

This is the final (and yet unofficial) draft of my paper forthcoming in “Attention: Philosophical and Psychological Essay’s” (eds. Mole C., Smithies D. and Wu W.), Oxford University Press (2010)

Attention as Structuring of the Stream of Consciousness*

Sebastian Watzl

This paper defends and develops the structuring account of conscious attention: attention is the conscious mental process of structuring one’s stream of consciousness so that some parts of it are more central than others. In the first part of the paper, I motivate the structuring account. Drawing on a variety of resources I argue that the phenomenology of attention cannot be fully captured in terms of how the world appears to the subject, as well as against an atomistic conception of attention. In the second part of the paper, I show how the structuring account can be made precise: attention causes and causally sustains phenomenal relations to hold between the parts of the stream of consciousness; most importantly the relation of one part being peripheral to another. I end by pointing out consequences for both the scientific study of attention as well as for several areas of central philosophical interest.

1 Introduction

My goal in this paper is to defend and develop an account of the nature of conscious attention. I will argue for the following view.¹

(STRUCTURALISM) Consciously attending to something consists in the conscious mental process of structuring one’s stream of consciousness so that some parts of it are more central than others.

* Previous versions of the material of this paper have been presented at the following occasions: the Thesis Preparation Seminar at Columbia University, the MindGrad conference at Warwick University, the Annual OSU/Maribor/Rijeka Philosophy Conference in Dubrovnik, the Consciousness Reading Group at NYU, and the philosophy department at Cornell University. I would like to thank everyone for their comments on these occasions. Special thanks to the following people: Ned Block, Bill Brewer, John Campbell, Taylor Carman, Guillermo Del Pinal, Imogen Dickie, Naomi Eilan, Lydia Goehr, Kerah Gordon-Solmon, Sidney Felder, Benj Hellie, Hemdat Lerman, Brian Kim, Patricia Kitcher, Uriah Kriegel, Geoffrey Lee, Farid Masrour, John Morrison, Christopher Peacocke, Carol Rovane, Jonathan Simon, Achille Varzi and Anubav Vasudevan. Special thanks also to the editors Chris Mole, Declan Smithies and Wayne Wu for their excellent comments, constructive criticism, and support.

¹ Precursors of the view can be found in Sartre (1943/1969), Merleau-Ponty (1945/2008), Gurwitsch (1964) and Evans (1970). Thanks to Taylor Carman and Charles Siewert for discussions pertaining to the connections of my work to some of those precursors.

In the course of this paper I will argue for STRUCTURALISM, show how it can be made precise and draw out some of its consequences for both the empirical science of attention as well as for several philosophical areas. At the beginning, though, I would like to introduce the idea that motivates STRUCTURALISM with the following analogy.

Suppose that you are structuring your life around a personally important project, be it the writing of a book, making your love life work, or bringing up your children. In a situation like this you will experience everything in terms of its relation to that project. Everything in your life now either points to that project, or – by contrast – has only minimal significance for you. Significance or insignificance for you will mean significance or insignificance with respect to that project.

In such a case this project is the focus of your attention. To focus one's attention on a project *is* to structure one's life around it: it is a certain form of mental management. It is natural to describe this structuring in terms of a "perspective" or "point of view." Your overall perspective on the world is centered around the object of your attention. People who focus their attention on different projects have different perspectives, or different points of view.

According to STRUCTURALISM *every* form of attention consists in a structuring of one's conscious point of view. Conscious *perceptual* attention, conscious attention *to one's bodily sensations* or conscious attention *to one's trains of thought* should all be viewed as ways of structuring one's conscious mental life or stream of consciousness.

My plan for the paper is the following. I will start by giving some examples, delineate the scope of my discussion, and make some initial clarifications. I will then motivate STRUCTURALISM by outlining the reasons for accepting five theses about conscious

attention. In the last third of the paper I will then develop STRUCTURALISM by providing a precise definition of what it is to structure the stream of consciousness: attention causes and causally sustains phenomenal relations to hold between the parts of the stream of consciousness; most importantly the relation of one part being peripheral to another. I will end by pointing out some consequences of my conclusion: for the scientific study of attention, for philosophical debates about the unity of consciousness, and for some other philosophical areas.

2 Examples and Clarifications

Let me start with simple examples that illustrate the phenomenon I am interested in. Suppose that you are listening to a jazz band. You will have one kind of auditory phenomenology² when you focus your attention on the sound of the saxophone and a different phenomenology when you focus it on the sound of the piano. Now suppose that you are on the subway. You will have one kind of visual phenomenology when you focus your attention on your newspaper and a different phenomenology when (maybe without having moved your eyes) you focus your attention on your neighbor.

Not only in its perceptual form, attention makes a difference to our overall phenomenology. Consider a slight pain in your foot. You have one kind of phenomenology when you focus your attention on that pain, and a different phenomenology when your attention is focused on the saxophone. Or consider a conscious craving for chocolate. You have one kind of conscious experience when your attention is focused on that desire, and a

² By the “phenomenology” of experience I shall mean what it is like to have such an experience. Alternatively, I sometimes speak of phenomenal character (Shoemaker (1994)) or of phenomenal properties (Chalmers (2004)).

different conscious experience when instead you focus your attention on a practical or theoretical problem, to which you are trying to find a solution.

In these examples, you consciously attend to the piano or saxophone, to your pain, to your craving for chocolate, or to your practical or theoretical problem. There is a certain phenomenon, “attending to something”, that makes a characteristic contribution to our overall phenomenology. My goal in this paper is to provide an account of the nature of this phenomenon.

Some people might be skeptical that this goal cannot be achieved, because they believe that there is no single, unified phenomenon of conscious attention, but only a vague resemblance between fundamentally disunified phenomena.³ I will argue that this is wrong by giving a unified characterization of conscious attention that can subsume under it the large variety of manifestations of attention. Conscious *perceptual* attention can, for example, be viewed as a determinate of the determinable process I am characterizing. The issue of whether there is something that is common to all cases of attending should be addressed by evaluating my account.

Conscious attention is a personal-level phenomenon in the same sense as desires, beliefs, intentions, and actions: *subjects* focus their attention on something, or attend to something; they shift their attention from one thing to another, or their attention gets drawn to something.⁴ Most of the scientific investigation of attention in the last 50 years has concentrated on the sub-personal mechanisms and neural networks (in short: attentional

³ See, for example, Duncan (2006).

⁴ Attention is also essentially involved in other activities such as listening to something, watching something, examining something, studying something, and several others (see White (1963, 1964) for some discussion). A detailed analysis of the relevant involvements is fascinating, but lies beyond the scope of this paper.

processes) that underpin and implement personal level attention.⁵ My discussion will engage with these scientific results, though it is pitched directly at the personal level. In order to completely understand attention, we need to complement the investigation of how attentional processes operate with a discussion of how the details might hang together at the personal level.

I will use the following regimentation on the notion of “attending to something.” When I employ this notion I shall mean the (temporally extended) process of holding your attention focused on something. In the examples I gave you were holding your attention focused on the piano, your newspaper, or the pain in your foot. Holding one’s attention focused on something needs to be distinguished from *shifting* one’s attention from what has previously engaged it to something else as well as from the event of coming to focus on something. The latter two notions can then be defined in terms of the one I concentrate on as follows: an event of coming to focus on something is the beginning of focusing your attention on something and an attention shift is a change (of whatever kind) in the object of attention, i.e. in what one focuses one’s attention on.⁶

The paradigm case of attention is conscious attention. This is illustrated by my examples and William James’ famous passage where he says that “[f]ocalization, concentration, of consciousness are of [the] essence [of attention].”⁷ There is a lively

⁵ For recent overviews see, for example, Itti et al. (2005). See also Mole (2006) who develops an account of attention as a way cognitive and neuronal processes operate in a certain type of unison. Mole’s and my account, though developed on different levels, share many common sympathies.

⁶ We should also distinguish attentional focusing from bodily or mental activities that *occupy* your (conscious) attention. A bodily action, like playing piano or basketball, or a mental action, like calculating in the head or visually imagining your last vacation, may occupy your attention without necessarily being the object on which your attention is focused. STRUCTURALISM will have a natural extension that covers these cases as well. For the distinction see Peacocke (2000). For the extension see footnote 44.

⁷ James (1890/1981, p. 403-404). The view of attention as a way of being conscious can also be found among many early heroes of empirical psychology such as Christian Wolff, William Hamilton, Wilhelm Wundt,

ongoing debate about whether consciousness is really part of the essence of attention as William James thought.⁸ For present purposes I do not want to take sides in this debate.

My goal is to give an account of attention when it is conscious.

3 Motivating Structuralism

This section will provide an extended argument for STRUCTURALISM by outlining reasons to accept the following five theses about conscious attention.

(PURITY) Consciously attending to something does not necessarily involve (a characteristic) bodily movement or posture, or an awareness of such a bodily movement or posture.

(OVERFLOW) Consciously attending to something does not just consist in being conscious of that thing.

(ANTI-ATTRIBUTION) Consciously attending to something does not just consist in being conscious of a certain way the world appears to be (it has a partially non-attributive phenomenology).

(FREEDOM) Consciously attending to something does not consist in consciously selecting that thing for any particular purpose.

Gustav Fechner, Herman Ebbinghaus, and Edward Titchener. For reviews of this tradition (and its precursors) see Bentely (1904) and Hatfield (1998).

⁸ See Jiang et al. (2006), Kentridge et al. (1999) and Koch and Tsuchiya (2007) for some evidence suggesting that there might be unconscious attention in both patients with blindsight as well as in the normal population. See Prinz (2005 and this volume) for the view that attention is both necessary and sufficient for consciousness, and Mole (2008) for the view that attention is sufficient, but not necessary for consciousness. For more discussion of these issues consider also Lamme (2003) and Block (2007), and Smithies (this volume).



Figure 1: Simplified Scenario. Two simple grey disks are presented equidistant to a fixation cross in the middle. They are here called *L* and *R* respectively. Underlying texture was added for reasons to become apparent later.

(STRUCTURE) Consciously attending to something in part consists in consciously experiencing what is unattended in characteristic peripheral ways.

STRUCTURALISM is based on these five claims as follows. First, it states that consciously attending to something consists in a certain *mental* phenomenon, and not necessarily in a specific bodily movement or awareness of such a bodily movement (from PURITY). Second, STRUCTURALISM claims that consciously attending to something consists in a *specific* conscious phenomenon, and not just in being conscious of that thing (from OVERFLOW). Third, it states that consciously attending to something consists in a conscious *process*. I use this terminology as a very general way of encoding ANTI-ATTRIBUTION (see section 2.3 below). Forth, STRUCTURALISM is opposed to the popular view that attention is simply selecting for, say, reasoning, action or other high-level cognitive functions (from FREEDOM). Fifth, it claims that attending to something consists in *structuring* the stream of consciousness into center and periphery (from STRUCTURE).

Providing detailed arguments for each of these theses would go beyond the scope of a single paper. My goal in the next sections will thus only be to outline the reasons for accepting them.

3.1 Purity

Let me start with PURITY. It says (to remind ourselves):

(PURITY) Consciously attending to something does not necessarily involve (a characteristic) bodily movement or posture, or an awareness of such a bodily movement or posture.

PURITY probably is the least controversial of the five claims. Nevertheless, opposed to it one might suggest that there are only two senses of ‘attention’: first, as referring to a subpersonal mechanism and, second, as referring to a kind of bodily posture.⁹ The idea would be that the only relevant *personal level* phenomenon is one involving bodily movement.

In order to see that attention need not be an embodied phenomenon, it is helpful to consider a simplified version of the scenarios mentioned above (which will also be useful in different context later in the paper). It is illustrated in Figure 1. While your eyes remain fixed on the cross in the middle, shift your attention to the disk on the left (call it *L*) and focus on it. Call this *The Left Scenario*. Then shift your attention to the disk on the right (call it *R*) and focus on it instead. Call this *The Right Scenario*.¹⁰

⁹ Tony Marcel and John Campbell sometimes talk about “a postural sense” of attention (personal communication). This idea goes back to Dashiell (1928) who provides an account of attention “as a form of posturing.” (Ch. 10). William James (1890/1981) claims that “any concrete attentive act” probably involves “the accommodation or adjustment of the sensory organs.” (p. 434). Noë (2004) and other sensorimotor accounts also suggest a view opposed to PURITY.

¹⁰ This scenario mimics the type of stimuli first used in the study of covert attention by Hermann von Helmholtz in the 19th century and made popular and influential in psychology by Richard Posner (see his Posner (1980). While at Helmholtz’ time there remained some doubt (voiced among others by William James) whether we can really shift our visual attention outside the foveal region of our eyes, these doubts since then have been put to rest and (as a recent overview says) “[t]here is now little debate about Helmholtz’s conclusion that the attentional focal point can be shifted independently of ocular fixation” (Wright and Ward (2008)). In the relevant empirical research eye-tracking systems are usually used to ensure that subjects do not move their eyeballs. The exact causal relation between saccades and shifts of visual

The phenomenal character of your visual experience is clearly different in the two scenarios. If not already evident, the phenomenal difference between The Left Scenario and The Right Scenario can also be seen by the fact that it leads to an epistemic difference: you *know* whether you are in The Left Scenario or The Right Scenario on the basis of your experience alone.¹¹

In many circumstances shifts of visual attention are associated with eye movements (saccades) as well as head and body movements. My simplified scenario shows that this is not essential. It provides a clear visual analogue of the auditory jazz concert example: a personal level conscious phenomenon that doesn't involve any (awareness of) bodily movement. While there might be forms of attention such as tactile attention to, say, the texture or temperature of a surface that involve the body, and even though conscious attention is associated with and probably causally connected with bodily movement, these connections are not necessary for conscious attention. We should therefore accept PURITY.

3.2 Overflow

Let me move to OVERFLOW. It says:

(OVERFLOW) Consciously attending to something does not just consist in being conscious of that thing.

Philosophers and psychologists sometimes express the view that attention is what brings a stimulus to consciousness.¹² One way to understand this idea (and this is the one relevant

attention is a hotly debated topic of current research (see Wright and Ward (2008)). Nothing I say here depends on the outcome of that debate. See also Armstrong (this volume).

¹¹ Thanks to Declan Smithies for suggesting this epistemic point.

¹² E.g. Mack and Rock (1998) and Prinz (2005, this volume).

in my argument for STRUCTURALISM) would be as the denial of OVERFLOW. Starting from the idea that attentional processes are those processes that underpin (or enable) consciousness, the view would be that there is no *special* personal level process or phenomenology of attending. The difference between The Left Scenario and The Right Scenario, for example, should just be viewed as the difference between being conscious of *L* and being conscious of *R*.

One motivation for this denial of OVERFLOW rests on the psychological experiments concerning in-attentional blindness.¹³ These experiments minimally show that subjects typically are unable to notice and consequently report much about locations or objects, to which they are not currently paying attention. The theorists mentioned above have taken these experiments to show not only that focus of attention is necessary for noticing or (perceptually) accessing certain objects or events but also that this focus of attention is necessary for any kind of conscious experience.¹⁴

I believe that there are good reasons to reject this interpretation and accept OVERFLOW. Let us, first, take a clear look at the intuitive evidence. Consider the simplified example where *L* and *R* are relatively close to each other. While there clearly is a phenomenal difference between attending to *L* and attending to *R*, in the case where your attention is focused on *R* it still seems to you that there is something roundish and grayish

¹³ Another motivation (see Prinz (this volume)) comes from considerations pertaining to the (at least apparent) absence of conscious experience in hemi-neglect (which most consider to be an attention deficit). For the in-attentional blindness experiments see Mack and Rock (1998) and Simons and Chabris (1999). In the experiments by Mack and Rock subjects focus their attention on a simple object or task on a computer screen. The experiments show that the subjects are typically unable to notice anything else that is happening on the screen or elsewhere. Simons and Chabris show that when performing an attention-demanding task subjects typically do not notice even a large object like a man in a gorilla suit that appears in the middle of the scene they are observing.

¹⁴ For opposing interpretations of these experiments according to which attention is not necessary for conscious experience see Lamme (2003), Dretske (2004), Block (2007), and Koch (2007).

at the location of *L*. Similarly, it seems clear that you remain conscious of, say, auditory background noise, while this noise is not the focus of your attention (after all, there is a clear phenomenal difference between focusing your attention on *L* in a quiet room and at a Jazz concert). True, it is likely that we would be very bad at noticing (changes in) the unattended disk's shape or color, or the pitch of the noise. Yet, this does not make it plausible that we have no conscious experiences outside the direct focus of our attention.

Of course, some will reject this intuitive argument as falling prey to the refrigerator light illusion: we only seem to be conscious of more than what we attend to, because we *become* conscious of it as soon as we focus our attention on it.¹⁵ Yet, empirical studies vindicate the common sense opinion that *focal* attention is not necessary for all conscious experience. It has been shown that typically subjects are able to notice and reliably report the *gist* of the unattended part of a scene. Furthermore, subjects reliably and confidently discriminate natural stimuli (such as animals or faces) outside the focus of attention.¹⁶ These results strongly indicate that subjects are conscious at least of something (though maybe not much) without focusing their attention on it, which is all that is needed for OVERFLOW.

Finally, there is a third and independent argument for OVERFLOW: attention comes in degrees, while consciousness does not (or at least not in the same way). If consciously attending to something just were being conscious of that thing, the phenomenal difference between The Left Scenario and The Right Scenario would need to be explained in terms of a higher degree of *consciousness* to *L* in The Left Scenario. Yet, even if one were willing

¹⁵ Noë (2004).

¹⁶ See Mack and Rock (1998, p. 167 ff), and Koch and Tsuchiya (2006) for a review of these results.

to accept borderline cases of consciousness,¹⁷ the view that there can be degrees of phenomenology or “what-it-is-like-ness” seems impossible to understand.¹⁷ A fuzzy or hazy state of consciousness is not a state with a low degree of consciousness, but a state of consciousness that has a particular phenomenal character.

Someone might complain that I have misrepresented the view that attention is what brings a stimulus to consciousness: it should be taken as the idea that *some degree* of attention is necessary for consciousness. This view is compatible with OVERFLOW as well as with STRUCTURALISM.¹⁸ The idea that some degree of attention is necessary for consciousness by itself, though, does nothing to explain the phenomenal difference between, say, The Left Scenario and The Right Scenario. We still need an explication of what that phenomenal difference comes to.

3.3 Anti-attribution

Given OVERFLOW it is natural to think that consciously attending to something consists in having a certain *type* of conscious experience. One might then suggest that a type of experience must be an experience, *in which the world appears to you a certain way*. For example, isn't the phenomenal difference between The Left Scenario and The Right Scenario a difference in the way things look to you? ANTI-ATTRIBUTION denies this suggestion. Let us remind ourselves of what it says:

¹⁷ E.g. by arguing that the physical basis of consciousness must allow for them. Though see Antony (2008).

¹⁸ STRUCTURALISM, indeed, might provide the resources for a new conception of the connection between attention and consciousness, on which it is necessary that (at least every unified) conscious experience has some place in a structure provided by attention, thus in a sense receiving some degree of attention. See Section 4.2.

(ANTI-ATTRIBUTION) Consciously attending to something does not just consist in being conscious of a certain way the world appears to be (it has a partially non-attributive phenomenology)

The phrase “a certain way the world appears to be” is deliberately left vague. Before considering specific precisifications, it is helpful to note that the denial of ANTI-ATTRIBUTION (which I will call “the attribution view”) is recommended by a broad family of general views about consciousness.¹⁹ What drives these views is the idea that there is a phenomenal difference only if there is a difference in how things appear to the subject.²⁰ Based on this idea these views normally hold that in general there is no difference in phenomenal character without a difference in how the world appears to be; in other words, phenomenal character supervenes on the properties our experience attributes to the world. Applied to conscious attention, the idea would thus be that you have the phenomenology of attending to something just in case there is a particular range of properties that your experience attributes to an aspect or part of the world around you.

A first precisification of the attribution view holds that the phenomenology of attending to something consists in being conscious of relatively *determinate* properties of

¹⁹ In particular pure representationalism and direct realism. “Ways the world appears to be” thus might be propositions, property structures, or facts about the world that we represent in a certain way. Representationalism would thus, I take it, normally be taken to imply the attribution view (see Byrne (2001) and Tye (2002) for examples of these standard forms of representationalism). Or they might be material objects and their qualities to which our experience directly relates us. Direct Realism similarly would, I take it, normally be taken to imply the attribution view (the standard forms of direct realism can, for example, be found in Snowdon (1990), Martin (2002), Campbell (2002) and Brewer (2004)). As I will point out below, there are – I believe – versions of pure representationalism and direct realism that can accept ANTI-ATTRIBUTION. See footnotes 28 and 29.

²⁰ See Harman (1990). For a rejection of this view that accepts that there are intrinsic phenomenal properties or (in Harman’s terms) “mental paint” see Block (2003).



Figure 2: Simulation of The Blurry Scenario. When looking through a cloudy pane of glass you will have an experience roughly like the one illustrated here.

that thing.²¹ This view seems to make talk about attention as focusing so appealing: to attend to something is like focusing a camera lens on it. The phenomenology of attention, one might think, consists in sharpening the accuracy and contrast of what we are conscious of. For example, when you focus your attention on the piano your experience characterizes its sound more determinately (or crisply) than the sound of the saxophone.

The effect of attention on the experience of contrast and determinacy has been studied experimentally.²² When subjects focus their visual attention on a particular textured patch, perceptual contrast seems to increase; subjects are able to detect finer gratings and more detail in texture than without attention, and they judge that an attended patch has the same perceptual contrast as an unattended one when the attended one in fact is lower in contrast.

Yet, the determinacy view should be rejected. Preliminarily, it is worth noting that there are some cases where the view is very unappealing: e.g. attending to features like color or shape or attending to, say, the left side of a uniformly colored screen. The best

²¹ See Nanay (forthcoming) for a defense of this view. Chalmers (2004) and Tye (2008, p. 172) also suggest views like this (though they do not fully endorse them).

²² Carrasco et al. (2004). For an overview see Carrasco (2009). These results are not uncontroversial. For one challenge, among others, see Schneider (2006). There is also a serious question about whether the determinacy view can actually explain the kind of effect on contrast found in Carrasco's experiments. (Ned Block argues in an unpublished paper that it cannot.)

reason to reject it, though, is this. Consider the phenomenal difference between the following two scenarios: (1) The Left Scenario (2) The Blurry Scenario (simulated in Figure 2): you are focusing your attention at the fixation cross of the drawing in the simplified scenario through a pane of glass with the following unusual characteristic: while it gives you a clear and transparent view of *L*, you get a slightly blurry view of the other parts of the drawing. Disk *R*, for example, is now presented to you much less than fully clearly.

If the simulation in Figure 2 does not already do that, The Blurry Scenario can be constructed so as to match The Left Scenario exactly in terms of the specificity, contrast or sharpness that characterizes the various parts of what is in front of you. Yet, there is a clear phenomenal difference between the two scenarios. The phenomenology of attention is different from any complex analogue of blurry vision. Therefore, the standard representationalist treatments of blurry vision do not help in the present context.²³ What it is like to look through a pane of glass that gives you a more determinate view of (a part of) the left side is not at all what it is like to focus your attention on something to your left. While attention might thus sometimes affect determinacy (and other aspects of the way the world appears to be), the determinacy view leaves out an essential aspect of the phenomenology of attention.

One might think that what the determinacy view leaves out is a kind of (apparent) prominence of the attended thing that is missed by considering contrast or determinacy. This idea leads to another plausible way of implementing the attribution view: the phenomenology of focusing your attention on something consists in being conscious of the

²³ For such treatments see Tye (2002).

(relative) prominence of that thing. In light of the problems with the previous proposal, the most plausible version of this idea is probably an account that does not reduce prominence to determinacy or anything else, but claims that there is a constitutive interdependence between the phenomenology of attention and the phenomenal appearance of something as prominent.²⁴

Yet, the prominence view faces a dilemma. The account is either trivial or false. The account is trivial if we understand the property of being prominent as follows: something has the property of being prominent at time t just in case you have at t the kind of phenomenology you have when focusing your attention on that object.²⁵ This would make the prominence view trivial because *any* theory about the phenomenology of attention could be construed as a version of the prominence view given this understanding of the property of being prominent.

But the prominence view is false if we take the notion of *attributing* a property to an object more seriously. Prominence is not a perceptible property (unlike, say, color or even the way a color looks). The prominence that is characteristic of an attended object is *not* experienced as a property of that object, which it has independently of our attending (there is, for example, no temptation to look for the physical underpinnings of prominence at the surfaces of objects).

Though I cannot claim to have provided a conclusive argument, I now hope to have motivated that the lesson we should learn from the failing of the determinacy view is not to

²⁴ See, for example, Campbell (1993), Shoemaker (1994), and Chalmers (2004) for versions of this view about color or color-like appearance properties. Chalmers (2004) suggests this view for conscious attention.

²⁵ Given the obvious response-, and subject-dependence of prominence it is not clear that there *could be* a property like the one defined here. For present purposes, I will assume that the relevant metaphysical quandaries can be avoided.

find a non-reductive precisification of “a way the world appears to be”, but to reject the attribution view: conscious attention has what might be called a *non-attributive* phenomenology.²⁶ It is not (or at least not only) how *the world* appears to you that distinguishes The Left Scenario and The Right Scenario. Rather, as Gustav Fechner, one of the pioneers of experimental psychology, expresses it: someone who focuses his attention on something somehow “feels the increase [in prominence] as that of his own conscious activity turned upon the thing.”²⁷ In order to denote the non-attributive phenomenal character attention, I will generally speak of the *conscious process* of attending to something.

How could one explicate the non-attributive aspect of the phenomenology of attention? I believe that there are two plausible candidates. On the one hand, one can say that the conscious process of attending to something is a particular *mode* of being conscious of something *with its own sui generis phenomenology*. Just like being visually conscious of, say, a certain shape and being tactilely conscious of that shape might be different modes of being conscious of that shape, being attentively conscious of something would be again another mode of being conscious.²⁸

On the other hand, one might hold the view that the conscious process of attending to something consists in attending to something while being *aware* of yourself attending to

²⁶ Nickel (2007) and Speaks (forthcoming) present arguments against (pure) representationalism based on examples somewhat similar to my simplified scenario. My argument is more general than theirs. Furthermore, as I argue in Watzl (in preparation) there is a plausible response on behalf of the representationalist in terms of what appears to be in front of what to Nickel’s and Speaks’ examples that does not carry over to the present case.

²⁷ Approvingly quoted in James (1890/1981). See also Fechner (1889, p. 452-453). Ned Block also uses Fechner’s quote in an unpublished paper.

²⁸ See Chalmers (2004). This first interpretation of ANTI-ATTRIBUTION must reject pure representationalism or direct realism (see footnote 19 above).

that thing. According to this second idea *consciously* attending to something is in part different from *simply* attending to something because in the case where attention is conscious we are aware of our own attending.²⁹

For present purposes, we don't need to adjudicate between these different implementations of ANTI-ATTRIBUTION. Whether we think of the process of attending to something as a mode of being conscious, or as a process, of which we are conscious, we now have to ask the following question: what does the conscious process of attending to something consist in?

3.4 Freedom

There is a very natural idea about what the process of attending is. This is the idea that consciously attending to something consists in consciously selecting that thing. In some way this idea is certainly correct. By itself, though, it doesn't tell us very much. The question is how to understand "selecting." Attention cannot just be any process of selection: there are too many such processes that clearly have nothing to do with attention (I am selecting my right hand to hold the pen; yet I do focus my attention on this hand). One very appealing idea is that consciously attending to something consists in consciously selecting that thing for high-level (cognitive) processes such as reasoning or bodily action.³⁰ FREEDOM consists in the generalized denial of this natural suggestion. Let us repeat what it says.

²⁹ This second interpretation of ANTI-ATTRIBUTION could be accepted by pure representationalism or direct realism by expanding what we are aware of or related to. I argue for a version of this proposal in my Watzl (in preparation). According to the proposal defended there we have action-awareness of our own mental activity of attending.

³⁰ See Neumann (1987) and Allport (1987) for psychological accounts of attention as selection for action and Wu (forthcoming b) for a philosophical account. It is somewhat unclear in what sense to-reason-about or to-

(FREEDOM) Consciously attending to something does not consist in consciously selecting that thing for any particular purpose.

There is good theoretical reason to think that in some way or other there *must* be processes that select something as the target of our bodily and mental actions. Two courses of action might be equally desirable, given your current perceptual experience, memories, and beliefs. There must be some way of picking one out of these many possible actions and attention often is closely involved in this selection.³¹ This makes thinking of attention as selection for action highly appealing.

The account of attention as conscious selection for action and reasoning should be rejected. The main reason is that conscious selection of something as target for reasoning and bodily action is *not sufficient* for conscious attention. Consider the following. While engaged in a conversation over dinner and while your (perceptual) attention is focused on your conversational partner you might reach for your glass to drink. You might be aware of your reaching as well as being peripherally conscious of the glass. Furthermore, you are selecting the glass as the target of a bodily action. This is, therefore, a case of consciously selecting the glass as the target for bodily action. Yet, you can do this without focusing your conscious attention on the glass. There may be attentional processes involved in your reaching for the glass, but you need not be consciously attending to the glass. Similarly,

act-on could be the *purpose* of the relevant selection. We normally speak of the *subject as having* the purpose to reason about or act on the attended object. Yet, consider focusing your attention on the sound of the saxophone. In such a situation there might not be a plausible sense, in which *you* have the purpose to act on that sound, or to reason about it. You are just enjoying the music. For the sake of the argument, I will grant, though, that we can make sense of the relevant notion of “purpose.”

³¹ Wu calls the problem of coordinating many inputs with many outputs (or actions) “The Many-Many Problem” (Wu (forthcoming a)). Wu believes that attention is essential to solving The Many-Many problem and that attention just is selection (which may be done for different purposes) (Wu (forthcoming b, this volume)).

consider coming home and switching on the light in a familiar room. Again you might be peripherally conscious of switching on the light (as well as being peripherally conscious of the switch). Furthermore, you are selecting the light switch as the target of your bodily action. But again, in a case like this your act of switching on the light might be so automatic that your attention need not be focused on the light switch. Similarly, you might find yourself reasoning about what you are not attending to. While certain forms of reasoning might constitutively imply attention, others do not. While your perceptual attention is focused on your conversational partner, a conscious thought about the glass in your hand might occur to you. You are consciously selecting the glass as target of your reasoning but you are not attending to it. These counterexamples show that consciously selecting something as the target of reasoning and bodily action is not sufficient for conscious attention.³²

A second problem with the view that attention is selection for reasoning and action is that it reverses the intuitive direction of explanation: often you are only able to consciously select an object to reason about it or act on it, *because* you have focused your attention on it.

A final and related problem is that selecting and attending have a different temporal character: attending is something that can go on for a certain period of time, while consciously selecting something as the target of reasoning or action occurs at a certain moment in time.³³ Your attending to the sound of the saxophone is the ongoing mental

³² For a similar criticism see Mole (2005, p. 44-46).

³³ See also White (1960, 1963). A discussion of the temporal character of attention lies beyond the scope of this paper. I discuss it in Watzl (in preparation).

process that in many circumstances enables you to consciously select something to reason about or act on it (though, as the examples given above show it is not necessary for it).

Attending thus is not selection for reasoning and bodily action. I believe that the kind of reasoning that undermined this idea generalizes: there is no particular purpose, such that if you consciously attend to something, you select that thing for that purpose. While I have not argued for this claim with absolute generality, I nevertheless hope to have given some reason to accept FREEDOM.

3.5 Structure

The view rejected by FREEDOM is only a specific implementation of a more general idea that I haven't given any reason to reject. This general idea can be called "atomism." According to atomism all that is constitutive of consciously attending to something is captured by the way you are conscious of *that* thing or in general by how you are relating to that thing. Atomism need not be a reductive view of attention. But for an intuitive motivation for atomism think of attention as mental pointing: when you (mentally) point to something you deal with this thing in a special way; you are not thereby also dealing with what you do not (mentally) point to. The famous spotlight metaphor also describes atomism very well: what it is to attend to something is completely captured by describing the way that spotlight shines and how it affects a certain part of our experience. Atomism is denied by STRUCTURE. Here it is again.

(STRUCTURE) Consciously attending to something in part consists in consciously experiencing what is unattended in characteristic peripheral ways.

According to STRUCTURE the problem with atomism is that an essential part of what it is to attend to something is that your experience of that thing is at the center of consciousness.

Part of the phenomenology of attending to something consists in having an experience that is structured into foreground and background. Any adequate characterization of conscious attention therefore will involve the background or periphery. I don't believe that there is a demonstrative argument for STRUCTURE; yet I do think that we have strong non-demonstrative and converging evidence for it. This is what I will point to in this section.

Let me start by elaborating the intuitive evidence already mentioned. When one attends to something, other aspects of one's experience recede into the periphery. This affects their phenomenology just like it affects the experience of what your attention is focused on: instead of asking about the phenomenology of attention, we might ask about the phenomenology of the periphery. Focus and periphery seem to be two sides of the same coin. Consider the case where you hear the sound of the jazz band. Your conscious attending to the saxophone does not just consist in a way of experiencing the saxophone, but also in a way of experiencing the piano and your pain. They are now in the phenomenal periphery.

Furthermore, the background does not appear to be completely unstructured. In many cases, when you are attending to the saxophone, the sound of the piano is experienced as relevant for or close to the experience of the melody played by the saxophone. By contrast, your pain might be experienced as further out in the periphery or at the fringe of consciousness: you are now only marginally aware of your pain.³⁴ This phenomenal contrast cannot be explained by atomism.

³⁴ For the notion of the fringe of consciousness see James (1890/1981). For the notion of the margin of consciousness see Gurwitsch (1964).

In general, it is highly intuitive that our experience is organized differently depending on what we focus our attention on. Sartre describes his experience when his attention is focused on his friend Pierre:

“When I enter this café to search for Pierre, there is formed a synthetic organization of all the objects in the café, on the ground of which Pierre is given as about to appear. [...] Thus the original nihilation of all the figures which appear and are swallowed up in the total neutrality of a ground is the necessary condition for the appearance of the principle figure, which is here the person of Pierre. [...] If I should finally discover Pierre, my intuition would be filled by a solid element, I should be suddenly arrested by his face and the whole café would organize itself around him as a discrete presence.” (Sartre (1943/1969, p. 9-10))

According to Sartre, differences between figure and ground primarily are differences in the organization or structure of your conscious experience. The special relation you bear to the object of your attention is that while you are attending to it you structure your consciousness around that object. Sartre’s example, I hope, helps to make the intuitive case for STRUCTURE. But is there any scientific basis for Sartre’s and my phenomenological observations?

Let me thus now turn to some relevant psychophysical results. In a series of experiments Elliot Freeman and his colleagues show that attention to something has effects on our experience of what is unattended.³⁵ The experiments use simple stimuli similar to the ones in my simplified scenario. The stimuli have five Gabor patches (oriented black-and-white patterns) in them: four of them are at the corners of the display and one is in its center. While the patches in the corners have fairly high contrast and thus can easily be detected the central patch is very low in contrast. The central Gabor patch is collinear to the flankers (i.e. the Gabor patches in the corners) in one diagonal, while it is orthogonal to

³⁵ Freeman et al. (2001). See also Freeman’s article (Chapter 79, p. 477-484) in Itti et al. (2005).

the flankers in the other diagonal. Subjects focus their attention on one of the Gabor patches in the corner. Subjects are then asked to detect the central patch.

It turns out that subjects can detect the central Gabor patch at much lower contrasts when they attend to a flanker that is collinear to it. What is unattended is perceived in its relation to what is attended. I believe that Freeman's results show in a highly simplified scenario an effect of the same general kind that Sartre was talking about in a more ordinary case: a structuring of experience around the object of attention. While it might be plausible to hold that the effects of attention on, say, the conscious experience of collinear stimuli is not constitutive of attention, these results *presuppose* something that is constitutive of it: the experience of what is unattended is peripheral to (and thus related to) the experience of what is attended. Freeman's results thus show that it is likely that there *is* a scientific basis for Sartre's and my intuitive observations.

Let me finally turn to some neuro-imaging data. Recent fMRI studies of the neuronal underpinnings of perceptual attention by Datta and DeYoe³⁶ show that visually attending to a particular spatial region has complex enhancing and inhibiting effects on the neuronal activity of large portions of the visual cortex, even on those portions that process information about regions outside the focus of attention. These findings suggest, as Datta and DeYoe say, that "attention is actively modulating visual processing throughout the field of view, not just in the local vicinity of the target." (p. 1044). There exists even in our primary visual cortex a complex "attentional landscape." Interestingly (and, again, related to Sartre's observations) this landscape seems to be subject specific, so that Datta and DeYoe speak of the neuronal correlate of the attentional *style* of each individual.

³⁶ Datta and DeYoe (2009). Thanks to Ned Block for making me first aware of these data.

While these results, of course, do not directly established anything about the conscious experience of the subject, they show us how the complex structure of experience into foreground and background might be realized in the brain and thus point to the psychological reality of this structure.

At this point one might suggest that the atomistic view can be rescued by introducing *degrees* of attention. The idea would be that all that is going on is that you, say, pay *more* attention to the piano, whereas you pay *less* attention to your pain. Similarly, the conscious correlate of the described attentional landscape might be said consist in the subject's paying more or less attention to the various regions. The basic metaphysical category of attention would still be a relation between a subject and an object of attention (which makes the view fundamentally atomistic in the sense described above). But now this relation would be allowed to be gradable. We can call this view "graded atomism."

Yet, graded atomism cannot be used to argue against STRUCTURE. The first and main problem is that it leaves mysterious what exactly the special gradable relation is supposed to be. The idea that attending to something is a form of selecting it, for example, does not sit well with graded atomism. It is unclear what it would mean to select, say, the sound of the saxophone to some high degree, while selecting the sound of the piano only to some lower degree. Second, graded atomism would *only* be a version of the atomistic view, if degrees of attention were independent of each other. But there is no such independence: to fully focus on something is to be only peripherally aware of other things. Relatedly, to have a peripheral experience of the piano is to have an experience that is peripheral *to something else*, and thus is an experience that cannot be had in the absence of focusing attention on something else. In order to account for the connections between different

degrees of attention we should explain the degree of attention paid to something in terms of how that experience is related to others: you pay more attention to something the closer the experience of it is to the (or a) center of attention.

4 Making Structuralism Precise

The forgoing, then, completes my motivating argument for STRUCTURALISM. We have good reason to accept five theses that rule out various initially plausible alternatives and together entail the view. For the rest of the paper it now remains to make STRUCTURALISM precise and develop its details. Before moving on let me restate what it says.

(STRUCTURALISM) Consciously attending to something consists in the conscious mental process of structuring one's stream of consciousness so that some parts of it are more central than others.

4.1 Basic Ideas

To structure something consists in the process of causing it to be structured. Suppose that you are engaged in the task of (re-)structuring an academic department or a company. What you do is bring about and sustain a certain *organizational* structure of that department or company. Similarly, when you are structuring your life around a certain project you are creating and sustaining a certain *life-structure*. The process of (attentionally) structuring your stream of consciousness, then, consists in creating and sustaining a certain *attentional* structure of your stream of consciousness.

The attentional structure of your stream of consciousness should be understood in terms of what I shall call *attentional relations* between the parts of the stream. The simplest example is the relation of one part being *peripheral* to another. I thus assume that

we can make sense of the idea that your stream of consciousness has parts that are related to each other in various ways. I do not think that this should be too controversial: your stream of consciousness, as I understand it, is the event of your having a certain complex temporally extended conscious experience. Understood as such a complex event the stream of consciousness has parts.³⁷ For example, there are temporal parts: certain events that form a part of the stream occur before others: your auditory experience of the music might have preceded your conscious thoughts about Coltrane, and your conscious desire for some chocolate. Similarly, each temporal slice of your stream of consciousness, your total conscious experience at a certain time, can also be divided into parts. These parts of that total experience are experiential events such as your auditory experience of the sound of the saxophone, your auditory experience of the sound of the piano, your visual experience of the scene in front of you, as well as your experience of pain in your foot.³⁸ Attentional relations hold between these parts of your state of consciousness. Your experience of the piano, for example, is peripheral to your experience of the saxophone.

Each part of your total conscious experience has a certain phenomenology; there is, for example, the phenomenology of your auditory experience of the piano (which consists in the *monadic* phenomenal properties of that part).³⁹ Since – as I argued – the attentional relations between its parts make a difference to the phenomenology of a complex state of

³⁷ For one example of a formal account of the structur(es) of events see: Pianesi and Varzi (1996).

³⁸ I will assume the notion of a part of our experience is natural enough for our purposes, though there is a debate about how certain views about consciousness can make sense of this idea (see Tye (2003)). It should also be noted that while there often are more and less natural ways to divide a total conscious experience into parts, speaking of such parts does not presuppose any preferred partitioning. Indeed the most natural division presupposes attentional structure: a single part of your experience is any aspect of it that can become the center of attention.

³⁹ These monadic phenomenal properties might consist in being consciously related to something: e.g. an event like saxophone's making a certain sound and the way it appears to be. So, what I here call *monadic* phenomenal properties might be relational properties in a different sense.

consciousness, STRUCTURALISM thus implies that there are relations between the parts of a complex state of consciousness that make a difference to the phenomenology of that state. Attentional relations thus are phenomenal *relations*, e.g. *dyadic* phenomenal properties such as ‘x is peripheral to y’.

In order to get a better grip on attentional structure, it might be helpful to contrast this structure with what might be loosely called the *spatial* structure of a certain state of consciousness. When we loosely speak of the spatial structure of, say, your visual experience, we just mean the spatial structure that your experience characterizes your environment as having: your experience attributes to disk *L* the property of being left, to the floor the property of being down, etc. The “spatial structure of experience” just is the spatial structure of the way the world appears to be. Attentional relations, by contrast, are not relations your experience attributes to the world, but are relations between parts of your experience themselves.

4.2 Attentional Space

The structuring account of attention provides us with a schema for how to think about attention: it is the ongoing process of creating and sustaining attentional phenomenal relations between the parts of your stream of consciousness. The schema can be implemented by giving characterizations of the relevant phenomenal relations and the structure that they impose. Questions about attention to a large part will thus be questions about (as I will say) the structure of *attentional space*. The structure of attentional space can be treated with some of the same formal precision, with which we can, say, treat the

structure of space-time or the structure of abstract mathematical spaces.⁴⁰ I will here only outline the most central structure.

The relevant structure has as its primitive the phenomenal *peripherality* relation ‘x is peripheral to y’ (importantly distinct from any *spatial* form of peripherality). Consider the case where you are focusing your attention only on the sound of the piano. In the corresponding attentional structure, all other parts of your experience are peripheral to your experience of that sound. It will be helpful to also have a name for the converse of this relation. I will say that x is central to y just in case y is peripheral to x.

Let us apply this to our simple examples. When you are focusing your attention on the piano, your experience of the saxophone is peripheral to your experience of the piano. Consciously attending to the piano consists in creating and sustaining a total state of consciousness where your experience of the piano is central to the other parts of your experience. We can now also make sense of the idea that in a scenario like this your experience of pain is likely to be *more* peripheral than your experience of the saxophone. Your pain experience is peripheral not only to your experience of the piano, but also to your experience of the saxophone.

In terms of the peripherality relation, we can define what it is to be the focus or object of attention as follows: some object, event or property in the world is the focus or object of your attention just in case you have an experience of it that is at the center of consciousness, where an experience is at the center of your consciousness during a certain period of time just in case during that period of time no part of your experience is central to it (or equivalently: just in case during that period of time it is not peripheral to any part

⁴⁰ There are important formal connections between STRUCTURALISM and the account of consciousness in Tononi (2008) (though Tononi has a different view of attention).

of your experience). Thus, in our example, the sound of the piano is the focus of your attention, because all other parts of your experience are peripheral to your experience of this sound.

The center of consciousness has a natural dual. We can call it the *fringe* of consciousness: those parts of your experience that are such that no part of your experience is peripheral to them (or equivalently: those parts that are such that they are not central to any part of your experience).⁴¹ In our example, your pain might be at the fringe of your consciousness. The way your fringe experiences present an aspect of the world need not be any different to the way a central experience presents it. The reason fringe experiences are phenomenally different from central experiences is not that their monadic phenomenal properties are different. Rather, they stand in a certain phenomenal relation to the other parts of your experience. This is what accounts for their special phenomenal character.

What more can we say about the peripherality relation? On a natural understanding the peripherality relation induces a strict partial order between the parts of your experience: it is irreflexive (nothing is peripheral to itself), anti-symmetric (if experience B is peripheral to experience A, then A is not peripheral to B) and transitive (if B is peripheral to A, and C is peripheral to B, then C is peripheral to A).

One might also suggest that peripherality is connex with respect to the subject's total experience:⁴² for every two parts A and B of that experience, either A is peripheral to B or B is peripheral to A. Yet, I believe that this is too strong: there might, for example, be two experiences at the fringe that are not peripheral to each other (though they are both

⁴¹ Thanks to Wayne Wu and Carl Ginet for helping me to improve my definition here.

⁴² Thanks to Chris Mole for pointing out the interest of this point to me.

peripheral to, say, the center). Yet, there is a slightly weaker notion that might still apply: our total experience is plausibly peripherality connected in the following sense: for each parts of our total experience A and B there is an (un-directed) peripherality path between them.⁴³ As I will point out in the conclusion, whether our total experience is peripherality connected will have important philosophical consequences related to the unity of consciousness. Note also that nothing about the peripherality structure defined so far guaranties that there is a center of attention as defined above: there might (only) be peripherality rings. I take this to be an open possibility. To exclude it one would need our total experience (for now assuming connectedness) to be bounded from above with respect to peripherality. I leave a detailed investigation of the structure of attentional space for future work.

The peripherality relation can be applied to all forms of conscious attention, not just its perceptual form. If you focus your attention on your craving for chocolate, then your experience of that craving is central to all your other experiences. If you focus your attention on a certain train of thought, then your experience of thinking that train of thought is central to your other experiences.⁴⁴

The structure of experience captured in terms of the peripherality relation can be mapped onto neuronal structures that plausibly underlie our experience. The fMRI studies

⁴³ The notion of a peripherality *path* thus (in the familiar and intuitive graph theoretic way) abstracts away from the directedness of the peripherality relation. We can define it via the notion of a peripherality edge, where there is a peripherality edge between x and y just in case either x is peripheral to y or y is peripheral to x. There, then, exists a peripherality path between x and y just in case there is a sequence of peripherality edges between x and y.

⁴⁴ Furthermore, we can define what it is for a bodily or mental activity to occupy your attention as follows: a mental or bodily activity occupies your attention during a certain period of time *just in case* your action-awareness of performing that activity is at the center of your consciousness (see Peacocke (2008) for one way of thinking about the relevant action-awareness).

by Datta and DeYoe⁴⁵ are of particular relevance in this respect. As I mentioned earlier, their data show that attending to one region has effects on the neuronal activity of large portions of the visual cortex, even on those portions that process information about regions outside the focus of attention: the visual cortex contains a complex attentional landscape. This attentional landscape can be mapped onto our structured experience as follows: if you attend to region R , then neuronal activity in those neuronal areas with receptive fields in R is strengthened relative to other regions. Relative strength of activity corresponds to relative centrality, and relative inhibition of activity corresponds to peripherality.

I believe it is unlikely that the peripherality structure as so far described exhausts the richness of the structure of attentional space. STRUCTURALISM provides us with a flexible framework that can be adapted as needed. One might, for example, want to draw a clear boundary between what is directly relevant for the current center of attention and those things that are irrelevant to it, such as in the example where your attention is focused on the saxophone and your experience of the piano forms a relevant background, while the experience of pain forms an irrelevant background (or consider Sartre's example). The idea would be that experiences are not just more or less peripheral to a central one, but that there (often) is a clear boundary between those experiences that phenomenally matter to the central one and those that do not. As long as we can define the topological notion of a boundary between parts of our experience, phenomenal relevance can be accounted for in terms of the topology of attentional space.

Yet more aspects of attentional structure might be employed to distinguish different forms of attention. One might, for example, suggest that attentional space has a

⁴⁵ Datta and DeYoe (2009). See discussion in Section 2.5 above.

fundamentally different structure when one perceptually attends to something as opposed to when one attends to something in perceptual imagination, or when one attends to something in thought. The intuitive notions of the parallel nature of perceptual experience as opposed to the linear nature of thought and imagination could be given definitions in topological or graph theoretic terms.

Finally, the framework provided by STRUCTURALISM can account for the idea that experiential space sometimes expands in characteristic ways around the center of attention. One might suggest that when one focuses one's attention on something, one is in some way aware of relevant alternative ways that thing could have been, while one is not (to the same degree) aware of such alternatives in other cases. For example, when one focuses one's attention on, say, the red color of something, one will be aware of other ways this thing might have been colored.⁴⁶ Such ideas might be developed by considering expansions of experiential space around the center of attention. I leave these developments of STRUCTURALISM for another time.

4.3 The Causes of Attentional Structure

Just by considering the simplest form of attentional structure it is evident that the structure of attentional space changes over time: now this is at its center and now that. It is by considering the causal structure of the process of attending that we can distinguish between voluntary and involuntary attention. What, then, explains how attentional structure changes or is sustained in both cases?

⁴⁶ Thanks to Sidney Felder and Jonathan Simon for important discussions of this point (I hope what I say here accommodates some of their ideas).

The answer is easy for cases of endogenous or voluntary attention. Voluntary attention, in this respect, is like any other type of intentional action. We can carry over our best accounts of the causal structure of other actions to the case of voluntary attention. One of the most plausible of such theories says that it is the persistence of certain intentions or tryings that causes and causally sustains the persistence of a particular attentionally structured stream of consciousness. In a case of voluntary attention you intend or try to attend to, say, the sound of the saxophone.

The answer is not quite as straightforward for the case of exogenous or involuntary attention. Consider the salient sound of a siren that suddenly captures your attention. You do not intend to focus your attention on the siren. There is much neuroscientific and computational work on neuronal structures often called “saliency maps” that suggests that such maps play a crucial role for involuntary attention. In particular, this work shows that these saliency maps guide both shifts to the salient object as well as playing a role in causally sustaining attention to that object.⁴⁷ As I argue in detail elsewhere,⁴⁸ these saliency maps underpin a certain kind of conscious experience. This is an experience with what I call a certain *experiential potential*, a particular causal role in re-structuring your stream of consciousness. Formally, experiential potentials can be treated as functions from one attentionally structured state to another. Your stream of consciousness according to

⁴⁷ For neuroscientific and computational accounts of saliency maps in the parietal cortex that guide attention see (among others) Koch and Ullman (1985), Gottlieb et al. (1998) and the overview in Wright and Ward (2008). The parietal cortex, in which these saliency maps can be found, is part of the so-called dorsal stream, which processes perceptual information in action-relevant terms.

⁴⁸ See Watzl (in preparation).

this picture forms a dynamic field, since experiential potentials are an inseparable diachronic element of attentional space.⁴⁹

5 Consequences

On the account given in this paper, conscious attention is a central aspect of our mental life, intimately connected to the nature of consciousness itself. It has important consequences at least in the following areas:

5.1 Consequences for the Science of Attention

STRUCTURALISM can provide a unified framework for the scientific study of attention. Scientific research suggests that the class of such sub-personal attentional processes is large, highly diverse and not well localized in the brain. Alan Allport, for example, observes that “[t]here is no one uniform computational function, or mental operation (in general no one causal mechanism) to which all so-called attentional phenomena can be attributed.”⁵⁰ This assessment is shared by many others.⁵¹ My account shows that the diversity of sub-personal attentional processes can be unified at the personal level: all of these processes play some role in underpinning and enabling the single personal-level process of attending. Whether you focus your attention on material objects and events and their qualities, on sensations like pain, on mental images, on the contents of conscious

⁴⁹ It should be allowed that one structured state maps into itself. This happens in cases where the experience with the highest experiential potential is also the center of the attentional structure. Endogenous and exogenous attention need not be thought of as mutually exclusive. In most normal circumstances, both intentions and experiences of saliency will work together. You intend to focus on the Jazz band instead of your pain and then you experience the sound of the saxophone as salient. As a result your stream of consciousness is structured around the sound of the saxophone. Your attending to the sound of the saxophone is constitutively caused and causally sustained by *both* your intention and the experience of a particular saliency.

⁵⁰ Allport (1993).

⁵¹ See Duncan (2006) and many of the articles in Itti et al. (2005) and other textbooks on the psychology and neuroscience of attention.

thoughts and desires, or on parts of your own body, in all these cases you engage in the conscious mental process of structuring your stream of consciousness around your awareness of that entity. The distributed nature of many sub-personal attentional processes is to be expected given the holistic nature of attention as conceived by STRUCTURALISM.

STRUCTURALISM also opens up new areas of research. Much of the empirical study of attention in psychology and the neurosciences has concentrated on studying the attentional processes and behavioral effects associated with the center of attention. Possibly due to an often unarticulated commitment to atomism and the spotlight metaphor, the computational processes and neuronal mechanism underpinning the richness of attentional space as well as the behavioral effects of the structure of attentional space have yet been underexplored. As evidenced by the studies cited above the situation is beginning to change.

In future empirical studies, techniques for the investigation of the topological structure of attentional space will have to be developed. Such techniques will have to rely, on the one hand, on particular assumptions about which types of verbal or behavioral responses (like response time) can serve as evidence of the holding of certain phenomenal relations in particular domains. On the other hand, such psychological studies will have to be complemented with techniques to investigate the underlying neuronal processes as in Datta and DeYoe's study. STRUCTURALISM may thus provide the foundations of interesting new research programs in the scientific study of attention that investigate the complex structure of attentional space.

5.2 Consequences for the Unity of Consciousness

STRUCTURALISM implies that complex states of consciousness are *phenomenally entangled* in the following sense: the phenomenology of such a state does not simply consist in the

monadic phenomenal properties of (the sum of) the parts of that state, but includes phenomenal relations between these parts.⁵² Some parts are, for example, peripheral to others. The holism that results from this phenomenal entanglement has consequences for the unity of consciousness. Consciousness seems to have some kind of unity, but it is notoriously difficult to make this idea precise.⁵³ Consider the famous split-brain patients. In these patients the corpus callosum that normally connects the left and right hemisphere of the brain has been cut and much of the information processing in these patients' brains is happening independently in the left and right hemisphere. Do these patients have a disunified consciousness? Our intuitions seem to depend (inter alia) on how these patients attend. If we consider that they attend independently on the left and on the right, we are inclined to say that their consciousness is disunified. By contrast, if we imagine that they have one attentional system and thus experience things on the left as peripheral to things on the right, we are inclined to say that they have a single stream of consciousness. A unified consciousness seems to go together with a single attentional structure with its center(s) and periphery. The holding of phenomenal relations between all parts of the total state of consciousness (attentional connectedness, see above) might thus be one way to make the vague notion of the unity of consciousness precise.⁵⁴

⁵² Phenomenal entanglement shares important similarities to the case of quantum mechanics. Quantum states are entangled in the sense that *information* contained in that state does not supervene on the information contained in the components (or parts) of that state. It should also be noted that phenomenal entanglement, unlike what Chalmers and Bayne (2003) have called "Gestalt Unity", does not necessarily affect what they call the content of each part of the complex conscious state (i.e. the way that state phenomenally characterizes the world as being).

⁵³ For important contributions to the recent discussion see Dainton (2000) and Bayne and Chalmers (2003).

⁵⁴ See also Eilan (1998) and Bayne (2008). Some research suggests that split-brain patients do indeed have such a single attention system (e.g. Lambert (1993), and the review in Bayne (2008)). I discuss the consequences of the structuring account of attention for the unity of consciousness in more detail in Watzl (in preparation).

5.3 Consequences for further philosophical areas

My account introduces and develops the idea that our stream of consciousness has structure over and above the way the world appears to us in having such a stream of consciousness. This opens the route to an investigation into the intrinsic structure of consciousness. One might, for example, think of the structure of experiential color space that determines which colors are experienced as most similar to which others. Maybe part of the structure of experiential color-space is due to certain constraints on the structure of consciousness, and not due to the structure of the space of colors proper?⁵⁵

STRUCTURALISM implies that there is an structure of our mental states beyond their contents, i.e. the way they represent the world as being (and also beyond the degrees of belief and desire). Attentional structure will allow the subject to manage their set of mental states in flexible and context-sensitive ways without adjusting the degree to which she is invested in various contents. Such a structure may have important epistemic consequences.⁵⁶

Finally, it is quite plausible that demonstrative reference and demonstrative thought depend on conscious attention: you are in a position to demonstratively refer to something or demonstratively think about it only if it is the focus of your conscious attention.⁵⁷ Furthermore, demonstrative thought and reference arguably form the basis of all *de re* (singular) thought and reference, connected to the first through information channels like memory and testimony. STRUCTURALISM may provide new ways of thinking about exactly

⁵⁵ See, for example, Kalderon (2007).

⁵⁶ For example, by playing a role in solving the frame problem.

⁵⁷ See Campbell (2002), Smithies (forthcoming), Roessler (this volume) and Watzl (in preparation).

why and how *de re* thought and reference might be grounded in conscious attention by linking attention to the center of the subject's actively structured conscious point of view.

6 References

- Allport, A. (1993): *Attention and control. Have we been asking the wrong questions? A critical review of twenty-five years*, In: Meyer, D. E. and Kornblum, S. (eds.), *Attention and Performance XIV*, chapter 9: 183–218
- Antony, M. (2008): Are our concepts *Conscious State* and *Conscious Creature* vague?, *Erkenntnis*, 68(2): 239-263.
- Bayne, T. and Chalmers, D. J. (2003): *What is the Unity of Consciousness?*, In: A. Cleeremans (ed.): *The Unity of Consciousness. Binding, Integration and Dissociation*, Oxford University Press
- Bayne, T. (2008): *The Unity of Consciousness and the Split-Brain Syndrome*, *The Journal of Philosophy*, 105 (6): 277-300
- Bentley, I.M. (1904): *The Psychological Meaning of Clearness*, *Mind*, 13 (50): 242-253
- Block, N. (2003): *Mental Paint*, In: M. Hahn, and B. Ramberg (eds.): *Reflections and Replies*, The MIT Press
- Brewer, B. (2004): *Realism and the Nature of Perceptual Experience*, *Philosophical Issues*, 14: 61-77
- Byrne, A. (2001): *Intentionalism Defended*, *The Philosophical Review*, 110: 199-240
- Campbell, J. (1993): *A Simple View of Color*, In: J. Haldane, and C. Wright (eds.): *Reality, Representation, and Projection*, Oxford University Press: 257-268
- Campbell, J. (2002): *Reference and Consciousness*, Clarendon Press

- Carrasco, M., Ling, S. and Read, S. (2004): *Attention alters Appearance*, Nature Neuroscience, 7 (3): 308-313
- Carrasco, M. (2009): *Attention Psychophysical Approaches*, In: T. Bayne, A. Cleeremans and P. Wilken (eds.), *The Oxford Companion to Consciousness*, Oxford University Press: 78-84
- Chalmers, D. (2004): *The Representational Character of Experience*, In: B. Leiter (ed.): *The Future for Philosophy*, Oxford University Press: 153-181
- Dainton, B. (2000): *Stream of Consciousness. Unity and Continuity in Conscious Experience*, Routledge Press
- Dashiell, J. (1928): *Fundamentals of Objective Psychology*, George, Allen and Unwin
- Datta, R. and DeYoe, E.A. (2009): *I know where you are secretly attending! The topography of human visual attention revealed with fMRI*, Vision Research 49:1037–1044
- Duncan, J. (2006): *Brain mechanisms of attention*, Quarterly Journal of Experimental Psychology, 59(1): 2-27
- Eilan, N. (1998): *Consciousness and the Self*, In: J. Bermudez, A. Marcel, and N. Eilan, N. (eds.): *The Body and the Self*, Bradford: 337-356
- Evans, C. O. (1970): *The Subject of Consciousness*, George Allen and Unwin
- Fechner, G. (1889): *Elemente der Psychophysik*, Breitkopf und Härtel, 2nd edition, Vol. 2
- Freeman, E., Sagi, D. and Driver, J. (2001): *Lateral interactions between targets and flankers in low-level vision depend on attention to the flankers*, Nature Neuroscience, 4(10): 1032-1036

- Gottlieb, J.P., Kusunoki, M., and Goldberg, M. E. (1998): *The representation of visual salience in monkey parietal cortex*, *Nature*, 391 (6666): 481-484
- Gurwitsch, A. (1964): *Field of Consciousness*, Duquesne University Press
- Hatfield, G. (1998): *Attention in Early Scientific Psychology*, In: R. D. Wright (ed.): *Visual Attention*, Oxford University Press
- Harman, G. (1990): *The Intrinsic Quality of Experience*, *Philosophical Perspectives*, 4: 31-52
- Itti, L., Rees, G., and Tsotsos, J.K. (2005): *Neurobiology of Attention*, Academic Press
- James, W. (1890/1981): *The Principles of Psychology*, Harvard University Press
- Kalderon, M. E. (2007): *Color pluralism*, *The Philosophical Review*, 116:563-601
- Kentridge, R.W., Heywood, C.A., and Weiskrantz, L. (1999): *Attention without awareness in blindsight*, *Proc. R. Soc. Lon. B*, 266: 1805-1811
- Koch, C. and Tsuchiya, N. (2007): *Attention and consciousness: two distinct brain processes*, *Trends in Cognitive Sciences*, 11(1): 16-22
- Koch, C. and Ullman, S. (1985): *Shifts in selective visual attention: towards the underlying neural circuitry*, *Human Neurobiology*, 4: 219-227
- Lambert, A.J. (1993): *Attentional Interaction in the Split-Brain: Evidence from Negative Priming*, *Neuropsychologia*, 31(4): 313-324
- Mack, A. and Rock, I. (1998): *Inattentional Blindness*, The MIT Press
- Martin, M. G. F. (2002): *The Transparency of Experience*, *Mind and Language*, 17: 376-425.
- Merleau-Ponty (1945/2008): *The Phenomenology of Perception*, transl. by Colin Smith, Routledge Press

- Mole, C. (2006): *Attention is Cognitive Unison*, PhD Thesis, Princeton University
- Mole, C. (2008): *Attention and Consciousness*, *Journal of Consciousness Studies* 15 (4): 86-104
- Nanay, B. (forthcoming): *Attention and Perceptual Content*, forthcoming in *Analysis*
- Nickel, B. (2007): *Against intentionalism*, *Philosophical Studies*, 136: 279-304.
- Noë, A. (2004): *Action in Perception*, The MIT Press
- Peacocke, C. (2000): *Conscious Attitudes, Attention, and Self-Knowledge*, In: C. Wright, B. Smith, and C. Macdonald, (eds.): *Knowing Our Own Minds*, Oxford University Press
- Pianesi, F., and Varzi, A. (1996): *Events, Topology, and Temporal Relations*, *The Monist*, 78 (1): 89-116
- Posner, M.I. (1980): *Orienting of Attention*, *Quarterly Journal of Experimental Psychology*, 32: 3-25
- Prinz, J. (2005): *A Neurofunctional Theory of Consciousness*, In: A. Brook and K. Akins (eds.): *Cognition and the Brain: The Philosophy and Neuroscience Movement*, Cambridge University Press
- Sartre, J-P. (1943/1969): *Being and Nothingness: An Essay on Phenomenological Ontology*, transl. by Hazel E. Barnes, Routledge Press
- Smithies, D. (forthcoming). What is the Role of Consciousness in Demonstrative Thought?, forthcoming in *The Journal of Philosophy*
- Schneider, K. A. (2006): *Does attention alter appearance?* *Perception and Psychophysics*, 68, 800–814

- Simons, D.J. and Chabris, C.F. (1999): *Gorillas in Our Midst: Sustained Inattentional Blindness for Dynamic Events*, *Perception*, 28: 1059-1074
- Snowdon, P. (1990): *The Objects of Perceptual Experience*, *Proceedings of the Aristotelian Society*, supp. vol. 64:121-150
- Speaks, J. (forthcoming): *Attention and Intentionalism*, forthcoming in *The Philosophical Quarterly*
- Tononi, G. (2008): *Consciousness as Integrated Information: a Provisional Manifesto*, *The Biological Bulletin*, 215(3): 216-242
- Tye, M. (2002): *Representationalism and the Transparency of Experience*, *Nous*, 36(1):137-151
- Tye, M. (2003): *Consciousness and Persons: Unity and Identity*, The MIT Press
- Tye, M. (2008): *Consciousness Revisited. Materialism without Phenomenal Concepts*, The MIT Press
- Watzl, S. (in preparation): *The Significance of Attention*, PhD Dissertation, Columbia University
- White, A. R. (1963): *Attention and Noticing*, *Proceedings of the Aristotelian Society*, New Series, 63:103-126
- White, A. R. (1964): *Attention*, Basil Blackwell
- Wu, W. (forthcoming a): *Confronting Many-Many Problems: Attention and Agentive Control*, forthcoming in *Noûs*
- Wu, W. (forthcoming b): *What is conscious attention?*, forthcoming in *Philosophy and Phenomenological Research*.
- Wright, R. D. and Ward, L.M. (2008): *Orienting of Attention*, Oxford University Press