BLOCK'S OVERFLOW ARGUMENT

BY

PETER CARRUTHERS

Abstract: This article challenges Block's 'overflow argument' for the conclusion that phenomenal consciousness and access-consciousness are distinct. It shows that the data can be explained just as well (or better) in terms of a distinction between contents that are made globally accessible through bottom–up sensory stimulation and those that are sustained and made available in working memory through top-down attention.

Many philosophers and psychologists believe that, while it might be possible to make a *conceptual* distinction between phenomenal consciousness (what an experience is *like* for a subject) and access-consciousness (what is 'globally broadcast' and available for a subject to report), in reality there is only one property picked out by these two concepts (Tye, 1995; Dennett, 2001; Baars, 2002; Dehaene, 2014). Others have denied that the properties are identical while allowing that they might always be co-instantiated in the brain (Chalmers, 1997). Ned Block has consistently argued, however, that the two properties *dissociate* (Block, 1995, 2007a, 2007b, 2008, 2011, 2014). This article focusses on his main argument (the 'overflow argument'), demonstrating that it is unsound.

First, some terminological clarification is in order. This is because access-consciousness can be understood either dispositionally or categorically. (Block, 1995, adopts the former reading, whereas Block, 2011, employs the latter.) An item can be access-conscious in the sense that it is *available* (counter-factually) to systems for forming memories, for generating affective reactions, for planning, and for verbal report. This is the dispositional notion. Perceptual information could be access-conscious in this sense because, although not currently attended and globally broadcast to all these systems, it *would* be so broadcast if attention were directed appropriately.

Pacific Philosophical Quarterly 98(S1) (2017) 65–70 DOI: 10.1111/papq.12152

Alternatively, one can take access-consciousness to be coincident with global broadcasting itself. This is the notion that Tye (1995) characterizes by saying that conscious information is *poised* to have an impact on central systems for decision making and reporting. Although this might *sound* dispositional, the intent is categorical: access-conscious information is information that *is actually being received as input* by a range of executive and decision-making systems. (Note that neither reading strictly requires that the consumer systems for globally-broadcast information should actually do anything with that information; although it would be remarkable if a globally broadcast state had *no* effect on any of the consumer systems.) Throughout the present discussion access-consciousness will be understood in this categorical sense, and regarded as a notational variant of the idea of global broadcasting. I take it that this is currently the standard use in the literature (and also in Block's own writing).

Now for Block's argument, which has remained remarkably consistent in outline across his publications from the last 20 years. It is best understood as proceeding in two steps. First, empirical evidence is drawn on to warrant an initial lemma. This is that the contents of phenomenally conscious experience are richer than – or *overflow* – what people are able to report. Then second, the conclusion is drawn that phenomenal consciousness and access-consciousness are distinct properties with separate realizations in the brain.

Support for the initial lemma draws on the empirical work of Sperling (1960), as well as more recent findings in the same vein (e.g. Landman *et al.*, 2003; Sligte *et al.*, 2008). In experiments of the sort appealed to participants are briefly presented with a complex array of items, such as letters or numbers arranged in a 3x4 grid. Participants say they saw the entire array quite clearly, but when prompted to describe it they can generally only recall three or four of the twelve items. However, if participants are cued by a tone in the interval following the offset of the stimulus to report just one particular line in the grid, then they can often report all four items. Block takes this to vindicate people's belief that they are conscious of the entire display in detail. Their problem is just that they cannot transfer the entire contents of their phenomenal experience into working memory in order to describe all those details. For everyone allows that working memory is a limited resource, being restricted to around four items when not supported by 'chunking' and other mnemonic strategies (Cowan, 2001). The conclusion, then, is that phenomenally conscious experience is richer than people can report.

Block takes this conclusion to have implications for the debate over the neural correlates of phenomenal consciousness, demonstrating the reality of the distinction between phenomenal consciousness and access-consciousness. Dehaene and others have argued that consciousness should be identified with

the global broadcasting of perceptual information within the brain (Baars, 1988, 2002; Dennett, 2001; Dehaene *et al*., 2006; Dehaene, 2014). In cases where people perceive a stimulus unconsciously there can be robust neural reverberation in occipital and temporal cortex which fades over the course of a few seconds, and which can give rise to a variety of priming effects. But when conditions are altered in such a way that participants report seeing the stimulus, these reverberations become linked into a global pattern of activity including large regions of prefrontal and parietal cortices as well. Dehaene denies that there is any real distinction between phenomenal consciousness and access-consciousness, and identifies both with the global broadcast of information in the brain. In light of his overflow argument Block claims, in contrast, that the reverberations in occipital / temporal cortex can be phenomenally conscious in the absence of broadcasting, and that the data are best explained by supposing that the contents of this reverberating activity are richer than can enter into the global workspace.

Critics of Block have mostly challenged the *lemma* of his overflow argument (namely, that phenomenally conscious experience is richer than we can report). They have denied that the contents represented in occipital / temporal cortex are already conscious (in either sense), just awaiting the post-stimulus cue and subsequent direction of attention in order to become globally accessible (Kouider *et al*., 2010; Cohen and Dennett, 2011; Phillips, 2011; Stazicker, 2011). Rather, the effect of the cue may be to attract attention to a set of representations that are mostly *un*conscious (both phenomenally and access-), thereby issuing in their global broadcast. Since attention is a limited resource (as is widely assumed), there is a limit to how much of the information represented in the visual system can become conscious. In fact, prior to the post-stimulus cue, all that is conscious might be a *gist* representation of the scene ('there are a bunch of letters in a grid'), perhaps with one or two items represented in detail, which somehow gives people the *impression* of seeing the complete details of the display.

I propose that one can also take a different tack: granting Block's interpretation of the Sperling experiments (that is, granting the truth of the lemma) while denying the conclusion that phenomenal consciousness and access-consciousness dissociate. In fact, the argument is invalid, not just in a logical sense but also as a purported inference to the best explanation. There is an alternative (and empirically plausible) explanation of the overflow finding. As I will show, it is possible to make sense of the idea that phenomenal consciousness is richer than we can report in a way that is consistent with the claim made by Dehaene and others that phenomenal consciousness coincides with global broadcasting (that is to say, with access-consciousness).

In order to make this point I need to put in place five related theses. I do not propose to argue for these here. (For an extended defense in a different context, see Carruthers, 2015.) For my goal is not to establish the truth of my alternative

construal of the overflow findings, but merely to show that it provides a plausible alternative to Block's account. This would establish (at least *prima facie*) that his argument fails as an inference to the best explanation.

The first thesis is that attentional signals directed at representations in sensory regions of the brain are a necessary (and, with other factors, sufficient) condition for those representations to be globally broadcast. The second is that attention is a limited resource: only so much information can be attended to at any one time. The third is that the effect of attentional signals is to boost the neural activity underlying the targeted representations (while also suppressing competing activity, and perhaps also sharpening the representations in question). The fourth assumption is that working memory uses the same attentional network to sustain previously-presented sensory representations in the global workspace. And finally, the fifth assumption is that global broadcasting takes place when some sort of threshold of neural activity is reached. All of these assumptions, although not entirely uncontroversial, are widely accepted among cognitive scientists.

It should now be easy to see how Block's overflow argument fails. For notice that there will be a significant difference between the amount of attention that is necessary to cause the global broadcast of an incoming sensory signal and the amount needed to sustain that same representation in working memory thereafter in the absence a stimulus. The incoming signal will involve exogenously caused neural activity that is already above baseline, needing less of an attentional boost in order to reach the threshold for global broadcasting. In contrast, when attention is used to sustain that activity in the absence of the stimulus, attention will have to do all the work unaided. One would thus expect that *more* attention should be necessary to sustain a representation in working memory for purposes of reporting than is needed to result in the global broadcast of the corresponding perceptual representation. As a result, greater richness and detail may be globally broadcast in perception than can be sustained in working memory thereafter.

We can thus grant Block his perceptual-overflow lemma. There is more information that is conscious in perception than can be sustained in working memory once the stimulus is removed. When people in Sperling-style experiments report that they can see most of the twelve items clearly, they can be telling the truth. For attention distributed over all twelve stimuli may be sufficient to boost the neural activity caused by those stimuli over the threshold for global broadcasting, resulting in access-conscious perception of most of those items in identity-defining detail. But as soon as the stimulus is removed that neural activity will begin to decay, and attention alone will soon be needed to sustain it, holding the activity far enough above baseline for global broadcasting to continue to take place. Without the support of any bottom–up stimulus, we can suppose that attentional resources cannot any longer be spread so thinly. Indeed, in order for four

items to be sustained in the global workspace, all attentional resources may need to be targeted on those four items and withdrawn from the remainder. As a result (since reporting takes significant time) people can normally only report three or four items from the initial display.

On this account, representations of much of the initial display in Sperling-style experiments can be globally broadcast when attention is distributed evenly over the entire display; but these broadcast representations decay rapidly once the stimulus is withdrawn. However, the neural activity caused by the stimulus in occipital / temporal cortex will still be actively reverberating, but fading away gradually over the course of a few seconds. The role of the post-perceptual cue is to fix attentional signals on a subset of this activity (thereby attending to a subset of the letters in the display). Provided that there is still sufficient activity there to be targeted by attentional signals, the role of the post-perceptual cue is to enable the corresponding items to be retained in working memory for subsequent report.

Note that no distinction needs to be drawn here between the kind of conscious status possessed by our perceptions, on the one hand, and our subsequent working-memory representations of those perceptual contents, on the other. Both consist of globally broadcast representations resulting from targeted attention. Both are equally access-conscious, and both can have phenomenal properties. So there are no grounds, here, for claiming an empirical dissociation between access-consciousness and phenomenal consciousness. What Block takes to be a contrast between rich phenomenal experience, on the one hand, and more limited-content access-consciousness, on the other, might rather be the difference between rich stimulus-driven perception (which is both access-conscious and phenomenally conscious) and limited-content working memory (which is likewise both access-conscious and phenomenally conscious).

Department of Philosophy
University of Maryland

Acknowledgments

I am grateful to Steven Gross, Ryan Ogilvie, and Bénédicte Veillet for comments on an earlier draft of this paper.

REFERENCES

Baars, B. (1988). *A Cognitive Theory of Consciousness*. Cambridge: Cambridge University Press.
Baars, B. (2002). "The Conscious Access Hypothesis: Origins and Recent Evidence," *Trends in Cognitive Sciences* 6, 47–52.

Block, N. (1995). "On a Confusion about a Function of Consciousness," *Behavioral and Brain Sciences*, 18, pp. 227–287.

Block, N. (2007a). "Consciousness, Accessibility, and the Mesh Between Psychology and Neuroscience," *Behavioral and Brain Sciences* 30, pp. 481–499.

Block, N. (2007b). "Overflow, Access, and Attention," *Behavioral and Brain Sciences* 30, pp. 530–548.

Block, N. (2008). "Consciousness and cognitive access," *Proceedings of the Aristotelian Society* 108, 289–317.

Block, N. (2011). "Perceptual Consciousness Overflows Cognitive Access," *Trends in Cognitive Science* 12, pp. 567–575.

Block, N. (2014). "Rich Conscious Attention Outside Focal Attention," *Trends in Cognitive Sciences* 18, pp. 445–447.

Carruthers, P. (2015). *The Centered Mind: What the Science of Working Memory Shows Us About the Nature of Human Thought*. Oxford: Oxford University Press.

Chalmers, D. (1997). "Availability: The Cognitive Basis of Experience," *Behavioral and Brain Sciences*, 20, pp. 148–149.

Cohen, M. and Dennett, D. (2011). "Consciousness Cannot Be Separated From Function," *Trends in Cognitive Sciences* 15, pp. 358–364.

Cowan, N. (2001). "The Magical Number 4 in Short-Term Memory: A Reconsideration of Mental Storage Capacity," *Behavioral and Brain Sciences* 24, pp. 87–185.

Dehaene, S. (2014). *Consciousness and the Brain: Deciphering How the Brain Codes Our Thoughts*. New York: Viking Press.

Dehaene, S., Changeux, J.-P., Naccache, L., Sackur, J. and Sergent, C. (2006). "Conscious, Preconscious, and Subliminal Processing: A Testable Taxonomy," *Trends in Cognitive Sciences* 10, pp. 204–211.

Dennett, D. (2001). "Are We Explaining Consciousness Yet?" *Cognition* 79, pp. 221–237.

Kouider, S., de Gardelle, V., Sackur, J. and Dupoux, E. (2010). "How Rich is Consciousness? The Partial Awareness Hypothesis," *Trends in Cognitive Sciences* 14, pp. 301–307.

Landman, R., Spekreijse, H. and Lamme, V. (2003). "Large Capacity Storage of Integrated Objects Before Change Blindness," *Vision Research* 43, pp. 149–164.

Phillips, I. (2011). "Perception and Iconic Memory: What Sperling Doesn't Show," *Mind & Language* 26, pp. 281–311.

Sligte, I., Scholte, H. S. and Lamme, V. (2008). "Are There Multiple Visual Short-Term Memory Stores?" *PloS ONE* 3, pp. e1699.

Sperling, G. (1960). "The Information Available in Brief Visual Presentations," *Psychological Monographs: General and Applied* 74, pp. 1–29.

Stazicker, J. (2011). "Attention, Visual Consciousness and Indeterminacy," *Mind & Language* 26, pp. 156–84.

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