UNCONSCIOUS PERCEPTION RECONSIDERED

Ian Phillips

0. According to the *same fundamental kind* (SFK) claim: perception of the same fundamental kind as ordinary conscious perception can, and does, occur without consciousness. SFK opposes the traditional and common-sense thought that perception is a determinate of consciousness (Moore 1925/1959: 46-7). Nonetheless, most contemporary philosophers regard SFK as an unquestionable empirical datum. Here I argue that SFK deserves no such status.

1. To assess SFK we need to know what perception is. According to certain relationalists: 'the fundamental fact of perception is our conscious acquaintance with [mind-independent physical objects] from a given spatiotemporal point of view' (Brewer 2011: 138).[1] Representationalist critics contend that relationalism conflicts with evidence for SFK (Nanay 2014). Below, I question whether the evidence genuinely supports SFK even if we endorse representationalism. However, the relationalist will reply by distinguishing between perceptual representations conceived of as part of an information processing account of perceptual cognition, and the perceptual acquaintance relation itself. Putative cases of unconscious perception, they will maintain, at best evidence the former, not the latter.

2. Let us set aside relationalism. Is representationalism inevitably committed to SFK? Burge (2010) develops a sophisticated representationalist account on which perception is constitutively a form of *objective, sensory representation by the individual*—a characterization unpacked in sequel. Burge also provides an exemplary defence of SFK. His account thus affords the ideal stalking horse to pursue this question.

Burge offers 'three considerations against holding that perceptual states imputable to individuals must be conscious' (374). Firstly and foremost, he cites alleged cases of dissociation between perception and consciousness in clinical patients with blindsight, unilateral neglect/extinction, and prosopagnosia. Second, he cites studies of priming in ordinary subjects. Finally, he highlights perception in certain arthropods, arguing for SFK on the basis that we know such creatures perceive but not whether they are conscious.[2] In each

[1] Cf. Campbell 2002. Sense-datum theorists are also relationalists, though their objects of acquaintance are non-physical (and, in more recent versions, mind-dependent).

[2] I set this consideration aside as doubly problematic. First, constitution can plausibly be a posteriori (Kripke 1980). Thus, the fact that we can know a state to be perceptual without knowing whether it is conscious no more shows that perception is not constitutively conscious than the fact that a young Lavoisier knew rain to be water without (yet) knowing it to be H_2O shows that water is not constitutively H_2O. Furthermore, even if it is a priori *knowable* that all perceptual states are conscious, it does not follow that it is *known*. Perhaps we are beguiled by erroneous beliefs and so fail to exploit our epistemic position. Note that we should not dismiss the possibility that certain arthropods are conscious—for a review of the impressive cognitive abilities of jumping spiders (Burge's chief case) see Jackson and Cross 2011, and Cross and Jackson 2014; for a discussion of invertebrate consciousness more generally see Allen and Trestman 2014, §6.6.

case Burge argues that we have evidence for objective, sensory representation by the individual without consciousness. His considerations are familiar. In particular, blindsight, neglect and subliminal priming are extensively cited as demonstrating SFK.[3] Here, I raise three doubts about such appeals. First, I question whether blindsight involves objective representation. Second, I question whether perceptual representations in neglect are unconscious. Finally, I question whether perceptual representations revealed by subliminal priming are attributable to individuals. Although I develop these doubts in relation to specific cases, their generality casts serious doubt on SFK.

3. According to Burge, perception is *sensory* since it begins with the registration of proprietary stimulation by a specialized system—thus vision normally begins with the registration of a light array (alongside other, e.g. proprioceptive, inputs). For processing of this initial stimulation to yield perception, however, it must yield *objective representation*: 'content that is *as of* a subject matter beyond idiosyncratic, proximal or subjective features of the individual', and instead of 'entities in the physical environment' (397). Perception therefore requires capacities for distinguishing between 'what concerns the individual's receptors and receptor-independent reality' (398). More specifically: 'Perception requires perceptual constancies' (399)—'capacities to represent environmental attributes, or environmental particulars, as the same, despite radically different proximal stimulations' (114).[4] Without constancies we have only the registration of proximal stimulation. And whilst such stimulation may co-vary with environmental regularities, carry information about the environment, and indeed explain complex sensory-motor capacities, absent the constancies it will not constitute perception proper.

Now consider blindsight, a condition least prejudicially defined as 'residual visual processing after destruction of primary visual cortex [V1 or striate cortex]' (Cowey 2010: 3). According to Burge: 'blindsight patients perceive environmental conditions. The perception involves perceptual constancies—including motion, location, and size constancies. The perception guides action. There is strong reason to believe that some of these patients lack phenomenal consciousness in the relevant perceptions.' (374) Burge takes the preservation of constancies in blindsight as uncontested, merely citing the first-edition of Weiskrantz's canonical *Blindsight* (1986/2009). However, sixteen years later, Weiskrantz notes 'that size constancy, or in fact any of the visual constancies, has never been addressed in any blindsight studies of which I am aware' (2002: 572).[5]

There is antecedent reason to doubt constancy preservation in blindsight. Monkeys with V2 lesions respond to retinal image size not object size, arguably because of problems coding distance (Ungerleider et al. 1977). Depth perception is fully achieved in higher cortical areas. Nonetheless, 'V1 is adapted to the specific requirements of depth perception, so as to

[3] See, for example, Levine 2010: 216; Rosenthal 2010: 374; Brogaard 2011; Block 2012: 11-12; Nanay 2014. Prinz (2010: 310; forthcoming).

[4] For related views see Smith 2002 and Siegel 2011.

[5] In the paper in question Weiskrantz reports afterimages obeying Emmert's law in DB, the first intensively studied blindsight patient. Emmert's law implies constancy mechanisms (Phillips 2013: §6). Yet the 'images' obeying Emmert's law are *conscious* and so do not reveal a dissociation between constancies and consciousness. Indeed, Cowey (suggesting that DB's afterimages may be due to islands of preserved V1) comments: 'How ironic if the discovery of blindsight proves to be based on a patient who does not possess it!' (2010: 7)

perform essential pre-processing of the signals it receives from the retinae' (Read 2005: 90). Essentially, V1 contains 'a kind of "cyclopean" retina"' (102) integrating monocular inputs ahead of further processing to yield depth. Given this, striate lesions predict size constancy failures since they abolish pre-processing of signals essential for depth perception. Moreover, since for Burge 'location constancies … require representation of distance' (425, fn. 73), striate lesions also predict location constancy failures.

Direct evidence concerning the lack of objective representation in blindsight has recently emerged. Alexander and Cowey (2010: Exp. 1) asked two patients, GY and MS, to locate stimuli in one of the four quadrants of their visual field. The stimuli were luminance-matched but differed as to whether they exhibited a sharp luminance edge. The Gaussian (Fig. 1, bottom left) matched the peak or mean luminance of the square (top left), and the Gabor (bottom right) matched the contrast and mean luminance of the square-wave (top right). MS's performance was high for the square and square-wave. However, it fell to chance for the Gabor and Gaussian. This suggests that MS's success was exclusively based on sharp luminance contours. Since a luminance contour is 'an immediate sensory effect of proximal stimulation' (Burge 2010: 352), such discrimination does not imply objective representation.

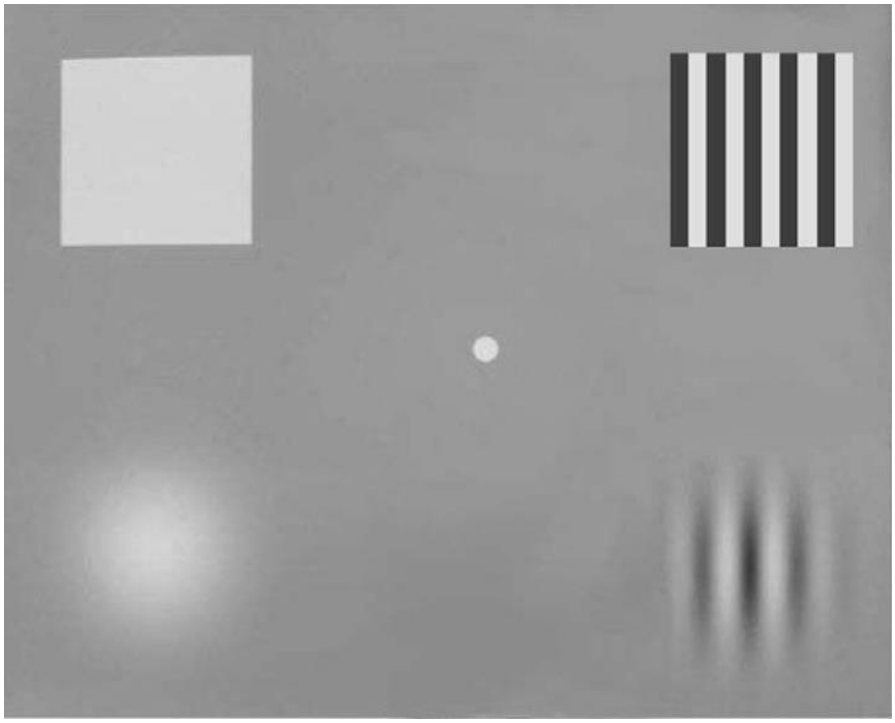

Fig. 1: Stimuli from Alexander and Cowey 2010: 522. Clockwise from top left: square, square-wave, Gabor patch, and Gaussian. Only one stimulus was shown in one location per trial.

GY was above chance on all stimuli in this experiment. However, a follow-up experiment (Exp. 3) suggests that this was exclusively a function of stimulus on- and offset transients. GY was asked whether a stimulus was presented in a yes or guess paradigm.[6] When stimuli had sharp edges and/or sudden on- or offsets, he performed well. However, when the stimulus was a Gaussian with a slow onset or no offset, he fell to chance on red and green

[6] Here the subject must answer 'yes' if they see a stimulus, and otherwise guess whether one was presented.

stimuli. Performance was preserved for blue stimuli, but no test was done with a Gaussian with a slow onset *and* no offset. Consequently, no evidence was found of perception not based on either sharp luminance contours or stimulus transients. Detection of on- and offsets, like luminance contours, is explicable in terms of proximal stimulation and does not indicate objective representation. In line with this, Alexander and Cowey conclude that both patients had only the ability to detect '"events"' varying in 'subjective salience' (532). This is not perception by Burge's lights.

Similar considerations apply to motion perception. Azzopardi and Hock (2011) demonstrate that motion detection in blindsight is limited to detection of 'objectless' first-order motion energy (spatiotemporal changes in luminance) as opposed to detection of changes in position or shape. This equally does not suffice for objective representation. In sum: we lack evidence that blindsight involves genuine perception as opposed to mere sensory registration. Burge's flagship case for SFK founders.[7]

4. The second, fundamental problem with studies alleged to demonstrate SFK concerns the measurement of consciousness. Studies of neglect provide an excellent illustration.[8] Neglect can be characterized as 'the failure to report, respond, or orient to novel or meaningful stimuli presented to the side opposite a brain lesion, when this failure cannot be attributed to either [elementary] sensory or motor defects' (Heilman et al. 1993: 279). In prototypical form, neglect involves right lesions, and neglect of left-space. Studies of unconscious perception in neglect either show priming due to unreported left-side primes or illusory/gestalt effects of unreported left-side cues on explicitly perceived elements. Here I grant that such studies evidence perception. I question whether such perception is unconscious.

An early case report exemplifies the issue. Marshall and Halligan (1988) presented a severe neglect patient (PS) with pairs of cards picturing houses (Fig. 2). 'Are the houses the same or different?' they asked. 'The same', she replied. 'Is there anything wrong with either card?' they continued. 'No', she answered. Finally: 'Which house would you prefer to live in?' PS replied that this was a 'silly question', but when 'forced to make a response', chose the non-burning house on nine out of eleven trials. In contrast, when cards were presented with right-side flames, she immediately noticed them and consistently preferred the non-burning house. Marshall and Halligan argued that PS's 'preference judgements clearly indicated covert knowledge' (767) of flames without 'conscious perceptual awareness' (766): a

[7] This verdict may seem in tension with the many striking abilities attributed to blindsight patients. However, such claims are often anecdotal or concern experiments lacking proper controls (e.g. for light scatter). Moreover, where experimentally grounded, such claims typically fail to consider whether the discriminations in question are explicable in terms of simpler stimulus properties, or by appeal to indirect awareness of autonomic responses, including reflexive light responses. Note that destruction of primary visual cortex does not abolish pupillary responses (Weiskrantz et al. 1998, 1999), blink reflexes and optokinetic reflexes. Moreover, certain of these responses correlate well with success in forced-choice responding (Weiskrantz et al. 1999). For this suggestion see Cowey and Weiskrantz 1963; Vision 1998; Kentridge and Keywood 1999: 8; Cowey 2004: 587-8 and 2010: 4.

[8] Campion et al. 1983 argue that blindsight is simply degraded normal (conscious) vision unreported in yes/no tasks due to conservative response bias (cf. Overgaard 2011). Azzopardi and Cowey 1998 show that this is plausible for moving but not for static stimuli. However, Azzopardi and Cowey's findings are consistent with blindsight for static stimuli being due to degraded *abnormal* vision unreported due to conservative response bias.

dramatic finding, showing unconscious perceptual 'analysis … far more extensive … than are dreamt of in most current theories' (767), and ostensibly powerful support for SFK. This interpretation is now standard lore (Husain 2008).[9] However, it faces a serious difficulty, namely that same/different (s/d) and yes/no (y/n) questions are prone to response bias and so do not convincingly establish that PS was not (dimly) conscious of the flames.

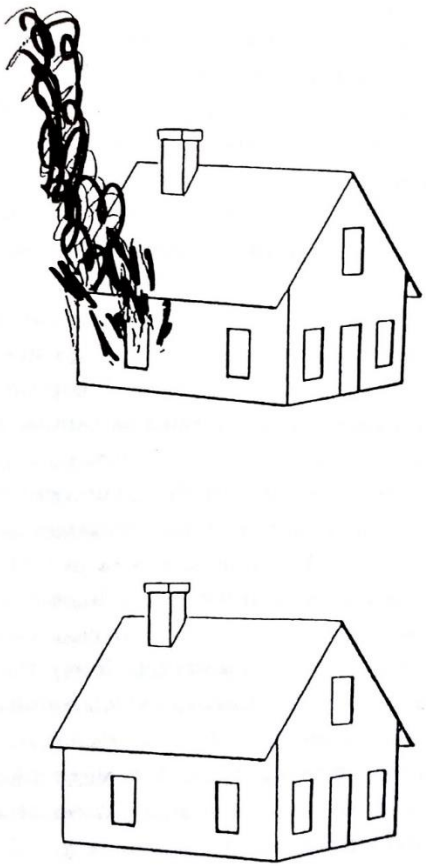

Fig. 2: Figure used in Marshall and Halligan 1998. Reproduced from Weiskrantz 1997: 25.

According to signal detection theory (SDT) (Green and Swets 1966) a subject's judgments depend on both her perceptual sensitivity and her response criterion. Consider a y/n task wherein a subject must say whether or not a given feature is present. SDT models the perceiver's sensitivity to feature-presence in terms of the distance between the means of two distributions of sensory responses—one associated with noise (in system and environment), the other with feature-presence (plus omnipresent noise). Assuming that these distributions are normal and equivariant, this distance is given by the parameter $d`$. Whether the subject responds 'yes' on any given trial is not settled by her sensitivity, however. This requires knowing her criterion—the variable threshold which a sensory response must meet to generate a positive judgement.[10]

[9] Follow-up studies include: Bisiach and Rusconi 1990; Vallar et al. 1994; and Doricchi and Galati 2000. It is controversial whether PS really perceived *flames* as opposed to a lower-level, pre-attentive feature such as asymmetry (Farah 1994/1997). This returns us to questions of whether genuine perception is in play. Doricchi and Galati's (2000) widely hailed attempt to show that higher-level features *are* perceived is in my view inconclusive.

[10] The analysis of s/d tasks is more complex (Macmillan and Creelman 2005; Petrov 2009; DeCarlo 2013). However, the same essential point holds: responses are the product of both sensitivity and response criterion.

As can be seen from Fig. 3, a subject with reasonable perceptual sensitivity to some feature ($d` \gg 0$) may repeatedly deny seeing that feature if her criterion is sufficiently conservative (far to the right). Most sensory responses associated with feature-presence will not reach such a criterion and so will go unreported. Consequently, knowing how often a subject correctly judges whether or not a feature is present is insufficient to determine her perceptual sensitivity. To determine sensitivity, we must either manipulate the subject's criterion, plotting a 'receiver operating characteristic' curve whose shape suffices to calculate $d`$, or exploit a multi-alternative forced-choice (mafc) task. A classic 2afc task involves asking a subject in which of two intervals a stimulus was presented. Such tasks are effectively bias-free since subjects naturally adopt a symmetrical criterion, simply choosing whichever interval corresponds to the strongest sensory stimulation. They thus directly gauge sensitivity (Green and Swets 1966: 107-8).

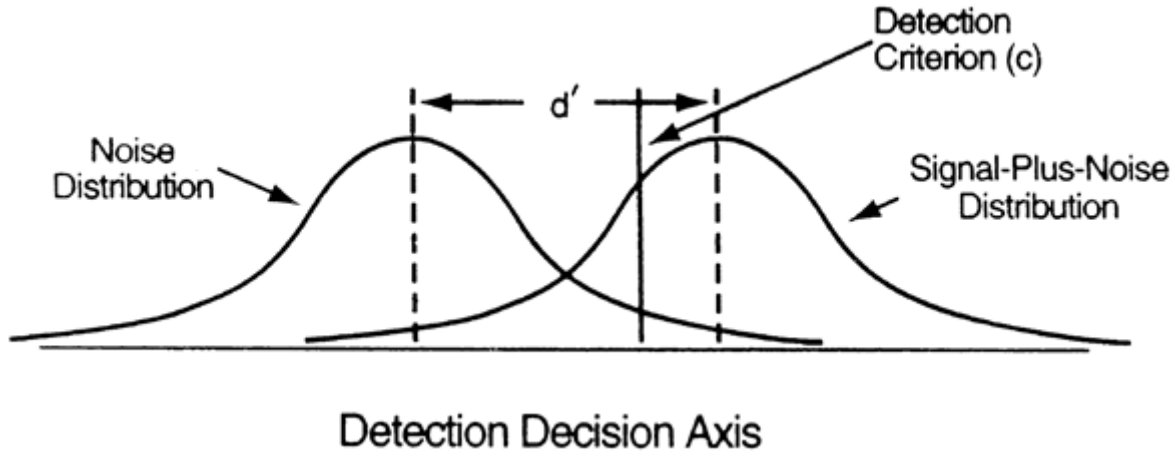

Fig. 3: SDT analysis of y/n task. Adapted from Snodgrass 2002: 550.

In Marshall and Halligan's study the final, 'Which house would you prefer to live in?' question is essentially a 2afc task: 'In which spatial interval is the good house?' As such, PS's responses directly attest her perceptual sensitivity. In contrast, the initial s/d and y/n questions are prone to bias. Accordingly, failure to report a difference between the houses, or a problem with either, may simply reflect conservative responding.

Response criteria vary widely for many reasons (Green and Swets 1966: 87). Relevantly, in s/d tasks 'participants seem to naturally adopt strong response biases …. In particular, a preference for "same" is commonly observed for hard-to-discriminate stimuli' (Macmillan and Creelman 2005: 218). Left-side stimuli are hard to discriminate for neglect patients. Hence, we should expect strong biases towards 'same' responding, and resist inferring from 'poor' performance to a lack of sensitivity. Neglect patients will also exhibit conservative bias if they have problems updating their pre-lesion criterion (or rely on a criterion appropriate to their right-side). An unbiased pre-lesion (or right-side) criterion will become conservative if maintained for their less sensitive, post-lesion left-side (Azzopardi and Cowey 2001). Whether neglect in general can be construed as degraded perception together with conservative responding is unknown. However, since all paradigms purporting to

demonstrate unconscious perception evidence lack of awareness by 'failure' on a biased measure, the hypothesis must be taken very seriously.[11]

If this hypothesis is correct, what follows concerning consciousness? Here SDT simply clarifies two thresholds: an *objective* threshold above which stimuli are *discriminable*; and a *subjective* threshold above which a subject will respond positively in a given task.[12] Some associate consciousness with a subjective threshold. However, this ignores the many factors—'demand characteristics', task design, experimental instruction, implicit and explicit pay-offs, prior probabilities, preconceptions, and natural variation—which impact a subject's judgements over-and-above the simple fact of their awareness. To take an extreme example, 'observers will have a different awareness threshold when they are paid $100 each time they consciously detect a stimulus than when they are penalized $100 each time they fail to detect a stimulus' (Merikle 1984: 450). It is not plausible that such payments consistently induce dramatic alterations in consciousness. Or imagine being presented with a near-threshold stimulus which is either a circle or a square. You must first indicate whether you see it, then which it is. It is natural to regard a positive answer to the first question as indicating your ability correctly to answer the second. Consequently, if you lack confidence that you saw the stimulus sufficiently well to say whether it was a circle or square, you may well deny seeing it, rather than risk professing an ability you lack. However, it is easy to underestimate how well you need to see a stimulus to determine whether it is a circle or a square. If you do, you may perform well on the square/circle task despite consistently denying seeing anything.

For these and other reasons, 'most investigators … reject any approach for distinguishing conscious from unconscious perceptual processes that is based solely on subjective reports' (Reingold and Merikle 1990: 17-18). Most philosophers also reject the simple association of consciousness and subjective threshold. To make that association is to insist that 'a commentary is a *sine qua non* for awareness' (Weiskrantz 1997: 76). On any less demanding conception of consciousness's cognitive requirements, a subjective threshold is too stringent. For example, imagine that consciousness requires cognitive 'access' but not explicit report. Then, if 'access' is a weaker requirement than explicit report (Block 1995: 231), a subjective threshold will underestimate consciousness. Or imagine that consciousness requires only *accessibility*, and that a content is accessible if and only if accessed in some nearby scenario. Then if nearby scenarios have differing response criteria, a subjective threshold will further underestimate consciousness. Finally, imagine that consciousness can occur in the complete absence of 'any capacity for thought or judgment' (Block 2014: 159; Burge 2010: 188). Then a subjective threshold may dramatically underestimate consciousness.

Some who eschew a subjective threshold, associate conscious with an *objective* threshold, treating only stimuli for which $d` = 0$ as unconscious (Eriksen 1960; Holender 1986). Others

[11] Studies of priming in neglect include: Berti and Rizzolatti 1992; Làdavas et al. 1993; and Della Sala et al. 2010. All use biased measures of awareness without calculating $d`$. In McGlinchey-Berroth et al. 1993, $d`$ can be estimated from their data: it is well above zero and may be as high as 1. Studies using illusory/gestalt effects to demonstrate perception and a s/d task to measure unawareness (again without measuring $d`$) include Mattingley et al. 1995; Ro and Rafal 1996; and Vuilleumier and Landis 1998.

[12] For this terminology see Cheesman and Merikle 1986 and Merikle and Cheesman 1986.

deny that consciousness maps straight-forwardly onto either threshold.[13] Either way, the interpretation of neglect studies as evidence of unconscious perception fails to rule out a plausible, rival interpretation which appeals to degraded conscious perception unreported due to conservative bias.

5. Given such concerns, might SFK be motivated by appeal to evidence of perception at the *objective* threshold? The leading paradigm is subliminal priming in which congruent primes, indiscriminable by the subject (e.g. due to masking), differentially speed responding to subsequently presented supraliminal targets. Here priming is taken as evidence of perception; lack of discriminability as evidence of unawareness. Subliminal priming is controversial. However, let us grant that constancy-implicating priming effects are robust.[14] Let us also agree that 'when performance is at chance … it is extremely unlikely that a subject is having any experience of the stimuli whose presence or absence he or she cannot discriminate' (Kentridge et al. 2008: 866). Does such priming then demonstrate SFK?

To see why not, recall that opponents of SFK insist only that 'perceptual states *imputable to individuals* must be conscious' (Burge 2010: 374; my emphasis). For Burge, although 'all perceptions … serve perception by the individual' (369), not all are attributable to the individual. Some are only attributable to sub-individual systems. According to Burge, perceptual representations are attributable to the individual only when they play the appropriate explanatory role in relation to individual action (369-376; cf. Dretske 2006). That role is to single out 'particulars that action aims for or aims to avoid' (370). Hence: 'Where a sensory state … can initiate action by the individual, it is attributable to the individual.' (373) The unconscious representations in subliminal priming do not meet this condition. They do not 'initiate action by the individual', nor single out 'particulars that action aims for or aims to avoid', nor figure 'directly in guiding action' (375). Subjects cannot make *any* discriminative response in respect of such primes: $d` = 0$. Such representations are capable of *indirectly* modulating responses to *subsequently perceived* targets. (They thereby *serve* perception.) However, action always targets the subsequent, consciously perceived stimulus, not the prime. Subliminal prime-representations may grease the wheels of response; they cannot turn them. Consequently, priming effects do not evince perceptual states imputable to individuals.

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[13] Block claims that SDT 'gives us reason to think that experiential content … can be instantiated without … access' on the grounds that certain shifts of response criteria reflect a difference in access, 'rather than a difference in consciousness' (2005: 49). That said, neither Block nor Burge can consistently adopt an objective threshold since they both hold that blindsight is unconscious. Block's attitude to neglect is puzzling. In recent work (2012) he cites neglect as evidence of SFK. Yet in earlier work he urges us to take seriously the possibility that extinction subjects 'really do have phenomenal experience of these stimuli without knowing it' (2001: 203), and it is hard to see why that attitude would not extend to neglect.

[14] For recent scepticism see Newell and Shanks 2014: §5—though see also responses from Finkbeiner and Coltheart 2014 and Snodgrass et al. 2014. Philosophers routinely cite Marcel's pioneering work as demonstrating semantic priming at the objective threshold (Marcel 1983). However, Cheesman and Merikle (1985) found no evidence of priming when the objective threshold was properly determined. For discussion of the difficulty of providing sufficient statistical power to demonstrate that $d` = 0$ see Rouder et al. 2007. For concerns about task artefacts arising from lack of motivation in subliminal priming paradigms see Pratte and Rouder 2009. For an experimental paradigm which seeks to address both concerns and finds a small but significant semantic priming effect at the objective threshold see Finkbeiner 2011. New data from Bob Kentridge's lab evidences priming implicating colour constancy mechanisms at the objective threshold (personal communication).

6. Many others paradigms have been appealed to in support of SFK. Nonetheless, the doubts above are wide-reaching. They show that SFK is not an unquestionable empirical datum. This matters. According to Prinz:

> Once upon a time, people thought that all perception was conscious.… But things have changed. Most people now believe that … perceptual states are conscious some of the time, but not all of the time. This raises a question: When are perceptual states conscious? A theory of consciousness is, in large part, an answer to that question. (2010: 310)

Prinz supposes that a theory of consciousness is required because some additional ingredient must be added to mere perception for it to be conscious. If SFK is false, no such theory is necessary.

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