Commentary on Nemira Gasiunas's "Grapheme-color synesthesia as perception without awareness", The Third Online Consciousness Conference, Feb 18 - March 4, 2011.

Perception without Awareness: Blindsight, Higher Synesthesia and Vision for Action

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In her paper Nemira Gasiunas raises the interesting question of whether there can be perception without awareness. She considers and rejects two candidates to be cases of perception without awareness, viz. inattentional blindness and blindsight. She then proposes that grapheme-color synesthesia is a case of perception without awareness.

In order to address the question of whether there can be cases without awareness, it will be helpful to look closer at the concepts of perception and awareness. Gasiunas doesn't offer a definition of 'perception' but takes it to be demonstrable in terms of the ability to discriminate among stimuli. I doubt a universal definition of 'perception' that is applicable to non-humans in non-nomic situations is easy to come by. If, however, we restrict our cases to actual human subjects, a characterization of 'perception' may be within reach.

Perception is likely to be an intentional act. When conscious it is likely accompanied by a representational phenomenal character. However, we cannot characterize 'perception' in terms of awareness without begging the question. Another way to capture the intentionality of perception is in terms of what the act disposes the perceiving agent to do.

I will here allow for a notion of perception that does not require veridicality. Let a sensory stimulus be an external stimulus or a proximate stimulus that activates neurons in the occipital cortex (or analogous areas for non-visual cases). The concept of perception can then be cashed out as follows:

Perception

ϕ is an instance of perception iff ϕ is a (sensory) neural process in subject S triggered by a sensory stimulus that (in the absence of independent counterevidence) disposes S to act in ways characteristic of neuro-typical

individuals exposed to an external stimulus under normal viewing conditions (or analogous conditions for non-visual cases).

Independent counterevidence is here to be understood as independent evidence against non-veridicality. In the cases of known illusions, for example, we are not tempted to act in ways characteristic of neuro-typical individuals but arguably these cases are still cases of perception.

We will ultimately need to specify what we mean by 'act in ways characteristic of neuro-typical individuals exposed to an external stimulus under normal viewing conditions'. I will refrain from engaging in that tedious exercise here. Suffice it to say that the acts will involve reaching to and grasping objects, avoiding or crashing into objects, reacting in stimulus-relevant emotional ways, making stimulus-relevant perceptual reports, forming stimulus-relevant propositional attitudes, and so on.

'Awareness' is more difficult to characterize than 'perception'. It is quite plausible that the notion is fundamental and hence cannot be defined in terms of more primitive notions (Chalmers 1996). In previous work I have argued that awareness comes in degrees (Brogaard, ms). While strongly conscious states will be vivid enough to be accessible to introspection and reporting, weakly conscious states may not be vivid enough to be accessible by executive processes. Like other degree concepts, however, awareness is best understood in terms of its definite instances. And these instances are accessible to introspection.

Blindsight

Let us turn now to the candidates to be cases of perception without awareness. Though I believe cases of inattentional blindness are indeed cases of perception without awareness, I am not going to make a case for that hypothesis here. The cases I want to address are those of blindsight and grapheme-color synesthesia. At the end of my commentary, I will briefly discuss a case not addressed by Gasiunas, viz. vision for action.

Gasiunas's main objection to blindsight being a clear case of perception without awareness is that we cannot rule out that the blindsighter makes his discriminations on the basis of contextual cues. I am not exactly sure how the cues Gasiunas lists as enablers of successful discrimination could enable blindsighter's choices in forced-choice paradigms if blindsight is not unconscious perception. Gasiunas points to Milner and Goodale's suggestion that blindsighters might be using vision for action in the discrimination tasks. But, as we will see below, vision for action is an exemplar of unconscious perception.

But it doesn't really matter, for there is little doubt that blindsight is a neural process triggered by a sensory stimulus that disposes the subject to act in ways characteristic of neuro-typical individuals exposed to an external stimulus under normal viewing conditions, and there is therefore little doubt that blindsight counts as a case of perception (Weiskrantz 1996, Weiskrantz et al. 1974, Weiskrantz et al 1995, Weiskrantz 1998, Weiskrantz 2009). For

example, most blindsight subjects tested have been found to have spectral sensitivity to wavelength (Stoerig and Cowey 1989) and the ability to reliably discriminate wavelength of stimuli in their blind field (Stoerig and Cowey 1992). In forced-choice paradigms trained blindsighters such as GY sometimes predict the color, motion and location of stimuli presented to them in their blind field with close to 100% accuracy. It has furthermore been shown that with training blindsighters can sometimes apply their skills more independently. Some blindsighters (e.g., GY) have acquired the ability to guess when to make a guess about a stimulus in their blind field in experimental settings (Sahraie et al., 2006), or show other remarkable capacities (in terms of e.g. accuracy) (e.g. DB) (Trevethan, Sahraie and Weiskrantz 2007, Kentridge, Heywood and Weiskrantz 2007). Training has similar effects on subjects in cases of induced blindsight (Schwiedrzik, Singer, and Melloni 2008).

The important question with respect to blindsight is not whether it is an instance of perception but whether it is a case of *unconscious* perception (Brogaard 2011, In Press a, In Press b). The issue of whether blindsight really is blind has been the subject of much debate. Paul Azzopardi and Alan Cowey (1997) carried out a sophisticated signal detection analysis study that showed that blindsight is not like degraded normal vision. Based on the results of Robert Kentridge, Charles Heywood & Weiskrantz (1999), Larry Weiskrantz (2009) compared discrimination performance and levels of awareness in sighted and blind hemifields and found that discrimination can be highly accurate despite no reported awareness. More recently Morten Overgaard et al (2008) and Mark Christensen et al. (2008) have argued that the current methods for reporting visual awareness do not suffice for determining visual awareness. They conducted a series of studies using improved measures for determining visual awareness and argued on the basis of these studies that blindsight is indeed severely degraded conscious vision. However, their methods for testing for subjective awareness presuppose that reported clarity “clear image” correlates with visual awareness, an assumption which is highly questionable (Brogaard, In Press a).

Navindra Persaud and Hakwan Lau recently added further evidence to the hypothesis that blindsight is not accompanied by visual awareness (Persaud and Lau 2008). Blindsight subject GY was given definitions of ‘qualia’ from The Oxford Companion to the Mind, The Stanford Encyclopedia of Philosophy, Consciousness Explained by Daniel Dennett and “Epiphenomenal Qualia” by Frank Jackson. GY read them at his leisure and was then tested for blindsight. Afterwards the researchers questioned him about whether he understood the notion of qualia, and whether he “experienced qualia.”

To the first question GY responded that he thought he understood the notion but didn’t understand what was meant by ‘ineffable’ and ‘private’. To the second question he first responded that he never has qualia in his right (affected) hemifield in everyday life and only ‘very rarely’ has qualia in his right hemifield when performing well in experimental conditions. But the researchers’ follow-up questions prompted him to retract the latter claim. The team concluded that GY never "experiences qualia." So, it seems that we have exceedingly good evidence for thinking that blindsight is a case of perception without awareness.

Grapheme-Color Synesthesia

Let us turn now to grapheme-color synesthesia. Gasiunas is quite right that there are many unconscious processes involved in synesthesia. But typical cases of synesthesia are hardly unconscious processes. In fact, the only insight we have into synesthesia relies on perceptual reports combined with other tools, such as visual search paradigms and neuroimaging. As Gasiunas points out, there is some evidence that synesthetes register colors before they become aware of them, but visual perception operates in exactly the same way. We register colors in the retina and the LGN, for example, before we become aware of them. However, we don't count these processes as perceptual processes because they do not ground action based on perception in neuro-typical individuals. Likewise, even though the high-level processing, cross-talking and feedback connections that are required for synesthetic experience to occur are not consciously registered, we shouldn't count them as unconscious perceptual processes unless they can ground action.

Most of the cases discussed by Gasiunas do not lend evidence to the hypothesis that these processes are perceptual processes. For example, about the pop-out cases in which 2s can be discriminated faster among a set of 5s when the 2s and the 5s have different synesthetic colors, Gasiunas says "Such cases indicate that synesthetic color experiences influence the perception of the grapheme; specifically, they speed up the conscious perception of this grapheme. This in turn suggests that the synesthetic color-experience is triggered before the target grapheme is identified". However, the fact that the synesthetic color experience is triggered before the targeted grapheme is identified does not show that any unconscious processes involved in generating synesthetic experiences are perceptual processes. Quite on the contrary. The cases show that identification (i.e., an action based on perception) is possible only once the synesthetic experience is generated.

At the end of the paper Gasiunas discusses two traditional synesthesia studies, crowding and priming studies. In both cases the visibility of the stimulus is decreased, and the studies show that synesthetes still have an advantage compared to non-synesthetes in terms of reacting to graphemes. They react significantly faster than non-synesthetes. The processes grounding the faster reactions are indeed potential candidates to be unconscious perceptual processes. One problem with crowding and priming studies, however, is that the stimulus still is weakly "visible".

In recent studies studies, however, we have demonstrated that higher synesthetes who don't have pop-out experiences locate hidden number sequences faster than non-synesthetes (Brogaard 2010). This indicates that even though the synesthetic experiences of higher synesthetes are triggered by thoughts or visual images of graphemes and not by externally presented graphemes, the synesthetic subjects still unconsciously perceive externally presented graphemes as colored.

Vision for Action

One final cases of unconscious perception that I want to mention here that Gasiunas doesn't address is the case of vision for action (Goodale and Milner 1992, Milner and Goodale 2008). Vision for action processes are perceptual processes in the sense articulated above. They occur in the dorsal stream, which starts in the occipital lobe and then runts upward through the parietal lobe. These processes prepare the subject for immediate, or "online", action. Since they are triggered by sensory stimuli that dispose the subject to act, these processes are perceptual processes. Moreover, as I have argued on earlier occasions, vision for action processes are unconscious processes (Brogaard In Press a, In Press b).

There is lots of evidence for the hypothesis that the vision for action representations that guide immediate action are unconscious. If an object suddenly changes location, subjects adjust arm velocity and trajectory in less than 100 ms, which is not enough time for the human brain to consciously represent a change in object location or a corresponding change in velocity and trajectory (Paulignan et al. 1991). Further, when subjects are asked to use a minimally demanding vocal response (Tah!) to indicate their awareness of a change in object location, correction of movement occurs significantly faster than the vocal response. Corrections of trajectory and hand aperture occur within 100 ms, whereas the vocal response occurs after 420 ms (Castiello, Paulignan and Jeannerod 1991, Castiello and Jeannerod 1991).

Studies of pointing and saccadic eye movement further indicate that subjects can correct saccadic eye and pointing movements faster than they can consciously perceive a change in object location (Goodale, Pelisson and Prablanc 1986, Pelisson et al. 1986). In one study, the researchers asked subject participants to point as fast and accurately as possible to stimuli occurring in the dark (Pelisson et al. 1986). In the first series of trials, the target leaped from an initial position to a randomly selected position. In the second series, the target made a second jump in the same direction as the initial leap. The subjects reported that they were unaware of the second jump, and they were unable to predict its direction, but while saccadic eye and pointing movements were initially aimed at the target's position after the first jump, both were instantly adjusted to fit the target's new location. Even though the participants had no awareness of the two jumps, they were evidently seeing and acting on both jumps. The findings indicate that the subjects updated movement trajectory and target location without awareness of the update.

Similar results were reported by L. S. Jakobson and Goodale (1989). They first showed that subjects could not detect a three-degree shift in vision through wedge prisms. They then monitored the subjects' movements. Despite no reported conscious awareness of the shift in vision, the shift generated a modified hand-path curvature.

Empirical data have also shown that while subjects are unaware of relying on visual information about their hand prior to movement, they perform with greater accuracy when this information is available (Prablanc et al.1979; Elliott et al. 1991; Rossetti et al.1994; Desmurget et al. 1995).

Together these findings indicate that the dorsal stream representations that constitute vision for action are inaccessible to consciousness.

In sum, I believe Gasiunas is absolutely right that there are unconscious perceptual processes but ordinary synesthetic processes are not instances of unconscious perception. The best candidates to be unconscious perceptual processes are cases of blindsight, cases of perception of externally presented graphemes by higher grapheme-color synesthetes and vision for action.

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