

CONSCIOUS STATES AND CONSCIOUS CREATURES: EXPLANATION IN THE SCIENTIFIC STUDY OF CONSCIOUSNESS

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1. Introduction

Explanation does not exist in a metaphysical vacuum. Conceptions of the structure of a phenomenon play an important role in guiding attempts to explain it, and erroneous conceptions of a phenomenon may direct investigation in misleading directions. I believe that there is a case to be made for thinking that much work on the neural underpinnings of consciousness—what is often called the neural correlates of consciousness—is driven by a mistaken conception of the structure of consciousness. The aim of this paper is to lay bare some connections between the explanation of consciousness and the structure of consciousness, and to argue for a conception of the structure of consciousness that is more adequate than that which currently drives much research into the neural correlates of consciousness.

2. The State-Based Paradigm vs. the Creature-Based Paradigm

The form of consciousness with which I am interested is phenomenal consciousness. We can think of phenomenal consciousness in two ways: in terms of phenomenal states, or in terms of phenomenally conscious creatures. A phenomenal state is a state that there is something it is like to be in. Phenomenal states are individuated in terms of their phenomenal character—that is, in terms of what it is like to be in them. There is something it is like to hear a siren sound, there is something it is like to see a field of daffodils in spring, and there is something it is like to smell freshly brewed coffee. Arguably, there is also something that it is like to intend to put the washing out, wonder when house prices will fall, and realize that an argument is fallacious. A phenomenally conscious creature is a creature that there is something it is like to be. Phenomenally conscious creatures, and only phenomenally conscious

creatures, have a phenomenal perspective. I will call the property of being phenomenally conscious ‘creature consciousness’.¹

It is tempting to take the contrast between state consciousness and creature consciousness as a contrast between the type of entity that is conscious, as though state consciousness is a property of mental states and creature consciousness is a property of creatures. I think that this is not the best way to conceptualise the contrast. Instead, we might compare the relationship between creature consciousness and state consciousness with the relationship between being coloured and being red, or the relationship between being shaped and being square. Creature consciousness is best thought of as a determinable of which the various forms of state consciousness are determinates.

We can group studies of the neural mechanisms underpinning consciousness into two classes depending on whether they focus on state consciousness or creature consciousness. State-based studies have dominated the search for the neural correlates of consciousness.² An early (and influential) example of the state-based strategy can be found in the binocular rivalry studies of Logothetis and colleagues (Logothetis 1998; Sheinberg & Logothetis 1997; see also Tong et al. 1998). When the left and right eyes are presented with different images—say, a sunflower and a house—one typically sees either the house or the sunflower, but not both at the same time, even though both stimuli are processed to a high level. Logothetis and colleagues trained monkeys to ‘report’ their visual experiences by pressing different levers, and then recorded from cells in their visual cortex whilst the monkeys were experiencing binocular rivalry. They found that changes in visual experience were most strongly correlated with activity in inferior temporal cortex. A more recent example of the state-based approach can be found in the perceptual extinction studies of Rees and colleagues (Rees 2001; Rees et al. 2002; see also Driver & Mattingley 1998). Perceptual extinction is a phenomenon in which patients “ignore” stimuli presented in one visual hemi-field (typically the left) when presented with stimuli in both visual hemi-fields. Stimuli in the patient’s good hemifield capture attention and lead to the extinction of stimuli in their bad hemifield. Rees and colleagues found that the difference between extinction and its absence correlated with activity in frontal (and parietal) attentional and working memory systems.

Whereas state-based studies of consciousness focus on the contrast between one state of consciousness and another, creature-based studies focus on the contrast between consciousness and its absence. Some creature-based studies have focused on the neural mechanisms affected by anaesthesia (Alkire & Miller 2005; White & Alkire 2003; Angel 1991; Angel 1993), whilst other creature-based studies have explored the neural mechanisms underlying the transition between coma (in which the patient is assumed to not be phenomenally conscious) and the minimally conscious state (in which the patient is thought to be phenomenally conscious, at least at times) (Graham et al. 2005; Laureys et al. 2000; Schiff 2004; Schiff & Plum 1999; Schiff & Plum 2000). Both sets of studies converge in implicating the thalamus and associated sub-cortical structures as crucially

involved in creature consciousness. Alkire and colleagues describe anaesthetics as “flicking a thalamocortical switch” (Alkire et al. 2000).

The existence of these two paradigms for the study of consciousness raises several questions. Should we attempt to privilege one approach over the other, or do both paradigms provide us with equally valuable tools for exploring the neural basis of consciousness? And how might we integrate the results of these two experimental approaches? Painting with a broad-brush, state-based studies indicate that fine-grained phenomenal states, such as seeing a face or hearing a melody, depend on the activation of particular cortical regions—what are sometimes called ‘cortical nodes’ (Allison et al. 1999; Epstein et al. 1999; Ishai et al. 1999; Kanwisher et al. 1997; McCarthy et al. 1997). Creature-based studies, by contrast, suggest that sub-cortical systems centred on the thalamus are necessary for the organism to enjoy any phenomenal states at all. We need an account of how the sub-cortical systems and cortical nodes conspire to produce consciousness. And we need to locate the contrast between content-based studies and creature-based studies in an account of the structure of consciousness itself. So, the next item on the agenda is to examine competing conceptions of the structure of consciousness.

3. Building Blocks vs. Unified Fields

At any one point in time, a subject can be in a multitude of conscious states. I am currently enjoying perceptual experiences in various modalities (an auditory experience of my next-door neighbour’s chain-saw; a visual experience of these words on the screen in front of me); a range of bodily sensations (feelings of limb position and stress); various affective and mood experiences (an experience of concentration co-mingled with a background feeling of fatigue), and (more controversially) various agentive and cognitive experiences. My current experiential state is not unusual in this regard, for the normal subject of experience enjoys a multitude of phenomenal states at any particular time. How should we think of the relationship between these states?

Following Searle (2000), we can distinguish two models of the structure of consciousness: the building block model and the unified field model.³ The building block theorist takes the subject’s overall phenomenal perspective—the stream of experience—to be built up out of units of consciousness—phenomenal ‘building blocks’. A building block theorist could follow O’Brien and Opie in holding that a conscious individual has “several distinct phenomenal consciousnesses, at least one for each of the senses, running in parallel” (O’Brien & Opie 1998: 387), or they could argue for a different account of how thick the building blocks of consciousness are. What they will agree on is that, at any one time, a conscious individual does not enjoy a single consciousness-generating system.

The unified field theorist denies that the subject’s phenomenal perspective is built up out of individual phenomenal units. Instead, she holds that each of the phenomenal features that contribute to the subject’s phenomenal perspective is

conscious in virtue of the fact that it is caught up in the subject's phenomenal field. The unified field theorist recognizes that there is multiplicity within the contents of consciousness at any one point in time, but she denies that this multiplicity is a manifestation of the activity of multiple consciousness generating systems.

We can articulate the contrast between the building block and unified field models more precisely by considering the notion of a minimal neural correlate of consciousness (Chalmers 2000). The minimal neural correlate of a phenomenal state (P) is the minimal amount of the neural system that correlates with the presence of P. The building block theorist will regard the minimal neural correlates of the various phenomenal states that a subject has at a time as completely distinct—that is, as having no parts in common. By contrast, the unified field theorist will regard the minimal neural correlates of each of the subject's various phenomenal states as having a common component, where this common component reflect the activity of the subject's phenomenal field.

Proponents of unified field approaches to consciousness are sometimes tempted to deny that there are any fine-grained phenomenal states: there is only the subject's total phenomenal field and the various phenomenal features that it subsumes.⁴ I think that this is a mistake. If we think of phenomenal states as instantiations of phenomenal properties, then there is no reason for the proponent of the field-based model to deny that there is such a thing as the experience of seeing something as red, and that it is possible to have such an experience in different phenomenal contexts. The only point that the field-based theorist need emphasize is that experiences of red, where they occur, should not be thought of *independent* units of consciousness. It might be useful here to consider a parallel with theories of belief. It is sometimes suggested that, strictly speaking, individuals have a single belief-state with rich content rather than lots of beliefs (see Lewis 1994; Stalnaker 1984). But note that accepting this view of belief does not demand that we reject all talk of fine-grained belief states. We can refer to the belief that dogs are mammals, even if—strictly speaking—the belief that dogs are mammals is an abstraction from a more complex belief-state. Similarly, we can speak of the experience of smelling freshly roasted coffee, even if—strictly speaking—such an experience is (almost always) only one component of the person's overall phenomenal field.

We can put some flesh on the distinction between these two conceptions of the structure of consciousness by asking who might be thought to espouse each of them. I will focus only on neurobiological accounts of consciousness, and will leave philosophical accounts to one side here.

Searle describes Crick and Koch as paradigmatic building block theorists. Here, Searle is influenced by the fact that in studying the neural mechanisms underpinning consciousness Crick and Koch have focused on the contents of visual experience.

Our main interest is not the enabling factors needed for all forms of consciousness, such as the activity of the ascending reticular systems in the brainstem.

Rather, we are interested in the general nature of neural activities that produce each particular aspect of consciousness, such as perceiving the specific colour, shape or movement of an object (Crick & Koch 2003: 119)

But although Crick and Koch have taken a state-based approach to the study of consciousness, it is not at all obvious that they subscribe to a building block model conception of the structure of consciousness. The crucial issue here concerns what Crick and Koch mean by an “enabling factor”. On the one hand, they might regard brainstem activity as merely *causally* necessary for consciousness. On this view, brain-stem activity will be correlated with creature consciousness, not because it directly contributes to (realizes, constitutes, etc.) phenomenal consciousness but only because it is needed in order to activate the relevant cortical nodes. On the other hand, Crick and Koch might regard the activity of the ascending reticular systems as *constitutively* necessary for consciousness—as an element of the neural state that underwrites (realizes, constitutes, etc.) consciousness. On this view of things, the role of the reticular system is not (just) that of activating the subject’s cortical nodes, rather, this system is an integral component of the total neural correlate of the subject’s phenomenal states. On the latter account, brain-stem activity forms part of the minimal correlate of consciousness, whereas on the former account the minimal correlate of consciousness is restricted to cortical activity.⁵

Nancy Kanwisher comes closer to an explicit endorsement of the building block model:

The multiplicity of cortical loci where correlations with awareness have been found provides some evidence against one of the oldest ideas about consciousness, that the contents of awareness are represented in a single unitary system. ... Instead, the data described above seem more consistent with a view in which the contents of current awareness can be represented in many different neural structures. However, one could still argue that the neural correlates described above are not in fact the actual representations that constitute the conscious percept, but merely information that is likely to make it onto the (as-yet-undiscovered) screen of awareness, so the possibility of such a unitary awareness system is not definitively ruled out by these data. In contrast to the idea of a unitary and content-general Cartesian theatre of awareness, the data summarized above fit more naturally with the following simple hypothesis: *the neural correlates of awareness of a particular visual attribute are found in the very neural structure that perceptually analyzes that attribute.* (Kanwisher 2001: 97, emphasis in original).

Whether Kanwisher really means to be endorsing the building block model depends on how exactly we are to understand the final sentence. Does she mean to suggest that the minimal neural correlate of the subject’s visual experiences is *restricted* to content-specific cortical nodes, or does she mean to suggest only that the minimal neural correlate *includes* activity in particular cortical nodes?

The unified-field theorist need not disagree with the latter claim, but I suspect that Kanwisher has the former thesis in mind.

Perhaps the most explicit endorsement of the building block model, at least within the cognitive neurosciences, comes from Zeki and collaborators.

Activity at each stage or node of a processing–perceptual system has a conscious correlate. Binding cellular activity at different nodes is therefore not a process preceding or even facilitating conscious experience, but rather bringing different conscious experiences together. (Bartels & Zeki 1998: 2330; see also Zeki 2007).

Zeki and Bartels call these conscious experiences ‘micro-consciousnesses’, and appear to conceive of them as phenomenal building blocks.

What about unified field models of consciousness? Perhaps the model of consciousness most naturally deserving of the ‘phenomenal field’ title is Tononi’s information integration theory according to which content enters consciousness in virtue of being caught up in a highly integrated neural process (Tononi 2004; Tononi 2007; see also Tononi & Edelman 1998). One could also make a case for thinking of global workspace models of consciousness in unified field terms. According to such models, content becomes conscious in virtue of entering a global workspace—a sort of domain-general working memory system from which it is available to a range of high-level consuming systems (Baars 1988; Dehaene & Naccache 2001).

4. Structure and Methodology

How does the distinction between the building block and unified field models of the *structure* of consciousness map on to the distinction between state-based and creature-based approaches to the *study* of consciousness? Here is a first-pass at the relationship.

On the face of things, the building block model seems to recommend a state-based methodology, for on the building block model creature consciousness is derivative on state consciousness. If the building block model is correct, then there is no particular reason to assume that there will be any unitary or central system associated with consciousness as such. Instead, all the work will be done by the various phenomenal building block: creature consciousness will be something of an explanatory free-rider on state consciousness. The unified field account, by contrast, would seem to recommend the converse strategy, for on the field-based model a creature enjoys the particular phenomenal states that it does only because of the ways in which its phenomenal field is modulated. We might put the contrast as follows: the phenomenal field theorist sees the determinable of creature consciousness as having explanatory priority, whereas the building block theorist accords explanatory priority to the determinates of creature consciousness—that is, (fine-grained) phenomenal states.

So much for the first-pass account; now for some complications. Firstly, state-based studies are not equipped to reveal the building blocks of consciousness, even if there are building blocks of consciousness. Rather, the state-based approach allows one to determine what neural states are responsible for differentiating one phenomenal state from another, but we cannot identify such differentiating states with phenomenal building blocks. State-based studies show only that activation of the fusiform face area generates an experience of seeing a face in the context of an already conscious creature, and we cannot assume that the activation of the fusiform face area would itself suffice to generate an experience as of a face. (Stimulating the fusiform face area that has been placed in a bottle would presumably not generate any experience at all, let alone an experience of a face.) At best, state-based experiments can reveal the neural correlates of the *contents* of consciousness.

What about the link between the unified field model and the creature-based methodology? Here too words of caution must be sounded. It is tempting to assume that if the unified field model were correct then there would no point employing a state-based approach to the study of consciousness. Indeed, one of Searle's chief aims in introducing the distinction between the building block and unified field conceptions of consciousness was to suggest that the search for the neural correlates of consciousness ought not to buy into the state-based paradigm: "There is no such thing as a separate visual consciousness, so looking for the NCC for vision is barking up the wrong tree" (Searle 2000: 574). This dismissal is overly hasty, for there is good reason to think that we might be able to find a role for the state-based approach within a unified field conception of things. Nonetheless, it is certainly true that the unified field model accords the creature-based paradigm an importance that it does not have on the building block model. I return to these issues in section 6. First, however, we must examine the debate between the building block and unified field models in more detail.

5. In Defense of the Phenomenal Field

The debate between the state-based and field-based models of consciousness cannot be settled from the armchair. Neither introspection nor conceptual analysis will enable us to decide whether the phenomenal perspective that we enjoy is generated by a single phenomenal field or by a multiplicity of building blocks. Nonetheless, it seems to me that there are certain very broad reasons—reasons that are already available to us—to think that consciousness has a field-based structure.

5.1. Phenomenal unity

The various phenomenal states that we enjoy at a time are not had in isolation from each other but are experienced together, as components of a

single phenomenal perspective (Bayne & Chalmers 2003; Dainton 2000). This perspective subsumes each of the particular phenomenal states that one enjoys at that time. We might think of this perspective as a total phenomenal state—a phenomenal state that includes within itself each of the fine-grained phenomenal states that the subject enjoys at the time in question. Call this feature of consciousness its phenomenal unity.

The unified field model provides us with a very natural account of phenomenal unity. The operations of the phenomenal field are such that at any point in time it produces a single total state of consciousness; any contents caught up in the field will be subsumed by this total phenomenal state. To put the point in another way: the very mechanisms that generate consciousness also bind the contents of consciousness together so as to form a single phenomenal state. On this picture, there is no need to bring separate phenomenal states together so as to form a total phenomenal state, for phenomenal states are not created as independent units.

But how is the building block theorist to account for the phenomenal unity of consciousness? There are basically two options open to the building block theorist at this juncture. On the one hand, she might simply deny that consciousness is unified in the way outlined above. She might hold either that consciousness does not appear, from the first-person perspective, to be unified, or that although consciousness appears to be unified there is little reason to take such an appearance as veridical.

But any account of consciousness that is forced to deny that consciousness is typically unified thereby incurs a significant cost. Why does consciousness seem to be unified if it is not? And how is it that the contents of consciousness are, for the most part at least, conjointly available to guide thought and action if there is no total phenomenal state within which they fall? Denying that consciousness is unified is not a step to be taken lightly.

Rather than denying that consciousness is typically unified, the building block theorist would be better off attempting to explain how the unity of consciousness is secured. To do this, the building block theorist must invoke a process responsible for stitching the building blocks of consciousness together so as to form a total phenomenal state. We might call this process ‘phenomenal binding’. Zeki and Bartels appear to invoke such a process when they refer to binding cellular activity as “bringing different conscious experiences together”.

It is important to distinguish phenomenal binding from the kind of binding that is discussed in connection with the binding problem—what we might call ‘representational binding.’ Representational binding is concerned with the question of how representations of perceptual features (colour, shape, motion, etc) are put together to form representations of unified perceptual objects. Everyone needs to solve this binding problem, but only building block theorists need account for phenomenal binding. Incidentally, we might note that the unified field theory does not itself solve the representational binding problem

(*pace* Searle 2000: 574). It is one thing to have a single phenomenal state, it is another thing for the contents of that state to be representationally integrated.

But if there are mechanisms responsible for phenomenal binding then we might expect them to be subject to occasional malfunction. We might expect to find syndromes in which the mechanisms responsible for generating the building blocks of consciousness continue to function normally but the processes responsible for binding the resulting phenomenal states together is disrupted. A subject suffering from such a syndrome would enjoy phenomenal atoms that would not be subsumed by any total phenomenal state.

I know of no syndrome that meets such a description. We simply do not find subjects with ‘orphaned’ phenomenal states. Of course, there are various pathologies in which *some* form of the unity of consciousness is lost. For example, patients with apperceptive agnosia see the various parts of perceptual objects but cannot form a visual representation of those parts as the parts of a single perceptual object (Farah 2004; Humphreys & Riddoch 1987). Such patients can be described as having lost a form of the unity of consciousness, but it is not the form of unity that is at issue here. Agnosics have lost the ability to synthesize their experiences of parts together so as to form an experience of wholes, but there is no reason to suppose that their experiences are no longer subsumed by a single experiential state. The kind of disunity that characterizes apperceptive agnosia is the kind of disunity that would result from a break-down of representational binding rather than phenomenal binding. The agnosic patient enjoys a total phenomenal state—a state that includes various representations of the cup—it’s just that this state doesn’t include a representation of the cup as a single, spatially integrated entity.

Arguably, the best case to be made for phenomenal disunity in human beings concerns epileptic patients who have undergone section of the corpus callosum—so-called split-brain patients. Under carefully controlled laboratory conditions, split-brain patients sometimes behave as though they have two streams of consciousness, one in each hemisphere (see e.g. Marks 1981; Zaidel et al. 2003). For example, the split-brain patient might be shown the word ‘key-ring’, so that ‘key’ falls within the patient’s left visual field and ‘ring’ falls within the patient’s right visual field. The contralateral structure of the visual system ensures that stimuli projected to the left visual field are processed in the right hemisphere and vice-versa. When asked to report what she sees the patient in the key-ring experiment will typically say only that she sees the word ‘ring’, yet, with her left hand the patient may select a picture of a key and ignore pictures of both a ring and a key-ring. According to the two-streams model of the split-brain syndrome, this disunified behaviour is a manifestation of the fact that the split-brain patient has two streams of consciousness, one in each of her two hemispheres.

Although it is the received view of the split-brain, there is good reason to regard the two-streams account with some suspicion. For one thing, split-brain patients enjoy behavioural unity outside of carefully controlled laboratory settings; in everyday life, they behave as would someone with a single phenomenal

perspective (Zaidel 1994).⁶ Furthermore, it is possible to explain the disunified behaviour of the split-brain patient without supposing that she or he has a disunified consciousness. In order to do this, we need only suppose that the patient has a single phenomenal field whose contents “switch” between the two hemispheres in accordance with shifts in hemispheric activation (Levy 1977; 1990; Levy & Trevarthen 1976). According to this ‘switch’ model, the split-brain operation does not split the patient’s stream of consciousness into two, but merely limits the degree to which the patient’s phenomenal field can simultaneously draw on the neural activity of both hemispheres. In effect, the model represents the split-brain patient as operating with only half of a phenomenal mind at a time. The everyday consequences of this deficit are minimal because activation moves back and forth between hemispheres as and when it is needed.

In my view the switch model provides the best overall account of the split-brain. However, the model is controversial, and it may well be the case that some split-brain patients do, on occasions, have two streams of consciousness. Would this provide support for the building block model? I think not. The streams of consciousness that, according to the two-streams model, split-brain patients enjoy hardly look like phenomenal building blocks. There is some elasticity within the building block approach as to how ‘big’ the building blocks of consciousness are, but it is implausible to suppose that the typical phenomenal field is composed of only two building blocks, one grounded in each hemisphere. So even on the two-streams account of the split-brain we should not think of the split-brain syndrome as revealing the pre-existing structure of consciousness.

Let us leave the split-brain syndrome to one side and return to the general issue of phenomenal unity. With the possible exception of split-brain patients, human beings enjoy unified streams of consciousness. This datum needs to be explained. The unified field model has a simple explanation: the unity of consciousness is secured by the fact that the subject’s various phenomenal states are made conscious en masse, by being caught up in a single phenomenal field. By contrast, the building block theorist needs to either deny that consciousness is (typically) unified, or she needs to posit mechanisms responsible for binding the subject’s various phenomenal states into a single total state of consciousness. As we have just seen, neither strategy is unproblematic.

5.2. Phenomenal holism

A second feature of consciousness that appears to be at odds with the building-block model is its holism. There are a number of senses in which consciousness might be said to be holistic, some of which are more difficult to reconcile with the building block account than others.

Firstly, consciousness might be said to be *semantically* holistic. According to the semantic holist, a particular cortical state is correlated with a particular phenomenal state only because it realizes a certain role in the functional system

in which it is embedded. The semantic atomist, by contrast, claims that a neural state is correlated with a particular phenomenal state because of some direct relation between it and the property represented by the phenomenal state. It is unclear whether—or rather, to what extent—semantic holism might apply to phenomenal content. But even if semantic holism were to apply to phenomenal content there seems to be little reason to suppose that it poses any obstacle to the building block model *per se*. Even if neural states carry the contents that they do only because of their role in the overall architecture of the mind, it is entirely possible that neural states are able to simultaneously realize distinct phenomenal states under their own steam, so to speak.

The only form of semantic holism that would pose a problem for the building block theorist is one on which particular kinds of phenomenal properties could be instantiated only in the context of certain other phenomenal properties. Perhaps, for example, certain kinds of bodily sensations can exist only in the context of an experience of one's overall body image. Following Dainton (2000), we might call this kind of relationship between phenomenal properties 'gestalt unity'. But although gestalt unity would constrain the degree to which consciousness could be built up of phenomenal building blocks, it seems to me that relations of gestalt unity between phenomenal states are few and far between. To take just one example, it seems as though my current experience of toothache could exist in any one of a vast number of phenomenal contexts.

A second form of holism concerns the transitions between consciousness and unconsciousness. Such transitions are typically global: they apply to all forms of phenomenal states, rather than to a select sub-set of the subject's experiences. On emerging from a dreamless sleep one doesn't first regain visual experience, then auditory experience, then affective experience and so on. Consciousness may dawn gradually, but it dawns gradually over the whole. Similarly, when consciousness is lost it is typically lost en masse rather than in a piecemeal fashion. We can capture this fact by saying that consciousness is punctate.

The unified field account has a straightforward explanation for why consciousness is punctate: consciousness is lost or regained when the phenomenal field is lost or regained. Can proponents of the building block model also explain why consciousness is punctate? Perhaps they can, although the explanation here is perhaps not quite as straightforward as it is on the phenomenal field model. The building block theorist might say that consciousness is punctate because all of the subject's phenomenal states enjoy a common set of enabling factors. When these enabling factors go down, so too does an entire range of phenomenal states. Think here of a power station: when it malfunctions all of the electrical appliances in your house go down with it. But the proponent of the building block model will urge that although all of one's phenomenal states depend on a common core of 'enabling factors', these states themselves are generated by distinct building blocks.

A third form of holism displayed by consciousness might be called *dynamic holism*. Entry into the stream of consciousness involves a competition between

coalitions of contents, each one of which struggles to make its voice heard above that of its fellows (Koch 2004). At one point in time one's experience will be dominated by perceptual content, at other points in time it will be dominated by affective content, and at other points in time it may be dominated by bodily sensations. Coalitions of content that win the competition—whether by top-down control or stimulus-driven attention—enter the stream of consciousness; the losers hover in the phenomenal fringes or outside of consciousness altogether. The forces behind these changes in the contents of consciousness are holistic. In order to predict whether a particular cortical node will make a contribution to consciousness one has to know how strongly other cortical nodes are activated. What matters is not absolute but relative strength of activation: a weakly activated node might dominate consciousness if it is more strongly activated than its competitors, and a strongly activated node might be crowded out by nodes that are even more strongly activated. Whether or not content becomes conscious depends on global factors—that is, on how the mechanisms underlying it are related to the rest of what the organism is doing, its attentional focus, and so on.

The building blocks of consciousness seems to be at odds with the dynamical holism of consciousness, for the building blocks of consciousness are most naturally thought of as operating independently of each other. As O'Brien and Opie put it, “a conscious individual has several distinct phenomenal consciousnesses, at least one for each of the senses, running in parallel” (O'Brien & Opie 1998: 387). Dynamical holism appears to put the squeeze on this claim, but perhaps the building block theorist will deny that she need be committed to a view of building blocks as autonomous units of consciousness. Instead, she might claim that the building blocks of consciousness are highly inter-dependent: the activation of one building block depends in complex ways on the activation of others. She might liken the various states to the members of a committee whether or not one person speaks might depend on what other committee members are doing (or appear to be planning to do). In some committees one might have to be very aggressive in order to get one's voice heard, whilst in other committees one might have an easy job of dominating proceedings. But here we are in danger of collapsing the building block model into a version of the unified field model, for highly-interdependent mechanisms might be best understood as the components of a single consciousness-generating mechanism.

The existence of dynamical holism suggests that there are domain-general capacity constraints on phenomenal consciousness: contents compete for entry into consciousness because only so much content can enter consciousness at any one point in time. Note that we need not think of this capacity constraint as invariant: it might differ between subjects or within the same subject across times. But whatever its nature, the existence of a domain-general capacity constraint on consciousness would appear to be at odds with the building block model, for one would expect the building block model to generate only domain-specific capacity constraints on consciousness. Individual building blocks might be able

to subsume only so much content, but why—given the building block account—should consciousness be governed by domain-general capacity constraints?

It seems to me that there are two ways in which the building block theorist might attempt to address this objection. On the one hand, she might attempt to account for the dynamical holism of consciousness by appealing to domain-specific capacity limits and deny that there are any domain-general capacity constraints on consciousness. On the other hand, she might acknowledge that there are domain-general capacity constraints on consciousness, but hold that the existence of such constraints derive from the domain-general nature of the mechanisms responsible for activating the building blocks of consciousness rather than the nature of the building blocks themselves. Neither of these approaches strikes me as promising as the unified field account of matters.

5.3. Background states of consciousness

A third source of support for the unified field model derives from the nature of background states of consciousness. The background state of consciousness with which we are most familiar is ordinary wakefulness, typically referred to in the clinical literature as a state of ‘clear consciousness’. Here, one is able to reason through problems, exert some control over one’s attentional focus, and one enjoys familiar perceptual and cognitive states. A quite different background state of consciousness occurs in REM dreaming, in which the contents of consciousness derive from internal stimulation rather than environmental input, reasoning and decision-making is impaired, and one enjoys unusual (at least, relative to normal waking consciousness) conscious states. Other background states of consciousness occur in the state of inebriation and under the influence of various forms of hallucinogens. Hypnosis is plausibly thought of as involving a particular background state of consciousness, as is delirium, which is often referred to in the medical literature as ‘clouded consciousness’.

How should we conceptualise background states of consciousness? Within the clinical and neuroscientific literatures background states of consciousness are often thought of as levels of consciousness. The comatose state and ordinary wakefulness are represented as marking out the two ends of the consciousness spectrum, with general anesthesia, deep sleep, REM sleep, light sleep, and drowsiness positioned between those two extremes (see e.g. Laureys 2005). I think this conception of background states is problematic, for it falsely suggests that one is more conscious when ordinarily awake than (say) when drowsy or in an REM dream state. It is unclear whether creature consciousness is the kind of property that can come in degrees, but even if it can, it seems to me that we have no reason to think that some background states of consciousness will involve higher degrees of consciousness than others.

A more appealing conception of background states of consciousness associates them with distinctive functional roles. The functional role of a

particular conscious state is, at least in part, dependant on the background state of consciousness in which it occurs. In normal wakefulness the contents of consciousness are available to the mechanisms associated with rationality and memory-consolidation in a way in which they are not available in dreaming, inebriation, hypnosis or delirium.

In the present context the key feature of background states of consciousness is the fact that they are domain-general. They characterize the subject's overall phenomenal perspective, rather than some particular subset of the subject's phenomenal states. One does not begin dreaming in only some modalities—rather, one's entire stream of consciousness switches from waking consciousness to dreaming (and back again). Similarly, the transition between normal waking consciousness to hypnosis and back again occurs en masse rather than in a piecemeal fashion. Background states of consciousness are properties of creatures, and they impact on the creature's particular conscious states only derivatively.⁷

The domain-general nature of background states of consciousness is not what the building block model of consciousness would lead one to expect. If, as the building block theorist asserts, the various components of consciousness are subserved by distinct mechanisms, then one would expect background states of consciousness to be domain-specific. It seems more parsimonious to assume that background states of consciousness are global because the mechanisms responsible for them are intimately related to those which underlie the phenomenal field, than to suppose that they are global because they affect a number of distinct consciousness-generating mechanisms, as per the building block model. We might note there is some neuroanatomical plausibility to the unified field conception of background states of consciousness, for the sub-cortical mechanisms responsible for modulating the subject's background state of consciousness are closely related to those that enable the creature to be phenomenally conscious in the first place. These facts provides additional reason to think of the subject as having a single global state of consciousness into which various contents feed rather than a variety of conscious states that must be bound together by some process that is independent of consciousness itself.

6. Objections and Replies

I turn now to some objections to the unified field approach.

6.1. Phenomenal conservatism

One line of objection to the phenomenal field model involves an appeal to phenomenal conservatism. Phenomenal conservatism is the view that the contents of phenomenal consciousness are restricted in scope: only low-level perceptual, sensory and affective states are phenomenally conscious;

high-level perception and cognition are excluded from the realm of phenomenal consciousness (Carruthers 2005; Tye 1995). Phenomenal conservatives typically allow that high-level perceptual and cognitive states have a phenomenology in the derivative sense that the images and bodily sensations associated with such states possess phenomenal character, but they deny that high-level perceptual and cognitive states have their own phenomenal character.

From the perspective of the conservative phenomenal consciousness is a relatively minor component of consciousness, and it is unlikely that the mechanisms subserving phenomenal consciousness will be constitutively connected to those subserving consciousness as such. It might be over-stating things to say that phenomenal conservatism is *inconsistent* with the phenomenal field model, but the two accounts certainly make for odd bed-fellows. One can see this by noting that on the conservative approach it is at least conceptually possible for a creature to lose all of its phenomenal states without losing consciousness. And if this is possible, then one cannot ground an account of phenomenality in an account of creature consciousness.

But although phenomenal conservatism has its advocates, it seems to me—as it has to others (Dainton 2000; Goldman 1993; Horgan & Tienson 2002; Pitt 2004; Strawson 1994)—that it should be rejected. Not only does phenomenal consciousness include high-level perceptual states such as recognizing a face, a voice or a melody, it also includes various ‘cognitive feelings’—such as tip of the tongue experiences, feelings of knowing, and *déjà vu* and *jamais vu* experiences—and, more controversially, purely cognitive states, such as understanding an argument, judging that one ought to attend a meeting, remembering what one did last winter, and desiring that the rain stop. The phenomenology of these states is not exhausted by whatever bodily and affective sensations accompany them, but belongs to these very states themselves. And if phenomenal consciousness is as much a matter of cognition as it is of perception and sensation, then it is not implausible to suppose that the very mechanisms that enable a creature to be conscious at all might be constitutively related to those that allow it to enjoy particular states of phenomenal consciousness.

6.2. The empty field?

The model of consciousness presented here has two basic components: mechanisms that generate the phenomenal field, and mechanisms that are responsible for particular contents of consciousness. The former appear to be centred on the thalamic system and associated brain-stem systems; the latter are distributed throughout the cortex (although sub-cortical systems might also contribute to certain contents, particularly those related to affect and bodily sensation). To a first approximation, an organism is conscious in a specific way when both the thalamic system and the appropriate cortical node are activated.

Now, suppose that the system responsible for the phenomenal field is active but all of the cortical nodes responsible for the contents of consciousness are dormant. One might suppose that in such a scenario the subject would have an empty phenomenal field. But, so the objection continues, this is not a coherent scenario: one cannot be conscious without being in a particular state of consciousness. A state of objectless (or contentless) consciousness is impossible. In order for a determinable to be instantiated, one (or more) of its determinates must also be instantiated.

The objection can be sidestepped, for the account presented here does not identify creature consciousness with the phenomenal field. The mere activation of one's phenomenal field does not itself suffice to make one conscious, for there is nothing it is like to have a phenomenal field unless one's phenomenal field is modulated in a particular way. We might put the model in Kantian terms: a phenomenal field without content is empty, but content that does not occur within a phenomenal field is blind. A full account of creature consciousness demands an account of both the neural systems underlying particular phenomenal states and the phenomenal field. We might think of the total neural correlate of every phenomenal state as having two components: a component that reflects the content of the state in question, and a component that reflects the activity of the subject's phenomenal field. Phenomenal states will have distinct neural correlates in accordance with their content, but there will be a neural state in common to each of these distinct total neural correlates, where this common neural element reflects the activity of the subject's phenomenal field.

6.3. The integration of contents and fields

I have suggested that in order for a subject to be in a particular phenomenal state both the system(s) responsible for the creature's phenomenal field and the system(s) responsible for the content (or character) of the phenomenal state must be activated. But does the activation of these two systems *suffice* for generating the target phenomenal state?

There is reason to think not. Research on visual extinction has found robust category-specific activation in ventral visual cortex even for those stimuli of which neglect patients appear not to be conscious (Rees 2001; Rees et al. 2002; Driver & Mattingly 1998). On the face of things, this research indicates that the total correlate of a particular phenomenal state cannot be equated with the mere *conjunction* of the activation of the organism's phenomenal field and the relevant cortical node. Something more seems to be required. What might that more be?⁸

One possibility is that cortical nodes generate consciousness only when their contents are made available to—or perhaps even contained within—a global workspace (Dehaene & Naccache 2001). Roughly speaking, the function of this

system would be to make the contents of consciousness jointly available to the subject's high-level consuming systems (executive planning, problem solving, memory consolidation, verbal report, and so on). Although this approach is within the spirit of the unified field model, I'm not much attracted to it, for it seems to me that consciousness—*phenomenal* consciousness—demands little in the way of high-level cognitive availability. Patients with pre-frontal damage are unable to generate coherent and effective action plans, but there is no reason to deny that they are conscious. Furthermore, hydranencephalic children, who are born with, at best, only the remnants of a cerebral cortex, show signs of being phenomenally conscious, suggesting that a pre-frontal cortex is not needed for consciousness (Merker 2007). The frontal-parietal network might be essential for complex forms of consciousness, but there is no reason to suppose that it is necessary for consciousness as such.

A better response to the objection, it seems to me, is to hold that particular phenomenal states require that cortical activity be *integrated* with sub-cortical activity. Rather than think in terms of two neural correlates—one of which reflects the content of the state and one of which reflects the activity of the phenomenal field—it is better to think in terms of a cortico-thalamic loop that includes both cortical and sub-cortical activation. Roughly speaking, the cortical component of this loop differentiates this phenomenal state from the creature's other phenomenal states, while the thalamic component of this loop binds these phenomenal states together so as to form the subject's total phenomenal state. On this model, being integrated into appropriate corticothalamic activity is both necessary and sufficient for cortical activity to be reflected in the contents of phenomenal consciousness.

These reflections point to one way in which the state-based paradigm for the study of consciousness might be employed within a unified-field conception of the structure of consciousness. What differentiates those mental states that can be conscious from those that are unable to enter consciousness? And of those states that are potentially conscious, which distinguishes those that actually enter consciousness from those that are only potentially conscious? The answer to this question, I suspect, concerns the degree to which the states in question can—and do—interact with the mechanisms underlying the creature's phenomenal field. Whether or not content enters consciousness will depend on the relations between the nodes that subserve it and the creature's phenomenal field. By looking at which cortical nodes support consciousness and which do not we might begin to get a fix on those systems that subserve the phenomenal field. The phenomenal field theorist will not be interested in the intrinsic properties of those cortical nodes that support conscious content, but will rather be interested in the relations that distinguish those cortical nodes that are capable of supporting consciousness from those cortical nodes that are not capable of supporting consciousness. In short, there are ways to reconstruct the state-based paradigm within the unified field conception of things.

7. Conclusion

Despite significant progress, the scientific study of consciousness is still very much in its infancy; not surprisingly, it includes competing research agendas. When viewed from afar, two general approaches can be discerned: some studies focus on the mechanisms underlying the contents of consciousness, others focus on the mechanisms underlying creature consciousness. Running in parallel to this methodological division is a debate about the structure of consciousness—Is a person's overall phenomenal perspective built up out of phenomenal building blocks, or does it involve a single phenomenal field into which various contents feed?

I have argued that there is much to recommend a field-based conception of consciousness. The mechanisms subserving the phenomenal field not only interact with cortical nodes so as to create particular conscious states, they also function to produce a unified total state of consciousness. On this view, the 'enabling mechanisms' of creature consciousness are constitutively involved in the construction of consciousness. If this model is on the right track, then the science of consciousness ought to be as concerned with the mechanisms underlying the phenomenal field as it is with uncovering the mechanisms underlying the contents of consciousness; that is, it ought to be concerned with both the neural states responsible for differentiating phenomenal states from each other, and the neural states that are common to each of the creature's phenomenal states. Nonetheless, state-based research paradigms are not fruitless, for by contrasting those conditions in which a certain neural node generates conscious content with those conditions in which it fails to generate conscious content we can explore the interface between the mechanisms that underlie the phenomenal field and those that underlie the contents of consciousness.⁹

Notes

1. My use of 'creature consciousness' differs from another use that currently has some currency. A number of theorists use 'creature consciousness' for wakefulness (e.g. Carruthers 2005; Rosenthal 2005). Being awake is certainly a respectable property, but it is not the one in which I am interested. Dreamers are—or at least can be—phenomenally conscious without being awake. And, arguably, patients in a vegetative state can be awake but not phenomenally conscious.
2. Although I follow tradition and speak of the search for the neural *correlates* of consciousness, it is almost universally agreed that the physical states in question are not merely correlated with conscious states but stand in some more intimate relation—such as realization, identity, or constitution—to them. Of course, the nature of this relation is a subject of much dispute—hence the practice of referring to the neural *correlates* of consciousness. See Hohwy (2007) for discussion.

3. Although I employ Searle's terminology my treatment of the distinction differs in important respects from his. Searle appears to apply these terms both to competing conceptions of the structure of consciousness and to competing approaches to the study of consciousness (what I have called state-based and creature-based paradigms). By contrast, I reserve these terms solely for competing accounts of the structure of consciousness.
4. Although he doesn't use the 'phenomenal field' terminology, Tye's (2003) approach to the structure of consciousness has certain affinities with the field-based account. However, Tye argues that fine-grained phenomenal states do not exist, which I think is an over-reaction to the building-block model. See Bayne (2005) for an analysis of Tye's position.
5. One problem with addressing these issues in terms of the neural *correlates* of consciousness is that it makes it difficult to pull these two positions apart.
6. In response to this fact, some theorists have suggested that split-brain patients have two streams of consciousness only under laboratory conditions, and that in normal contexts they enjoy a single total phenomenal state (see e.g. Tye 2003). This account appears to do justice to both the everyday behavioral unity of the split-brain patient and the behavioural disunity that he or she exhibits under laboratory conditions, but it has problems of its own. The proponent of this account needs to explain how the onset experimental conditions might split a previously unified stream of consciousness into two streams, and how a return to normal cognitive environments reintegrates the patient's two streams of consciousness.
7. In certain situations background states of consciousness might be restricted to a sub-set of the subject's overall phenomenal states. Perhaps the lucid dreamer and the daydreamer both enjoy both normal waking conscious states commingled with dream states. And perhaps, in certain cases, hypnotized subjects are able to preserve an island of intact normal awareness in the midst of an overall state of hypnosis. But such cases are both obscure and unusual; in general, background states of consciousness appear to be global.
8. One could challenge the assumption that these patients are not conscious of the stimuli that they neglect. Block (In press) suggests that neglected stimuli might be conscious but unreportable. Although I think that Block's proposal should be regarded as a live option, I will proceed on the assumption that the subject is not phenomenally conscious of neglected stimuli.
9. This paper was presented at the 11th annual meeting of the Association for the Scientific Study of Consciousness (Las Vegas), and I am grateful to the audience for their comments. I am also very grateful to Jakob Hohwy and Nicholas Shea for their comments on a previous version of this paper, and to David Chalmers for previous discussion on this topic.

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