Grapheme-color synesthesia as perception without awareness

NEMIRA GASIUNAS

Columbia University

Many philosophers assume that all perception involves awareness on the part of the perceiving subject. There have been various experimental findings, however, which purport to demonstrate the occurrence of perception in cases where the subject is not aware that they are perceiving. In this paper, I review two kinds of cases which have been claimed as evidence for the existence of perception without awareness, and point out the weaknesses in each of them. By way of remedying these deficiencies, I draw attention to a relatively new kind of case. Experiments performed with grapheme-color synesthetes, I argue, provide the most convincing case yet in favor of perception without awareness.

1. Perception without awareness: What is at stake?

Philosophers, psychologists and neuroscientists disagree - with each other and amongst themselves - about whether there can be perception without awareness. The idea of unconscious perception contradicts what is philosophical received wisdom: that perception necessarily involves consciousness *of some kind* on the part of the perceiving subject.[1] Indeed, many philosophers have defined the first in terms of the second; a strategy which seems perfectly in keeping with 'folk' usage.[2] Given how widespread is the presumed tight link between perception and awareness, the stakes are high. In Tim Crane's dramatic words, showing that perception can occur in the absence of awareness would demonstrate that "sensations are not essential to perception [and] if it did, then many theories of perception would be doomed."[3]

It should be immediately obvious that this is a debate in which clarity of concepts is even more than usually superlative. On the one hand, consciousness is what Block dubs a "mongrel concept", and in so far as awareness is treated as synonymous with a specific kind of consciousness, we need to establish what *kind*, and what sort of test we can apply to establish its

[1] A preliminary note on the terms 'aware' and 'conscious': I treat these terms as synonymous, in so far as to be conscious of something is, in ordinary language, the same as to be aware of something. Awareness is *not* identical with alI kinds of consciousness. This issue will be treated more fully below.

[2] The *Merriam-Webster* dictionary classifies perception either as "awareness of the elements of environment through physical sensation" or as "physical sensation interpreted in the light of experience". See www.merriam-webster.com/dictionary/perception

[3] Crane, ed. (1992), p.14

presence. At the same time, we need to find a test for cases of genuine perception which doesn't simply define out of existence the possibility of its being unconscious. It may turn out that the evidence in favor of perception without awareness [which I will henceforth refer to with the unfortunately clumsy acronym, PwA] is flawed or uncompelling; but the kinds of cases I want to discuss suggest that, if it is true that PwA is impossible, it is not, at least, trivially true.

The first issue is to establish exactly what we mean by awareness. It is not unusual to find awareness and consciousness treated as synonymous in the literature.[4] But there are many *kinds* of consciousness, and awareness is plausibly coextensive only with some of them. First, awareness is always awareness *of* - what Rosenthal calls *transitive consciousness.* It does not seem to make sense to talk of awareness independently of an object of awareness, though it apparently *does* make sense to talk of consciousness, more generally, in an intransitive sense.[5] '*Of'* what, exactly? One distinction to bear in mind is the distinction between perception of *facts* and perception of *things.* It is one matter, for example, to be aware that one is perceiving Susan; and quite another to be aware that Susan is a spy.[6] Just because we are not aware of the facts about what we are perceiving, that does not mean we are not aware of the objects we are perceiving. Claims about perception without awareness obviously involve the absence of the stronger, thing-awareness.

Another important difference involves 'higher' and 'lower' levels of awareness. For example, 'automatic pilot' experiences are meaningfully 'unaware', but not, I think, in the sense relevant

---

[4]A good example comes from Searle (Quoted in Block, (2007) p.166) who writes that "by consciousness I simply mean those subjective states of awareness or sentience that begin when one wakes in the morning and continue throught the period that one is awake."

[5] Rosenthal (1994)

[6] The example is due to Dretske (2006)

to this discussion. Armstrong's truck driver example brings this point out nicely [7]. The long-distance driver, on automatic pilot, "is aware of the road", but he "does not perceive his perceiving, or anything else that is going on in his mind"; so there is a distinction between being aware of an object of perception (A), and being aware of one's awareness of that object of perception (A*). The debate over perception without awareness centers on A.[8]

Armstrong's case also brings out the distinction between awareness and attention. Awareness is often equated to what is within the focus of attention; but the two phenomena are in principle independent. The most useful conception of attention is that of a selection process; attention is the mind's selective 'directedness' towards certain features of its surroundings; often in order to process these faster or in more detail. Armstrong's truck driver, it might be argued, has awareness of the road, but he is not *attending* to his awareness of the road.

It is a further question how we can *measure* A. For a long time, the dominant mode of assessment of awareness was also the most obvious: to *ask* the subject whether they were aware.[9] According to this 'subjective test' of awareness, S must judge, *and to be prepared to say* that she perceives x. But this criterion is problematic. For one thing, it seems perfectly obvious that animals and neonatals need not be able to *express* the contents of their perceptions in order to count as being aware - arguably, they do not even need to have any beliefs about the contents of

[7] Armstrong (1981) p.14 "If you have driven for a very long distance without a break, you may have had experience of a curious state of automatism, which can occur in these conditions. One can suddenly 'come to' and realize that one has driven for long distances without being aware of what one was doing, or, indeed, without being aware of anything. ine has kept the care on the road, used the break and the clutch perhaps, yet all without any awareness of what one was doing."

[8] Of course, higher order theorists would deny that conscious awareness exists without A*. See, for example, Rosenthal (2004). I will just stipulative that this is not the notion of awareness that I'm working with.

[9] See, for example, Sidis (1898); Williams (1938).

their awareness.[10] But even in the case of normal adult human perceivers, it has been objected that the subjective measure places an unwarranted amount of confidence in the subject. Charles Eriksen was one of the first to observe that factors unrelated to awareness (e.g. ideas about value) may lead subjects to conservatively underestimate their levels of awareness.[11] These sorts of response biases are particularly threatening to the validity of subjective measures because they may vary enormously according to the personality of the subject tested and the conditions under which they are tested. As an alternative, Eriksen recommended an *objective* test of awareness*;* one which requires merely that S reliably judge or say whether x is present. Examples include "forced choice" tests or "post-decision wagering".[12] Since a subject can satisfy this measure while believing she perceives absolutely nothing at all it is obviously less demanding than the subjective test.

We now turn to the question of how to frame a test for perception. An initial suggestion might be the transmission of information from stimulus *x* to a subject, *S*. But a problem immediately arises as to the *kind* of information which counts. It is uncontroversial that we are unaware of many of the processes that go on inside our bodies when we receive information; I am not aware, for example, of most of the signals from my musculature and inner ear that enable me to stand upright. If such operations of the central nervous system were all that were 'unconscious perception' involved, the debate would be entirely devoid of interest.

---

[10] Viz Dretske: "Human infants […] see, hear, and smell things in the same conscious way you and I do, but […], lacking conceptual sophistication, they do not think they are. Nor do they think they are not. They don't have thoughts on this topic. There is awareness, but no acknowledged awareness. Acknowledgment, though, isn't necessary for awareness. That is a level of understanding you don't need to be aware of things." Dretske, (2007), p. 11

[11] Eriksen, C. (1960)

[12]Forced choice tests are ones where subjects have to guess as to features of percepts, even under conditions of uncertainty. Wagers are simiilar. Following presentation of a stimulus, subjects are required to make two responses: a psychophysical judgment about some attribute of the stimulus and a rating of their confidence in that judgment. For the latter, see Clifford et al. (2008)

Dennett's distinction between 'personal' and 'sub-personal' levels of information processing provides us with a principled basis for identifying the worthy cases.[13] The interesting questions about perception without awareness seem to apply uniquely to the personal level, because perception is a concept which acquires its content *within* the personal level.[14] Discussing pain perception, Dennett says,

> "when we abandon the personal level in a very real sense we abandon the subject matter of pains as well. When we abandon mental process talk for physical process talk, we cannot say that the mental process analysis of pain is wrong, for our alternative analysis of pain cannot be an analysis of pain at all, but rather of something else - the motions of human bodies or the organization of the nervous system."[15]

Sub-personal level explanations are physical and mechanistic; personal level explanations invoke a vocabulary that is different in kind; a conceptual system based on "people and their sensations and their activities".[16] Whilst it may be necessary, it is not sufficient to define perception in terms of 'transmission of information', because this purely causal account fails to capture the sense in which perception is necessarily something predicated of an individual. [17]

---

[13] Dennett (1969) One way to flesh out the distinction is as follows: when we inquire what persons do, explanation at the personal level - the level that adverts to a person's thoughts, motives, passions, and purposes - end with the citing of one sort of *capacity* or *trait* (we appeal to someone's eloquence, for example). But there are still questions to be asked as to how a person has the capacities she has, and how they are exercised in particular cases (what happens in someone's brain when they use long words in sophisticated ways?). Explanations on this second level are ones in which the person, *qua* person, does not figure; rather, they relate to the causal interaction of a person's parts. These causal processes that go on within us do not seem to be *accessible to us*.

[14]To be sure, Dennet allows that we can talk derivatively of perception on the sub-personal level, but this sort of usage makes sense only in so far as we 'borrow' our descriptions from the personal level.

[15]Dennet (1986) p.94

[16] Dennett (1986) p.93

[17] Tyler Burge puts this point nicely: "necessarily and constituitvely, *individuals* perceive. Perceptual states, as distinct from transformations by which they are formed, are the individual's [...] Perceptual states are realizations of individuals' capacities [and] this claim is a priori." Burge (2010) p.369

Recall that we were not looking for a definition of perception but rather for a *test* which gives *sufficient* conditions for what counts. I think we look in the right direction when we enquire *why* perception properly applies only to the personal level. When he characterizes the personal level in terms of 'people's *activities'*, Dennett alludes to a constitutive connection between perception and agency. Tyler Burge presses this point, portraying the action-guiding quality of perceptual kinds as the foremost reason why perception is necessarily attributable to individuals: "perceptual kinds constitutively figure in individual functions—in fulfilling needs and guiding action."[18] Plausibly, then, genuine perception will be capable of influencing actions. The emphasis on descriminative capacities is taken up by Dtreske.[19] A good working test of whether X is perceived, he claims, is whether the perception carries information about x *and* whether this information is available for control of S's actions. This sort of criterion leaves open the possibility that the perceiver not be aware of the perceptual experiences which move them to the appropriate sort of action. It is not, however, identical with our test for awareness, for the following reason: it is conceptually possible for a subject's actions to be influenced by a given stimulus, in the appropriate way, without that subject being able to discriminate, when tested, between the presence or absence of that stimulus. For example, we can imagine a subject who can manipulate a given object without placing correct or consistent bets about features of that object. Our tests for perception and for awareness do not, at least *prima facie*, pick out the same phenomenon.

[18] Burge (2010) p.370

[19] Dretske (2006)

2. Shortcomings in existing examples of perception without awareness

I want now to consider the two most convincing cases which have been offered as proof of PwA, and to indicate, for each, where they fall short. The criticisms I address are not decisive, but they do cast serious enough doubt on existing eperimental findings to warrant a quest for more robust evidence.

a. Inattentional blindness and change blindness

One class of case cited as evidence of PwA are cases of 'inattentional blindness', or 'change blindness'.[20] Psychologists have found that normal perceivers are often unaware of large changes in their visual environment until attention is drawn directly to these objects. Mack and Rock demonstrated 'inattentional blindness' using rapidly flashed geometric stimuli.[21] The observer's task was to indicate which arm - horizontal or vertical - of a briefly flashed cross was longer. A small object was also flashed close to where the observer is looking, alongside the cross. When observers were subsequently given a recognition test in which they were asked to pick out this second object from four alternatives, they were unable to indicate which shape had been presented. Paying attention to the vertical and horizontal arms apparently made observers "blind" to the unattended objects, even though those objects were well within their visual field.[22]

---

[20] These two terms cover different phenomena; *inattentional blindness* refers to all cases in which perceivers are 'blind' to the presence of certain stimuli because their attention is focussed elsewhere. *Change blindness* is more specific - it covers cases in which perceivers fail to notice changes in their environment because of attentional deficits.

[21] Mack and Rock (1998)

[22] The same results have been found in experiments conducted in more naturalistic settings. In a now well-known video, Daniel Simons and Christopher Chabris showed two teams of three players each, who threw a basket ball between them. [22] Observers were told to count the number of passes. After about 45 seconds, a person in a gorilla suit walked through the game, stopped and thumped their chest. When observers were asked, afterwards, whether they had seen anything unusual happen, nearly half failed to report seeing the gorilla.

Such cases are often used to illustrate the central role played by attention in perception.[23] But change blindness is also taken to demonstrate PwA; the idea being that observers *are perceiving* areas outside their attention, but *without awareness that they are doing so*. [24] On the basis of similar experiments, for example, Fernandez-Duque and Thornton claimed that representation of change can occur in the absence of awareness.[25] Using forced choice methods to determine perceptual discrimination, they claimed to show that visual system is capable of tracking orientation change, but that without attention, such representations will not reach awareness and will not be accessible for explicit report

Though change blindness experiments with respect to PwA possess the advantage of relying on objective measures of awareness, ultimately, they won't work. As an illustration of why not, consider Dretske's description of Sarah, who looks at seven clearly visible people gathered around a table, without paying particular attention to any of them. She then looks away, during which time an additional person, Sam, joins the group. Sam is clearly visible; but when Sarah looks back, she doesn't notice the difference. Having no reason to suspect a change has occurred, she thinks she is looking at the same group of people; when asked whether she sees a difference, she responds in the negative. Says Dretske:

"This is an example of what psychologists call change blindness—a clearly visible difference that Sarah does not see. At least she doesn't believe she sees it. She says she doesn't see it. [...] [But] the question we are now asking is

---

[23] See, for example: Reseink et al (1997)

[24] This does not of course contradict my earlier claim that attention and awareness are importantly distinct. As well as controversy over whether (a) perception necessarily involves awareness, it is a moot point amongst psychologists and philosophers alike whether b) perception necessarily involves attention and c) attention necessarily involves awareness. The following sorts of cases affirm a) whilst denying b) and remaining neutral on (or sometimes affirming) c).

[25] Fernandez-Duque, Diego and Thornton, Ian M. (2000) Subjects were presented with two 16-rectangle displays, separated by a blank screen, and shown 250 miliseconds apart. The rectangle frames were identical except for a single object which changed orientation during the intermediate blank. The investigators claimed that awareness is "not always *necessary* for the representation of change. Although conscious visual experience of change may indeed require attention, the current work raises the possibility that our overall mental representation of the visual world is not as incomplete, incoherent or as dependent on the last attentional act as has sometimes been suggested."[29]

not whether Sarah thinks she is aware of something different, but whether she is, in fact, aware of something different. We are not interested in what Sarah knows. We are interested in what Sarah sees. We want to know what, if anything, she is blind to, not what, if anything, she is ignorant of."[26]

The problem with this case is not obvious that the fact that Sarah has not *noticed* a difference means that she has not *consciously perceived* a difference. Indeed, it is more plausible to suppose that Sarah's failure at detection represents a cognitive shortcoming rather than a lack of conscious perception. As with Armstrong's truck driver, Sarah is conscious of objects that constitute a visible difference yet not conscious of the fact that she is conscious of them.
The claim about cognitive shortcomings is also well-illustrated Sperling's memory-based experiment.[27] In Sperling's experiments subjects are briefly (50 milliseconds) shown set of letters:

T D A

S R N

F Z B

Asked to identify as many letters as they could, subjects identified at most four. But when asked, after removal of the stimulus, to identify the letters in only a single row subjects could often identify every letter in any given row. There was an important distinction between subjects' responses under 'full report' conditions and under 'partial report' conditions, despite the stimuli being exactly the same in both situations.[28] Sperling concludes that: "a calculation of the information available to the subjects for their partial reports indicates that between two and three

[26] Dretske (2007) p.216

[27] Sperling, G. (1960)

[28] Clearly, this is not a question about attention: the signal for which row to report occurs *after* removal of the stimulus. There is no longer anything out there (where the stimulus was) for subjects' attention to be drawn to.

times more information is available for partial reports than for whole reports."[29] If more information is available than subjects can use, Sperling argues, they must choose a part to remember, and a part to forget. But the 'forgotten information' is nonetheless available to a subject (as revealed by the partial reports) in conscious experience at the time and shortly after the letters are seen. It is available as a reason to do (say) one thing rather than another. Subjects in Sperling cases thus pass subjective measures of PwA but fail to pass objective measures.

b. Blindsight

Where the previous case had application to normal perceivers, blindsight cases concern subjects who have experienced brain damage. A damaged striate cortex (the primary locus in the brain for visual processing) results in a scotoma (a region of blindness) in the corresponding part of the visual field. In some such patients, a so-called '*blindsight'* phenomenon has been observed. Blindsight involves the ability of some patients with scotoma to detect and localize visual stimuli presented within the blind region where they are forced to guess. The *locus classicus* of this experimental discovery is in a paper by L.Weiskrantz and his colleagues, who found that blindsight patients had a very good capacity to detect visual events in this 'blind' area , including detection of movement, flicker, orientation and pattern.[30] Importantly, though, patients claimed not to be seeing anything: when questioned they say "that they are just guessing and playing the experimenters game."[31] These patients also failed objective tests of awareness under forced-choice conditions.[32] Thus, blindsight cases seem to demonstrate that a subject is processing

---

[29] Sperling (1960), p.20

[30] Weisekrantz et al. (1974)

[31] Weisekrantz et al (1974)

[32] Cowey, Alan (2004), p584

visual events whilst there is no phenomenal sensation of vision taking place; and thus, no awareness.[33]

However, even blindsight cases are problematic as examples of PwA. It is widely assumed that patients‘ reliable responses to stimuli indicate instances of perception. But an equally plausible explanation of the experimental results suggests that, rather than unconsciously perceiving stimuli, patients may be relying on subtle clues from, say, the movements of their eyes or the premotor readiness of their muscles.[34] The blindsight report is made possible not by any sort of detection or discrimination of an object in the visual field, but by proprioceptive clues about the visuomotor system's response to there being such an object. As the psychologist Gerald Vision puts it, “if anything could be said to be "perceived" by virtue of the force-choice guesses, it would be the state of one's own musculature. But that would not be a case of seeing in any event.”[35]

3. Grapheme-color synesthesia: evidence of perception without awareness

The focus of this essay has been largely critical thus far. I now want to present a class of cases which appear to meet the requirements of PwA as we have outlined it, whilst avoiding the difficulties of the kinds of cases that have featured prominently in the literature. I hope to show that experiments conducted with grapheme-color synesthetes provide the best evidence that PwA is a genuine phenomenon.

---

[33] As Alan Cowey points out, not all blindsight cases involve a total lack of phenomenal experience. However, he does not take this to count against the thesis that blindsight demonstrates perception without awareness, because the phenomenal experiences appear to be learnt reactions to sensory-motor operations rather than consciousness associated with explicitly visual processes. See Cowey, (2004) p.587

[34] Milner and Goodale (1995) p. 78

[35] Vision, G (1998), p.150

Synesthesia is a neurological condition in which certain stimuli perceived in one sensory modality (for example, *hearing* a particular sound) trigger an unusual additional sensory experience in another modality (for example, *seeing* metallic green). The associations are automatic in the sense that they are fast; involuntary, in that they cannot be produced or suppressed at will; highly consistent, in that the same associations persist from early childhood; and specific, as a particular stimulus elicits a highly specific synesthetic sensation.[36] The *inducer* is the stimulus that triggers the synesthesia; the *concurrent* is the modality in which the synesthesia is experienced.[37] By far the most common inducers, accounting for 80– 90% of all cases, are digits, letters, and words (either heard, read, or evoked internally thought), whilst synesthetic concurrents involve color in around 90% of all cases.[38]

Cases of synesthesia in which numbers or letters invoke color sensations are known as grapheme-color synesthesia (G-C synesthesia). How does grapheme-color synesthesia relate to the problem of PwA? To an extent, the answer to this question depends on where one stands with respect to a distinction between the two main accounts of the origins of synesthetic experience. One explanation of synesthesia is that it arises as a result of direct, hard-wired neural connections from one perceptual system to another.[39] This sort of interpretation, which appears to be supported by evidence of a genetic influence,[40] would be a sub-personal level phenomenon, and as much a part of a subject's internal processes as are our 'inner ear state changes'. These would not be interesting cases of PwA.

---

[36] V.S. Ramachandran & E.M. Hubbard (2001)

[37] Grossenbacher (1997)

[38] Barnett et al. (2008)

[39] Harrison (2001)

[40] According to Ramachandran, "almost every study of synesthesia has agreed that synesthesia seems to run in families." V.S. Ramachandran & E.M. Hubbard (2001), p.6

But although the 'direct connections' account may well hold true for types of synesthesia in which the inducer is a relatively simple perceptual dimension (e.g. where the inducer is musical pitch and the concurrent is a color sensation), it does not adequately explain cases which involve 'high level' cognitive faculties; in particular, linguistic faculties. Obviously, one isn't born with number and letter graphemes hardwired in the brain. What cases like G-C synesthesia suggest is that, in contrast to the 'direct connection' explanation, links between perceptual systems may occur as a result of higher-order associative regions of the brain that are responsible for encoding more abstract conceptual and linguistic properties.[41] On the one hand, the form of the grapheme is significant in determining synesthetic experiences: Ramachandran and Hubbard found that in several of their subjects, only the actual Arabic numerals evoked colors — Roman numerals and clusters of dots did not, suggesting that "it is the actual visual appearance of the grapheme, not the numerical concept that evokes color."[42] But on the other hand, so-called 'top-down' (that is, cognitive) processes played a role in the color perceived. For example, when G-C synesthetic subjects were shown a display like 'THE CAT' (see fig. 1) many reported that they saw different colors for the 'H' and for the 'A', despite the fact that the two forms are identical. Though the visual form is necessary for the perception of the colors, the way in which it is classified by the perceiver is important in determining which color is evoked.



Figure 1

The significance of these top-down influences on the perceptions of synesthetes with respect to our topic can be summarized as follows: color sensations in G-C synesthetes arise as a result of high-level (i.e. lexical) cognitive processing. But at the same time, the colors elicited *by* digits or

---

[41] Though it is not the only variety of synesthesia to do so: Ward, for example, has described in fascinating detail the case of a lexical-gustatory synesthete , in whom speech sounds induce an involuntary sensation of taste. See Ward, J. and Simner, J. (2003)

[42] Ramachandran and Hubbard (2001) p.10

letters can influence the perception *of* the digits themselves. In other words, the reception of information by a subject, which is capable of influencing that subject's subsequent actions (for example their linguistic reports about other perceived stimuli) is perceived in such a way that the subject is not aware of this information. I will describe three cases which illustrate this proposal, and show for each how it supports the notion of unconscious perception.

i. Pop-out cases

In a group of participants required to identify a geometric shape made up of graphemes of one identity (e.g. 2s) from among distractor graphemes of a different identity (e.g., 5s), G-C synesthetes have displayed an advantage over controls. Ramachandran and Hubbard presented a group of subjects with a matrix of randomly placed, '2's, within which was embedded a shape — such as a triangle — composed of other graphemes (e.g. '5's).[43] Since '5's are mirror images of '2's, non-synaesthetic subjects find it hard to detect the embedded shape composed of '5's. G-C synesthetes, on the other hand, see the '2's as one color and the '5's as a different color, so they claim to see the display as (for example) a red triangle amidst a background of green '2's. It was found that the synesthetes were significantly better (that is, faster) than non-synesthetic control subjects at detecting the embedded shape. Similar results have subsequently been found by Palmeri et al.[44] They asked a synesthete, W.O., to search for a 2 among 5s, which elicited orange and green, respectively; or an 8 among 6s, which both elicited blue. The displays were entirely achromatic, and the Arabic numerals were "digitalized" (i.e., composed of vertical and horizontal line segments only) so that they could not be distinguished on the basis of individual features. For non-synesthetes, search times increased over larger set sizes, as would be expected for this difficult serial search task. A similar effect was found for W.O. when the target and distractors

[43] Ramachandran and Hubbard (2001)

[44] Palmeri et al (2002)

elicited the same synesthetic color (a blue 8 among blue 6s). But when the numerals elicited distinct synesthetic colors (an orange 2 in green 5s), W.O. showed a shallower search slope. 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

ii. Crowding

Synesthetic colors appear to reduce visual crowding effects for graphemes presented in the visual periphery, in much the same way as occurs for such tasks when the target and distractors are actually displayed in different colors. Individual graphemes presented in the periphery are easily identified. However, when other letters flank the target, it is difficult to identify the target grapheme. Hubbard and his team had a group of synesthetes try to identify a black target letter positioned in peripheral vision.[45] The target was surrounded by black distractor letters of a different identity, thus inducing a crowding effect that would normally render the target difficult to identify. Three of the six synesthetes performed significantly better than non-synesthetes on this task, suggesting that somehow the unique color associated with the target helped unmask it from the distractors. Similar results were obtained by Ramachandran et al.: "We have found that the crowded grapheme nevertheless evoked the appropriate color; a curious new form of blindsight. The subject said, 'I can't see that middle letter but it must be an "O" because it looks blue.' This observation implies, again, that the color is evoked at an early sensory — indeed preconscious — level rather than at a higher cognitive level."[46] Again, these results suggest that the color-experience is prior to, and has an influence on, the identification of the grapheme.

---

[45] Hubbard et al. (2005).

[46] Ramachandran and Hubbard (2001) p.8

iii. Camouflage

It has been demonstrated that target identification can be affected by the relationship between a synesthetic color and the background upon which the inducer appears. Smilek et al asked a synesthete, C., to identify a briefly flashed target digit that was immediately followed by a pattern mask.[47] The digit was achromatic, and appeared on a background that was colored so that it matched the synesthetic color induced by the target (the congruent condition) or so that it was not matched (the incongruent condition). The authors reasoned that a target appearing on a congruently colored background might be more difficult to identify, by virtue of some sort of color camouflage, than one presented on an incongruent background. C. did in fact make more errors for congruent versus incongruent displays, in support of the authors' prediction. In a further experiment, C. performed a more conventional visual search task in which she had to indicate the presence of an achromatic target digit (a 2 or 4) among achromatic distractors (8s). Once again, the target elicited a synesthetic color that was either congruent or incongruent with respect to the background color. C. showed a somewhat shallower search slope for the incongruent condition relative to the congruent condition, though this difference was not statistically reliable. A subsequent study which employed a similar paradigm with a different synesthete, yielded a significant slope difference, with search being more efficient for incongruent than congruent trials.[48] Once again, these findings suggest that synesthetic colors are triggered prior to character identification.

4. **Conclusions**

Each of the three cases we have discussed show that the synesthetic color influences - and thus is experienced prior to - the perception of the grapheme. This seems counterintuitive because it

---

[47] Smilek et al. (2001)

[48] Smilek et al. (2003)

implies that a synesthetic color that depends on an identified grapheme for its existence can itself influence perception of the grapheme. The most plausible explanation is that grapheme-color synesthetes perceive the grapheme without being aware of doing so - thus initiating an experience of color, which in turn influences the conscious perception of the grapheme. G-C synesthesia thus constitutes a striking example of perception without awareness.

The experimental results garnered from synesthetes boast significant advantages over the previous sorts of cases which have been cited as evidence of perception without awareness. First, they do not at all rely on reports of awareness. The fact that synesthetes displayed significantly improved perceptual capacities in comparison to control subjects clearly demonstrates that their color experiences influenced their perceptions of graphemes; which in turn objectively shows that they perceived the grapheme before they were aware of doing so. Second, the experiments described are clearly not explicable in terms of cognitive shortcomings on the part of the synesthetic subjects. Unlike change blindness cases, they do not involve a disjunction between on the one hand, a state of perceiving and on the other a state of recall or recognition. The perception without awareness is displayed under objective conditions (namely, improved perceptual capacities) and does not rely in any sense upon the perceiver's reports. Finally, experimental results involving grapheme color synesthetes are not subject to the kind of objection that was directed against blindsight cases: that is, there is no suggestion that the improved perceptual capacities of synesthetes in the kinds of cases we examined are explicable as a result of non-perceptual 'clues' from other modalities. On the contrary, it is the visual perception that explains the color experience, which in turn explains the improved perceptual discrimination.

In conclusion, experiments involving grapheme-color synesthetes represent a significant advance on the existing evidence of perception without awareness. More importantly; on the basis of existing research, it is plauisble that the mechanisms underlying synesthetic experiences might

prove fruitful for an exploration of the relationship between perception and awareness in normal perceivers.

Bibliography

Allport, A. (1988): 'What concept of consciousness?' In A.J. Marcel and E. Bisiach (eds.), Cons*ciousness in Contemporary Science*. Oxford: Clarendon.

Armstrong (1981) : The Nature of Mind. In his *The Nature of Mind and Other Essays*, Ithaca, NY: Cornell University Press

Barnett, KJ, Finucane, C, Asher, JE, Bargary, G (2008): Familial patterns and the origins of individual differences in synaesthesia, in Cognition

Bayne, Tim (2007): The Unity of Consciousness: A Cartography. In M. Marraffa, M. de Caro & F. Ferretti (eds.) *Cartographies of the Mind: Philosophy and Psychology in Intersection*. Dordrecht: Kluwer, pp. 201-10.

Bermudez (2007): What Is At Stake in the Debate on Nonconceptual Content? *Philosophical Perspective*s, 21, Philosophy of Mind

Block, Ned (2007): *Consciousness, Function and Representation*. Cambridge: MIT press

Burge, Tyler (2010): *Origins of Objectivity*. Oxford: Oxford University Press

Colin W.G. Clifford, Ehsan Arabzadeh and Justin A. Harris (2008) :
Getting technical about awareness, in *Trends in Cognitive Sciences* Volume 12, Issue 2, February, Pages 54-58

Cowey, Alan (2004) 'The 30th Sir Frederick Bartlett Lecture: Fact, Artefact, and myth about blindsight', the Quarterly journal of Experimental Psychology Section A, 57: 4, 577-609

Crane, Tim (ed.) (1992) The Contents of Experience: Essays on Perception. (Cambridge: Cambridge University Press)

Davidson, Donald (2001) : Rational Animals, in *Subjective, Intersubjective, Objective,* pp. 95-107 (13)

Dennett, Daniel .C.: (1978): Brainstorms (Vermont: Bradford Books)
(1986): Content and Consciousness.

Dretske, Fred (2006). Perception Without Awareness. In Tamar S. Gendler & John Hawthorne (eds.), Perceptual Experience. (Oxford: Oxford University Press.
(2007): What Change Blindness Teaches us about Consciousness, in Philosophical Perspectives, 21, Philosophy of Mind

Elton, Matthew (2000): 'The Personal/sub-personal distinction: an exploration'. Philosophical Explorations, Volume 3, Issue 1 , pages 2 - 5

Eriksen, Charles W. (1960): Discrimination and Learning Without Awareness, *The Psychological Review,* Vol. 67, No. 5

Farrah, Martha J. and Ratcliff, Graham (1994): The Neuropsychology of high-level vision: collected tutorial essays (New Jersey: Lawrence Erlbaum Associates Ltd.)

Fernandez-Duque, Diego and Thornton, Ian M. (2000): Change Detection without Awareness: Do explicit reports Underestimate the Representation of Change in the Visual System.

Grossenbacher, P.G. (1997): Perception and sensory information in synesthetic experience. In S. Baron-Cohen & J. Harrison (Eds.), Synesthesia: Classic and Contemporary Readings, (pp.148-172). Oxford, England: Blackwell.

Grossenbacher, P. G., & Lovelace, C. T. (2001). 'Mechanisms of synesthesia: Cognitive and physiological constraints'. *Trends in Cognitive Sciences, 5(1),* 36-41.

Harrison, J. (2001): Synaesthesia: the strangest thing. Oxford: Oxford University Press.

LaBerge, D. (1997): Attention, awareness and the triangular circuit. *Consciousness and Cognition, 6,* 149-181.

Lycan, W. and Ryder, Z. (2003), The Loneliness of the Long-distance Truck driver. Analysis 63.2 (April 2003), pp.132-36

Marcel, A.J. (1983): Conscious and unconscious perception: Experiments on visual masking and word recognition. *Cognitive Psychology*, 15

Mattingley, Jason (2009) Attention, Automaticity, and Awareness in Synesthesia, in The Year in Cognitive Neuroscience 2009: Ann. N.Y. Acad. Sci. 1156: 141–167

McDowell, J. (1994a) The Content of Perceptual Experience, *The Philospohcal Quarterly*, Vol. 44, No. 175 (Apr. 1994), pp.190-205

McDowell (1994b) : *Mind and World* (Cambridge, Mass: Harvard University Press)

Milner, A.D. and Goodale, M.A. (1995). *The visual brain in action. (*Oxford: Oxford University Press)

Palmer, S. E. 1999: *Vision Science: Photons to Phenomenology*. (Cambridge, MA; MIT Press/A Bradford Book)

Palmeri TJ, Blake R, Marois R, Flanery MA, Whetsell W Jr.(2002): 'The perceptual reality of synesthetic colors'. *Proc Natl Acad Sci U S A*. Mar 19;99(6):4127-31.

Peacocke, Christopher (1998): 'Nonconceptual Content Defended', *Philosophy and Phenomenological Research,* Vol. 58, No. 2, pp. 381-388

Ramachandran, V.S. and Hubbard, E.S. (2001): 'Synaesthesia — A Window Into Perception, Thought and Language', *Journal of Consciousness Studies*, 8, No. 12, 2001, pp. 3–34

Rensink, R.A., O'Regan, J.K., and Clark, J.J. (1997). 'To see or not to see: The need for attention to perceive changes in scenes.' *Psychological Scienc*e, 8, 368-373.

Rosenthal, David M. (1986). "Two Concepts of Consciousness," *Philosophical Studies 49*, no. 3: 329-59.

(1994). State Consciousness and Transitive Consciousness. Consciousness and Cognition 2 (3):355-63.

(2004) 'Varieties of higher-order theory,' in R. Gennaro (ed.) 2004.

Sidis, B. (1898): The psychology of suggestion. New York: D. Appleton.

Simons, Daniel J. and Chabris, Christopher F. (1999): Gorillas in our midst: sustained inattentional blindness for dynamic events, *Perception* 28(9) 1059 – 1074

Smart, J.C.C. (2004): Consciousness and Awareness, Journal of Consciousness Studies, Volume 11, Number 2, pp. 41-50(10)

Smilek, Daniel, Dixon, Mike J., Cudahy, Cera and Merikle, Philip M. (2001) *Synaesthetic Photisms Influence Visual Perception, in* Journal of Cognitive Neuroscience 13:7, pp. 930–936, p.933

Sperling, George (1960) The Information Available in Brief Visual Presentations, Psychological Monographs: General and Applied, 74 (11, Whole No. 498). pp. 1-29

Vision, Gerald(1998): 'Blindsight and philosophy', Philosophical Psychology, 11: 2, 137 — 159

Ward, J. and Simner, J (2003) 'Lexical-gustatory synaesthesia: linguistic and conceptual factors', *Cognition* 89 (2003) 237–261

Weiskrantz, L. , Warrington, E.K., Saunders, M.D. and Marshall, J (1974): 'Visual Capacity in the Hemianopic Field Following a Restricted Occipital Ablation'. *Brain*,709-728.

Williams Jr., A. C. (1938): Perception of subliminal visual stimuli. *Journal of Psychology*, 6, 187-199.