judgments of Maher and Chudnoff.

Hugh Garavan's paper "Serial Attention Within Working Memory" (1998) provides some behavioral evidence that will help us answer my question. In Garavan's study, participants formed and maintained two counts at the same time. Participants were informed of their two tasks - keeping count of the triangles and rectangles that they saw - and then exposed to one shape (a triangle or a rectangle) at a time. Participants controlled when they were exposed to the next shape in the series by pressing a bar as soon as they had updated their count (i.e., they had control of the "stimulus onset" time).

There were two kinds of transitions between shape-slides within the series of shape-slides. In a "No Stimulus Switch" transition, a rectangle followed a rectangle or a triangle followed a triangle. In a "Stimulus Switch" transition, a rectangle followed a triangle or a triangle followed a rectangle. I've included my illustration of this below: transition #1 is a "No Stimulus Switch" transition, while transitions #2, #3, and #4 are "Stimulus Switch" transitions. On my way of speaking, a transition is the duration between two stimulus onset times.

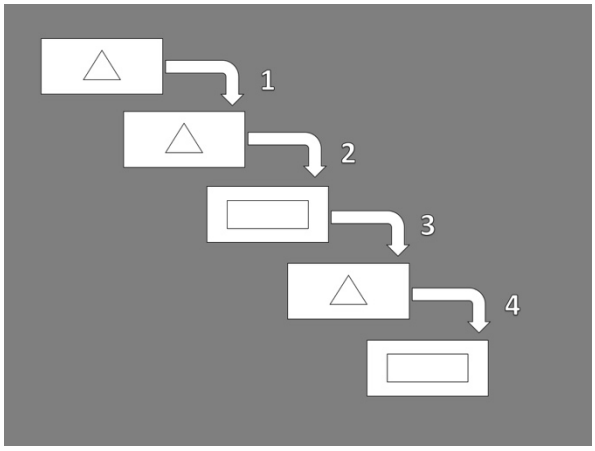

Figure 3: Garavan's experiment

Garavan found that participants took longer to respond to two slides in a "Stimulus Switch" transition than in a "No Stimulus Switch" transition. His explanation of the delay was that participants were only able to attend to one count at a time, and that in order to update their count in the "Stimulus Switch" condition, participants first had to switch their focus of attention to a different count than the one that they were already attending to (Garavan 1998 p. 271). Garavan performed additional experiments to rule out other perceptual explanations of the delay - e.g., the explanation that the delay occurred because it is easier to focus one's gaze on two triangles consecutively than a triangle and then a rectangle (Garavan 1998 pp. 267-268). In short, this effect does not seem to be a purely perceptual phenomenon, and so our explanation of why it occurred needs to advert to *cognition*.

Garavan also argued that an explanation that adverted to a shift in attention was more plausible than one that adverted to retrieval from memory. As he points out, over the course of the study participants would verbalize both of their counts in the same order. But in Stimulus Switch transitions, the delay persisted even when the count that the participant had to switch to was the count that they had most recently rehearsed. He has in mind, *e.g.*, the following sequence of events: the presentation of a square, a participant verbalizing their count of squares and then their count of triangles, the presentation of a triangle, and then the participant verbalizing their count of squares and count of triangles. As Garavan notes, "one would expect the retrieval of [the most recently rehearsed] count's current value to be

at least as fast as, if not faster than, retrieval of the just updated count" (Garavan 1998 p. 273). But this is not what he observed, and the Stimulus Switch delay persisted even when a count had been recently rehearsed.

But why should we really think that this explanation should advert to *intellectual attention* rather than some other non-memorial aspect of cognition? This brings us to challenging question of what the nature of attention really is, and the related question of what counts as behavioral evidence that a participant has directed her attention to one thing and then another. See Anderson 2011 Watzl 2011b for discussion of the problem of widespread disagreement amongst psychologists and philosophers about how to define "attention". Anderson's concern that most psychologists studying attention are actually all studying something different is aptly expressed in the title of his 2011 paper, "There is no such thing as attention". And Garavan, like many psychologists working on attention, did not explicitly define "attention" in his article. Instead, he seemed to rely on the idea that the process he was studying seemed to be a paradigm case of intellectual attention.

I agree with Garvan's assumption, and here will provide an argument for it grounded in Wayne Wu's (2014) analysis of the way many psychologists study perceptual attention. First I'll explain Wu's view and how it applies to the intellectual case, and then I'll explain how we can use his view to defend the idea that Garavan's task required shifts of intellectual attention.

Wu's view is designed to address the problem of apparent disagreement amongst psychologists about what *perceptual* attention really is. He acknowledges that many psychologists appear to define "perceptual attention" differently. But, he argues, many psychologists seem to think that when a participant uses information from a personal level perceptual representation to guide the performance of some task, she has perceptually attended to the object that the representation is about. This view is based on Wu's analysis of how a wide variety of psychologists make inferences about perceptual attention, including psychologists studying attention via the visual search paradigm and the shadowing paradigm (Wu 2014 p. 39)

Wu's analysis reveals that although many psychologists studying perceptual attention might *appear* to use the word "perceptual attention" in different ways, a large group of them are actually all using the word in the same way when it really matters (i.e., when drawing conclusions about attention on the basis of observed behavior). As Wu notes, realizing that a variety of psychologists endorse such a view about what is sufficient for attention goes along with being able to explain why we should resist the skepticism that some psychologists have about the progress of our collective study of attention. Moreover, on this way of thinking, there might be both conscious and unconscious attention: when the representation in question is conscious, the participants' use of information would be sufficient for conscious attention, and when the representation is unconscious, the participants' use of information would be sufficient for unconscious attention.[13]

Suppose that Wu is right about how many psychologists study perceptual attention. Then it would be reasonable to hypothesize that psychologists studying *intellectual* attention believe that a similar kind of behaviour is sufficient reason to conclude that a participant has intellectually attended to an object. On this way of thinking, what would suffice for intellectual attention to an object is that a subject uses information from a personal level cognitive representation of the object to guide the performance of a task.

The way that psychologists study intellectual attention using the "refreshing paradigm" provides support for this hypothesis. In the simplest version of the refreshing paradigm, subjects see a series of words on slides, one at a time, interspersed with the occasional slide that displays a single black dot. They are instructed to read aloud the words that they see, and to think of ("refresh") and say the previous word they saw when they see

[13] That idea seems to make sense of why, e.g. Kentridge (2011), Norman, Heywood, & Kentridge (2013), and Mole (2014) say that when a subject uses information from a representation of some object but doesn't seem conscious of it, there is evidence in favour of the view that unconscious attention exists. The subjects they have in mind are subjects with blindsight using information from representations of objects in their blind fields, or sighted subjects that use information from representations of objects that are "invisible" because of their rapidly flickering boundaries (see Mole 2014 p. 45 for more on "invisible" objects).

a black dot. Here is an example of what a series of slides in the refreshing paradigm look like:

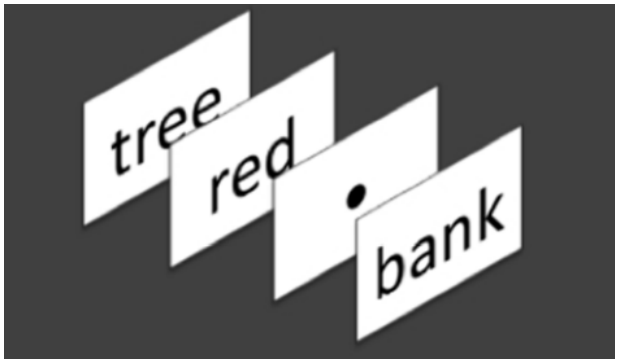

Figure 1: The refreshing paradigm

Psychologists seem to think that when subjects successfully respond to the black dots, the subjects have attended to the previous word that they saw.[14] The hypothesis that they believe that using information from a personal level and cognitive representation of an object to guide the performance of a task seems to explain why they make this inference. That's because in this paradigm, subjects must have used information from cognitive representations of the previous word they had seen to guide their performance of the "respond to a black dot" task.

Psychologists that study intellectual attention via the refreshing paradigm, therefore, seem to think of attention in just the way that Wu argued that psychologists studying perceptual attention do. It's also the case that scientists working in other paradigms, like the "*n*-back" paradigm and the "retro-cue" paradigm, appear to think of intellectual attention in terms of using information from cognitive representations to guide the performances of tasks, but I do not discuss those paradigms in this paper for brevity's sake (see McElree 2006 for a look at the *n*-back paradigm and Astle et al. 2012 for a look at the retro-cue paradigm).

[14] See Johnson et al. (2002 p. 64) for this task, and Johnson et al. (2005 p. 340) for the explicit assertion that 'refreshing' (which is required by responding to the dot) entails attention. For more work in the refreshing paradigm see, e.g., Raye et al. (2002), Chen & Cowan (2009), Higgins & Johnson (2009), and Johnson et al. (2013).

Now I'll argue that if we use this view about what's sufficient for intellectual attention to analyze the methodology in Garvan's study of mental counting, we get the result that we should expect: in Garavan's study, participants had to switch their conscious intellectual attention from one count to another throughout his experiment.

First, note that in this experiment, participants working through the two slides of a Stimulus Switch transition had to use information from one cognitive representation of a count and then another cognitive representation of a count in order to guide their performances of their two counting tasks. The reason that the representations in question seem cognitive is because their existence is doesn't actively depend on any particular stimulus – indeed, the point of these representations is to track information about several stimuli that are only ever briefly perceptually available (and some that are never perceptually available – the counts themselves).

Second, note that participants working through the two slides of a Stimulus Switch transition had to use information from one conscious representation of a count and then another conscious representation of a count in order to guide their performances of their two counting tasks. The representations in question seem conscious because, throughout the procedure, as participants updated any individual count, they verbally reported the current values of both counts:

> "As previously described for Experiment 1, when asked to count aloud, all subjects adopted the technique of verbalizing both counts following each figure, that is, subjects would update one count and rehearse the current value of the other count. For convenience, these different operations will be referred to as "updating" and "rehearsing." (Garavan 1998 p. 10)

I take this kind of capacity to describe some of the content of a representation via introspection to be a good (although defeasible) reason to think that the representation in

question is a conscious one. It seems phenomenologically implausible to suggest that while verbally reporting on their counts the participants were using unconscious representations to guide their actions, in the way that a person with blindsight, forced to guess about where a nearby object is located, uses information from an unconscious representation to guide their actions. When we form and update two mental counts at once, it does not feel like we are being guided by an unconscious state or retrieving something from memory.

But it is possible to press this point: after all, even if it seems as though we are conscious of both counts throughout, we might be mistaken about that. Perhaps, in fact, participants are only ever conscious of the count that they are updating, and that the count that they are not updating is stored in memory and consequently unconscious. If might be argued that one count "moves" to long term memory and thereby becomes unconscious.

However, the example of H.M., a famous patient in the history of psychology and neuroscience, suggests otherwise. As a result of a lesion, H.M lost the capacity to form new long-term memories, but retained the capacity to acquire new skills and engage in day-to-day tasks. Crucially, the day-to-day tasks he was able to perform seem to include tasks that are very much like the mental counting task at issue in Garavan's study – see this passage from Larry Squire's paper "The Legacy of Patient H.M. for Neuroscience":

> "A key additional finding was that H.M. had a remarkable capacity for sustained attention, including the ability to retain information for a period of time after it was presented. Thus, he could carry on a conversation, and he exhibited an intact digit span (i.e., the ability to repeat back a string of six or seven digits). Indeed, information remained available so long as it could be actively maintained by rehearsal… In contrast, when the material was not easy to rehearse (in the case of nonverbal stimuli like faces or designs), information slipped away in less than a minute." (Squire 2009 p. 7)

What H.M.'s capacities suggests is that the rehearsal strategy that Garavan's participants engaged in was *not* a strategy that was enabled by the use of storing a count in long-term memory. As Squire notes, it seems like in H.M. long-term memory was damaged but what William James called "primary memory" was preserved, and that H.M.'s use of primary memory is what explains his success in performing day to day tasks like carrying on a conversation or rehearsing some digits. James said that information presented to us via primary memory "comes to us as belonging to the rearward portion of the present space of time, and not to the genuine past", whereas "secondary memory is quite different. An object which has been recollected is one which has been absent from consciousness altogether, and now revives anew. It is brought back, recalled, fished up, so to speak, from a reservoir in which, with countless other objects, it lay buried and lost from view". (James, 1890, p. 647-648).

These two points, combined with Garavan's observation that Stimulus Switch transitions took more time than no stimulus switch transitions, show that during such a moment, the participants were consciously thinking of both counts, but only consciously attending to one of the counts. Paired with the assumption that attention structures consciousness into a centre and periphery (which I defend in the next section of the paper), we get the result that the peripheral-to relation can obtain in conscious cognition, *contra* Martin's and Phillips's descriptions of the phenomenology of conscious cognition.

§5. Do shifts in conscious attention *always* accompany structural change?

As I've remarked a few times above, I've assumed that shifts in attention come along with alterations to the structure of consciousness. Someone with intuitions like Martin's and Phillips's could maintain their view of the phenomenology of conscious cognition through arguing that *although* we can consciously and attentively think of one thing while consciously and inattentively thinking of another, it's not the case that shifts in attention necessarily cause one experience to become more central than another one. So far, in this paper I've only provided an argument for the former claim, and not the latter one.

As we saw earlier in the paper, the latter claim is widely endorsed by many theorists that talk about attention. Early psychologists like William James and David Pillsbury, and a variety of philosophers including Cedric Owen Evans, Sebastian Watzl, and Carolyn Jennings, have *all* claimed that (i) shifts in conscious attention seems to alter consciousness and that (ii) the language of centrality should be used to characterize this alteration. Their claims seem grounded in introspection, and I agree with them about the introspective verdict here.

These claims are not, however, undisputed. Wayne Wu, for example, has this to say about the phenomenal effects of conscious attention:

> In discussing phenomenal salience, I suggested that the phenomenology of attention is a product of very special cases where one reflects on attention and its targets. In reflecting in this way, one focuses on the targets, although in a way that need not involve a change in the phenomenology of experience per se... Watzl might be right that there is something like a center-periphery structure, but I claim that this is a reflection of special cases. Alternatively, Watzl can claim that I have simply missed a common structural feature of all perceptual experiences where attention is differentially deployed. At this point, the debate mirrors something like the exchange between James and Fechner, a difference in basic intuitions about the phenomenology of attention. The challenge then is how to resolve the impasse when one hits rock-bottom disagreements about how consciousness seems to be. (Wu 2014 p. 130).

On Wu's view, attention only *sometimes* results in phenomenal changes, and the language of centrality is *not* the right language to characterize the changes that shifts in attention sometimes do explain. As Wu notes, it is difficult to know how to resolve "rock-bottom disagreements" like this one.

That being said, I think that it is reasonable to think that Wu's description of the phenomenology of attention is something of an anomaly, and to side with theorists on the other side of this dispute – theorists like William James, David Pillsbury, Cedric Owen Evans, Sebastian Watzl, and Carolyn Jennings, who all seem to describe the phenomenology of attention in convergent ways.

Moreover, the fact that Wu is such an outlier is not the only reason to side with James, Pillsbury, Evans, Watzl, and Jennings It also seems epistemically significant that this range of theorists, from a wide array of differing intellectual vantage points – i.e., from a wide range of times, places, and theoretical backgrounds – have described the phenomenology of attention in such strikingly similar ways. The tendency to describe attention in terms of centrality and peripherality, or equivalent terms, seems to be one that endures while time, place, and theoretical background vary, and most charitable explanation of that convergence is that these theorists are just getting at something right about the phenomenology of attention.

Finally, while intuitive descriptions of the effect of perceptual attention on consciousness are more common than intuitive descriptions of the effect of intellectual attention on consciousness, it would be surprising if attention turned out to have radically different effects on the centrality of a cognitive experience as opposed to a perceptual experience. The field of consciousness is composed of both perceptual and cognitive experiences, and attention seems to make experiences more central in the field *as a whole* rather than more central *just with respect to experiences of the same variety* (cognitive or perceptual).

§6. Conclusion

In this paper, I've made some headway on the question of what, in various contexts, occupies the centre of a field of experiences. In so doing, I've shown that understanding the notion of the "centre" of a field of experiences in purely introspective terms leads to some methodological troubles. Then I used some behavioral evidence in favour of one way of

answering the question. As I've pointed out above, there remain a variety of open and interesting questions about the ways that intellectual attention and cognitive consciousness interact. For example, is there a cognitive analogue to James's and Fechner's question about whether perceptual attention alters perceptual consciousness in a non-structural sense? And if so, how should we answer it?

Moreover, in investigating whether cognitive experience is structured into foreground and background, I've only begun the investigation into *all* the ways it might be structured: according to James's introspective observations, attention structures our fields of consciousness in a wide variety of ways other than "foreground and background" including, for example, "accent and emphasis, light and shade". (James 1890 p. 402). This paper provides a foundation for the investigation of further questions about accent, emphasis, light, and shade in conscious cognition that are suggested by James's remarks, as well for doing the conceptual work required to fully understand the additional ways in which his remarks suggest that there is more to phenomenal structure than the "peripheral-to" relation.

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