

How Experiences Should be Individuated: A Defense of Contrastive Individuation

Abstract

The non-transitivity of the relation *looking the same as* has been used to argue that the relation *same phenomenal character as* is non-transitive; a result that might jeopardize certain theories of consciousness. In this paper I will argue against this conclusion, granting the premise, by defending a contrastive criterion for individuation of phenomenal characters. This criterion forces one to dissociate *lookings* and *phenomenology*, what some might find counterintuitive. However, this intuition is left unsupported once one distinguishes phenomenology and cognitive access; a distinction that is conceptually and empirically grounded.

Keywords: Consciousness, looks, representationalism, transitivity, phenomenal sorites, cognitive access.

1 Transitivity and Theories of Consciousness

While I am writing this paper I am having a rich experience. I see the computer in front of me, smell the aroma of my cup of coffee, feel the keys of my keyboard under my fingers, feel a soft pain in my knee, etc. Undergoing a conscious experience *feels* a certain way or, to borrow Nagel's famous expression, there is *something it is like* to undergo them. The way it *feels* or *what it is like* to undergo an experience is called 'the phenomenal character of experience'.¹

Theories of consciousness try to provide an account of phenomenal characters and the kind of property that *undergoing an experience with certain phenomenal character* is. In general, theories of consciousness maintain that the property of *undergoing an experience with phenomenal character*

¹ There are several features contributing to the way it feels to undergo my experience, like the redness of the apple, the herbality of the coffee or the painfulness in my knee. Call these features 'phenomenal properties'. For simplicity and due to the terms in which the discussion is presented in the literature I will assume in this paper that it makes sense to talk about experiences whose phenomenal character is given by a unique phenomenal property; and so, I will speak, for example, of an experience having a phenomenal character as of red.

PC is the property of *being in a state that P-s*. For instance, identity theories maintain that P-ing is *being identical to certain brain state*, direct realists that it is *being in certain relation with an external object*, functionalists hold that it is *satisfying certain functional role* and for representationalism, it is, roughly, *having certain kind of representational content*.

I take the claim that two numerically different states are of the same kind—*qua* experiences—if they have the same phenomenal character to be sufficiently uncontroversial.² Hence, the question that should be replied, if one is interested in the individuation of type-experiences, is when two numerically different experiences have the same phenomenal character. In particular I would like to question whether NTPC is true:

NTPC The relation *same phenomenal character as* is non-transitive.

This question is very relevant for theories of consciousness; for insofar as one accepts Leibniz's law it seems that if the relation *same P as* is non transitive and the relation *same Q as* is transitive, then the property of having P cannot be the property of having Q. Some theories might therefore be jeopardized. For example, if *same phenomenal character as* were non-transitive and *same representational content as* were transitive then representationalism would be false.³

Support for the claim that NTPC is true comes from the failure in transitivity of perceptual indiscriminability; i.e. the non-transitivity of the relation *looks the same as*. In this paper I will argue that one should resist the entailment from the non-transitivity of perceptual indiscriminability to the non-transitivity of *same phenomenal character as*. This would leave NTPC unsupported.

2 The Intransitivity of Perceptual Indiscriminability

Goodman (1951) was, as far as I know, the first one to consider the relation *looking the same as* non-transitive. The relation *looking the same as* is non-transitive if there can be three objects A, B and C such that A looks the same as B and B looks the same as C but such that A doesn't look the same as C. Wright (1975) showed that perceptual indiscriminability has to be non-transitive if i) there might be continua of *lookings* and ii) the human discriminatory powers are finite. But this has

² And I will assume that we can compare the phenomenal character of numerically different experiences. If one is skeptical with this claim, one can translate, I think, *mutatis mutandi* the discussion about the phenomenal character of numerically different experiences to that of different phenomenal properties within one experience.

³ This alternative has been defended by Deutsch (2005). See also Perkins and Bayne (2012) for an argument against representationalism with exactly the opposite premises. Other philosophers that appeal to the failure in transitivity of a relation in order to extract some or other consequence about the nature of phenomenal properties are, for example, Antony (2006); Dummett (1975); Everett (1996).



Fig. 1: Lookings continuum

not gone without controversy (see Fara (2001); de Clercq and Horsten (2004) and Chuard (2010) for discussion)

In this paper I will simply grant that perceptual indiscriminability is a non-transitive relation—that NTL is true—and that from figure 1 one can build up a soritical series of patches with regard to *lookings*:

NTL $\exists a, \exists b, \exists c$, such that: [To a subject S] $(a \text{ looks the same as } b) \wedge (b \text{ looks the same as } c) \wedge \neg(a \text{ looks the same as } c)$

The non-transitivity of perceptual indiscriminability has been used as a basis for arguing for the non-transitivity of the relation *same phenomenal character as*. The underlying idea being that there is a match between how things look and the phenomenal character of the experience we have while looking at them (Fara, 2001, p.911). And so, the following two principles would be true:

$L \rightarrow PC$ A and B look the same to S \rightarrow S's experience of A has phenomenal character $PC_1 \wedge$ S's experience of B has phenomenal character $PC_2 \wedge PC_1 = PC_2$

$PC \rightarrow L$ A and B look the same to S \leftarrow S's experience of A has phenomenal character $PC_1 \wedge$ S's experience of B has phenomenal character $PC_2 \wedge PC_1 = PC_2$

Several philosophers (Byrne (2001); Tye (1997, 2002)) have endorsed $L \rightarrow PC$ and claimed that the phenomenal character of the experience cannot vary unless there is a change in the way things look to me. In this paper I will deny this claim and give reasons for resisting the entailment from sameness in lookings to sameness in phenomenal character and hence, resist the conclusion that the relation *same phenomenal character as* is non-transitive—even if NTL is true. So, although I will grant to some extent the claim that “[o]ur notion of phenomenal character seems essentially tied to our notions of appearing the same as, or being perceptually indistinguishable from.” (Deutsch, 2005, p.9)—for I will grant that the experiences one has while looking at A and B cannot have the same phenomenal character unless A and B look the same to her ($PC \rightarrow L$)—I will deny the truth of certain reading of

the claim that “[t]hings that are perceptually indistinguishable [understood as differing *in respects I cannot notice*] cannot give rise to phenomenally different perceptual experiences” (ibid. p.10); namely the one that makes $L \rightarrow PC$ true.

Deutsch (2005) appeals to series like the one presented in fig.1, to claims that the conclusion to be derived is that *same phenomenal character as* is non-transitive:

Suppose we divide the spectrum from red to yellow into a series of adjacent patches, and that we divide it finely enough so that, for a normal human subject, each patch looks precisely the same in color as each patch adjacent to it. By so doing, we make it the case that a normal human subject’s visual, color experience of any particular patch has the same phenomenal character as that subject’s visual, color experience of any patch adjacent to it. However, the phenomenal character of a subject’s experience of the first patch in the series is undeniably different from the phenomenal character of that subject’s experience of the last patch in the series...the relation of same phenomenal character is not transitive. (op.cit. pp. 3-4)

Deutsch endorses $L \rightarrow PC$ and appeals to it, as we have seen, in order to reply to the objection that “[t]he argument [in the quote] simply assumes that if two patches look the same in color, then the experiences of those patches share a phenomenal character.” (p.9). In favor of $L \rightarrow PC$ he adds, “[t]he assumption that adjacent patches produce experiences with the same phenomenal character can be further supported by citing the introspective indistinguishability of the experiences in question. Being introspectively indistinguishable from is yet another relation that is intimately connected to the relation of same phenomenal character as”. Should we accept that experiences that are introspectively indistinguishable have the same phenomenal character? If we do, then the conclusion that the relation *same phenomenal character as* is non-transitive seems inescapable modulo NTL. But, there are good reasons for rejecting it, especially considering the empirical evidence in favor of the dissociation between experiences and the cognitive access we have to them.

3 Phenomenal Consciousness Vs. Cognitive Access

Ned Block (1995-2002) famously introduced a conceptual distinction between Phenomenal consciousness and Access Consciousness. On the one hand, a mental state is Access-Conscious if and only if, roughly, its content is available for belief formation and rational control of action. On the other hand,

a mental state is Phenomenally-Conscious if and only if there is something it is like to be in that state. The conclusions to be derived from this conceptual distinction have remained controversial since the publication of the paper: do they pick up different properties?

In the search for an answer, the debate has recently moved away from the conceptual domain into the empirical one focusing on the possibility of phenomenology without access. The notion of Access-Consciousness has been fine-grained to that of *Cognitive Access* and the question turned into whether the neural basis of phenomenal consciousness can be disentangled “from the neural machinery of the cognitive access that underlies reports of phenomenal consciousness”. And there is good evidence supporting this claim:

Based on the results of partial report experiments, like those in Sperling (1960) and some more recent results—Landman et al (2003); Sligte et al (2008), etc—, Ned Block (2007; 2011) has argued that the capacity of the memory buffer in which the content of phenomenally conscious states is encoded is greater than that cognitive access, concluding that “...the machinery of phenomenology is at least somewhat different from the machinery of cognitive accessibility” (Block, 2007, p. 489) and defending that the empirical evidence suggest that the content of experience overflows what we can cognitively access (for discussion of latter results see Kouider et al (2012); Block (2012)): there is more to phenomenology than what we can tell.

Further support in favor of the claim that cognitive access is not required for having experiences has been provided by Sebastian (2013), who relates the neural correlates of cognitive access to empirical research into the neurophysiology of dreams. He shows that there is strong empirical evidence suggesting that cognitive access essentially depends on the activity of the dorsolateral prefrontal cortex (see for example, Dehaene and Naccache (2001); Fuster (2008); Goldman-Rakic (1988)); however, such an area is strongly deactivated during sleep; a period in which, common sense and independent evidence shows (Horikawa et al (2013); LaBerge (1988); Leclair-Visonneau et al (2010)), we entertain conscious experiences: dreams.

4 Individuating Phenomenal Characters

As we have seen in section 2, the step from perceptual indistinguishability to sameness of phenomenal character ($L \rightarrow PC$)—as in Deutsch’s argument—rests on the claim that experiences should be individuated by appeal to introspection: if two experiences are introspectively indistinguishable then they have the same phenomenal character. I want to contrast this way of individuating experiences, that I

will call 'First-Sight indistinguishability' (FS-indistinguishability),⁴ with a closely related one, that I will call 'Contrastive' (C-indistinguishability).

FS-indistinguishability Two experiences, E_1 and E_2 , are *first-sight indistinguishable* (FS-indistinguishable or $ID_{fs}(E_1, E_2)$) for a subject S if and only if S cannot distinguish the phenomenal character of E_1 from the phenomenal character of E_2 by simply introspectively comparing their phenomenal characters.

C-indistinguishability Two experiences, E_1 and E_2 , are *contrastively indistinguishable* (C-indistinguishable or $ID_c(E_1, E_2)$) if and only if there is no experience e such that e is not FS-indistinguishable from E_1 and FS-indistinguishable from E_2 .

$$ID_c(E_1, E_2) \leftrightarrow \neg \exists e (\neg ID_{fs}(E_1, e) \wedge ID_{fs}(E_2, e))$$

If NTL is true then FS-indistinguishability (ID_{fs}) is a non-transitive relation, taking into account that $PC \rightarrow L$ is not under dispute. Take A, B and C to be the entities that make NTL true and call ' E_a ', ' E_b ' and ' E_c ' the experiences one has when looking at them respectively. If one could tell the phenomenal character of E_a and E_b apart by introspection, then A and B would not look the same; so, E_a and E_b are FS-indistinguishable. The same is true for E_b and E_c . But E_a and E_c are not FS-indistinguishable, for A and C look different (by $PC \rightarrow L$). So, there are three experiences E_a , E_b and E_c such that E_a and E_b are FS-indistinguishable, as so are E_b and E_c without thereby E_a and E_c being FS-indistinguishable. On the other hand, C-indistinguishability is transitive under the same conditions: if an experience E_a is C-indistinguishable from an experience E_b and E_b is C-indistinguishable from an experience E_c , then E_a and E_c are C-indistinguishable:

$$\forall E_1, E_2, E_3 ((ID_c(E_1, E_2) \wedge ID_c(E_2, E_3)) \rightarrow ID_c(E_1, E_3))$$

$$(1) \quad ID_c(E_1, E_2) \wedge ID_c(E_2, E_3) \text{ Assumption}$$

$$(2) \quad \neg ID_c(E_1, E_3) \text{ Assumption}$$

$$(3) \quad \forall e (\neg ID_{fs}(E_1, e) \rightarrow \neg ID_{fs}(E_2, e)) \text{ From 1 and C-indistinguishability}^5$$

$$(4) \quad \forall e (\neg ID_{fs}(E_2, e) \rightarrow \neg ID_{fs}(E_3, e)) \text{ From 1 and C-indistinguishability}$$

$$(5) \quad \exists e (\neg ID_{fs}(E_1, e) \wedge ID_{fs}(E_3, e)) \text{ From 2 and C-indistinguishability}$$

⁴ It is important to note that by first-sight distinguishability I do not mean *prima facie* distinguishability. It may well be that distinguishing two experiences at first-sight requires plenty of concentration and attention.

⁵ Note that both ID_{tc} and ID_{fs} are commutable: $ID(a, b) \leftrightarrow ID(b, a)$

- (6) $\neg ID_{fs}(E_1, p) \wedge ID_{fs}(E_3, p)$ From 5
- (7) $\neg ID_{fs}(E_2, p)$ From 6 and 3
- (8) $\neg ID_{fs}(E_3, p)$ From 7 and 4
- (9) $ID_c(E_1, E_3)$ From 8, 6 and 2 by *reductio ab absurdum*

$\therefore (ID_c(E_1, E_2) \wedge ID_c(E_2, E_3)) \rightarrow ID_c(E_1, E_3)$ From 1-9 by \rightarrow introduction, QED.

We have two different notions of indistinguishability and the question is which one we should prefer for the individuation of phenomenal characters. For it should be noted that they will determine different collections of experiences as having the same phenomenal character if we accept that NTL is true:

Let E_x and E_y be any two numerically different experiences and PC_x and PC_y their respective phenomenal character.

FS-Individuation The phenomenal character of E_x and E_y is the same if and only if E_x and E_y are

FS-indistinguishable:

$$\forall xy(ID_{fs}(E_x, E_y) \leftrightarrow PC_x = PC_y)$$

C-individuation The phenomenal character of E_x and E_y is the same if and only if E_x and E_y are

C-indistinguishable:

$$\forall x\forall y(ID_c(E_x, E_y) \leftrightarrow PC_x = PC_y)^6$$

If type-experiences are to be individuated by FS-distinguishability then the relation *same phenomenal character as* will be non-transitive. If, on the other hand, it is the notion of C-indistinguishability then the relation *same phenomenal character as* will be transitive. How should we decide among these two criteria?

Deutsch, as we have seen, commits himself to FS-individuation.⁷ But the only reason I know to prefer this criterion is as Deutsch points out that if FS-individuation is false, then one cannot tell

⁶ Note that if two experiences are not FS-indistinguishable, then they are not C-indistinguishable and do not share the same phenomenal character.

⁷ Dummett (1975) seems to agree with him. On the other hand, philosophers like Goodman (1951) would be willing to accept C-individuation as Deutsch (2005) himself notes:

[T]he visual experiences of two objects have the same phenomenal character just in case they look the same as each other and look the same as all the same third parties as well. (ibid. p.18 fn.13)

by introspection whether two experiences share the same phenomenal character. But this might be expected if, as Block defends, phenomenology overflows cognitive access.⁸

In favor of FS-individuation one can further state—as Deutsch and Fara do—that there is a conceptual connection between visual indistinguishability and sameness of visual phenomenal character. C-individuation respects, to some extent, this idea: it saves the idea that if two objects look different to S then the experiences S has while looking at them have different phenomenal character ($PC \rightarrow L$). Now, if the way things look does not depend exclusively on the experience we have while looking at them but also on the cognitive access to our experiences and if phenomenology overflows cognitive access, then there are good reasons for resisting the other direction of the entailment; namely, that if the experiences S has while looking at two objects have different phenomenal character then the object looks different to S, thereby rejecting the conclusion that the relation *same phenomenal character as* is non-transitive.

The proposal I make here agrees with Goodman and denies what Fara and Deutsch consider to be a truism; namely, that if two things look the same to a subject S, then the phenomenal character of the experiences (if the experiences are veridical) S has while looking at these objects is the same. The claim that this is a truism is based on an appealing intuition, an intuition that depends on the idea that we have a perfect access to the phenomenal character of our experience: if we cannot tell two experiences apart by introspection then they have the same phenomenal character. However, this intuition ignores that the judgments we make to introspectively compare the phenomenal character of two experiences require cognitive access to the phenomenal character of our experiences; so, once cognitive access is dissociated from phenomenal character we can endorse C-individuation and explain what happens in the case in which we look to objects that satisfy NTL, resisting the former intuition:

It follows from NTL and $PC \rightarrow L$ that there can be two experiences that are FS-indistinguishable but are not C-indistinguishable, namely E_a and E_b . E_a and E_b on the one hand and E_b and E_c on the other are FS-indistinguishable; but E_a and E_c are not FS-indistinguishable and consequently E_a and E_b are not C-indistinguishable. If phenomenal consciousness can be dissociated from cognitive access, then it is plausible that the access we have to the phenomenal character of the experience is less fine grained than the phenomenal character itself. Hence, there will be cases in which we will not be able to decide just by introspection whether two experiences have the same phenomenal character or not: our resources for doing so are limited and the access we have to the phenomenal character of

⁸ It is worth stressing that, in order to reject FS-individuation, one does not have to deny that we *typically* can tell by introspection whether two experiences have the same phenomenal character or not.

our experiences does not allow us to tell whether E_a and E_b have the same phenomenal character. If C-individuation is correct, they do not have the same phenomenal character and that explains right away why we can tell E_a and E_b apart. *The way things look to me* depends on the access I have to the phenomenal character of my experience and that is why the object I look at when undergoing E_a looks the same as the object I look at when undergoing E_b in spite of the fact that the phenomenal character of E_a and E_b are different. Our access resources to the phenomenal character of experiences do allow us to distinguish E_a from E_c because their phenomenal characters are sufficiently different, but not so between E_a and E_b nor E_b and E_c .

My opponent intended to show that NTPC is true due to the failure of transitivity in the relation *looks the same as*. However, as I have argued, the acceptance of this failure of transitivity does not commit oneself to the claim that *same phenomenal characters as* is a non-transitive relation, unless one accepts FS-individuation; but if consciousness can be disentangled from cognitive access there is no reason to do so. She might be willing to resist the claim that cognitive access be less fine grained than the phenomenal character and insist that it is preferable to save the intuition that $L \rightarrow PC$ is true. So, the debate turns on whether there is any further positive reason to prefer C-individuation, and I think there is: no further properties beyond the phenomenal character of experience have to be postulated. E_a and E_b are C-indistinguishable and in order to decide so it seems that we are exclusively appealing to the way it feels to undergo these experiences, namely to their phenomenal character. Our ability to contrastively distinguish experiences seems to rely on phenomenology (on the phenomenal character) alone. If in virtue of the fact that E_a and E_b are FS-indistinguishable they would have the same phenomenal character, then how can it be that these experiences can be contrastively distinguished? If E_a and E_b have the same phenomenal character how can we *phenomenologically* distinguish E_a from E_c but not E_b from E_c ? Even if she bites the bullet and denies that this distinction has to appeal to phenomenology, she would have to offer an explanation of it. For that purpose, she has to postulate an additional property E_a has and E_b lacks and an ability we have to access this additional property in virtue of which we can tell the two experiences apart.

In my view, we have right away a criterion for telling E_a and E_b apart: the way it feels to undergo E_b is, whereas the way it feels to undergo E_a is not, similar enough (so that we cannot FS-distinguish them) to the way it feels to undergo E_c . The way it feels to undergo E_a is different from the way it feels to undergo E_b . E_a and E_b have different phenomenal characters.⁹

⁹ What is more, the acceptance of FS-indistinguishability as an individuation criterion for phenomenal characters leads to paradoxical results if NTL is true. In this case, two experiences that are FS-indistinguishable but not C-

5 Conclusion

I have maintained that even if one accepts a failure in transitivity of the relation *looking the same as*, this is not a good reason for believing that *same phenomenal character as* is not transitive and defended the view that the criterion for individuation of phenomenal characters should be C-distinguishability.

The view that C-indistinguishability individuates phenomenal characters avoid paradoxical results and secures the view that how things look depends on phenomenal characters—but not exclusively on it. How things look like depends on the cognitive access we have to the phenomenal character of our experience. This access does not allow us to distinguish two experiences with too similar, but different, phenomenal characters.

The fact that we cannot distinguish at first-sight between two experiences does not show that both have the same phenomenal character, because we contrastively distinguish experiences that we cannot at first sight, and we do so just by appealing to the phenomenal character of experience. Defender of FS-indistinguishability have to maintain that phenomenal characters do not suffice for contrastively distinguish two experiences and postulate further properties. It is obscure what those properties would be if they are not the phenomenal character of experience.¹⁰

References

Antony M (2006) Consciousness and vagueness. *Philosophical Studies* 128(3):515–538

indistinguishable—possible by the conjunction of NTL and $PC \rightarrow L$ as we have seen—share and do not share a PC property, the phenomenal character, which is a contradiction. Formally:

- P1 $\neg ID_c(E_a, E_b)$
 P2 $ID_{fs}(E_a, E_b)$
- (1) $\forall x \forall y (ID_{fs}(E_x, E_y) \leftrightarrow PC_x = PC_y)$ Assumption
 - (2) $\exists z (\neg ID_{fs}(E_z, E_2) \wedge ID_{fs}(E_z, E_1))$ From P1 and C-distinguishability.
 - (3) $\exists z ((PC_z = PC_b) \wedge (PC_z \neq PC_a))$ From 1 and 2.
 - (4) $PC_a = PC_b$ From P2 and 1.
 - (5) $\exists z ((PC_z = PC_b) \wedge (PC_z \neq PC_b))$ From 3 and 4.

 $\therefore \neg \forall x \forall y (ID_{fs}(E_x, E_y) \leftrightarrow (PC_x = PC_y))$ From 1 to 5 by *reductio ad absurdum*

For there to be a link from the non-transitivity of the relation *looking the same as* to the claim that the relation *same phenomenal character as* is non-transitive, phenomenal characters should be individuated by FS-distinguishability (the assumption of the argument).

My opponent could block this argument by reviewing classical logic. I consider that, if the proponent of FS-discrimination as a criterion for the individuation of phenomenal characters is committed to the rejection of classical logic, and we have an alternative theory, supported by empirical evidence, then we have good reasons for dismissing her view. Appealing to C-indistinguishability as an individuation criterion for phenomenal character is such an alternative. It explains how two experiences can be not distinguishable by introspection without thereby entailing that they have the same phenomenal character.

¹⁰ ACKNOWLEDGEMENTS.

- Block N (1995-2002) On a confusion about the function of consciousness. In: Block N (ed) *Consciousness, Function, and Representation: Collected Papers*, vol 1, Bradford Books
- Block N (2007) Consciousness, accessibility, and the mesh between psychology and neuroscience. *Behavioral and Brain Sciences* 30:481–548
- Block N (2011) Perceptual consciousness overflows cognitive access. *Trends in Cognitive Sciences* 12:567–575
- Block N (2012) Response to kouider et al.: which view is better supported by the evidence? *Trends in Cognitive Sciences* 16(3):141–142
- Byrne A (2001) Intentionalism defended. *Philosophical Review* 110(2):199–240
- Chuard P (2010) Non-transitive looks & fallibilism. *Philosophical Studies* 149(2)
- de Clercq R, Horsten L (2004) Perceptual indiscriminability: In defence of wright’s proof. *Philosophical Quarterly* 54(216 ,):439–444
- Dehaene S, Naccache L (2001) Towards a cognitive neuroscience of consciousness: basic evidence and a workspace framework. *Cognition* 79:1–37
- Deutsch M (2005) Intentionalism and intransitivity. *Synthese* 144(1):1–22
- Dummett M (1975) Wang’s paradox. *Synthese* 30(3-4 ,):201–32
- Everett A (1996) Qualia and vagueness. *Synthese* 106(2):205–226
- Fara DG (2001) Phenomenal continua and the sorites. *Mind* 110(440):905–935
- Fuster J (2008) *The prefrontal cortex* (4th ed.). London: Academic Press.
- Goldman-Rakic PS (1988) Topography of cognition: parallel distributed networks in primate association cortex. *Annual Review of Neuroscience* 11:137–156
- Goodman N (1951) *The Structure of Appearance*. Harvard University Press
- Horikawa T, Tamaki M, Miyawaki Y, Kamitani Y (2013) Neural decoding of visual imagery during sleep. *Science* 340(6136):639–642
- Kouider S, Sackur J, de Gardelle V (2012) Do we still need phenomenal consciousness? comment on block. *Trends in Cognitive Sciences* 16(3):140–141

- LaBerge S (1988) Lucid dreaming in western literature. In: *Conscious Mind, Sleeping Brain. Perspectives on Lucid Dreaming*, Plenum
- Landman R, Spekreijse H, Lamme VAF (2003) Large capacity storage of integrated objects before change blindness. *Vision Research* 43(2):149–164, URL <http://www.ncbi.nlm.nih.gov/pubmed/12536137>, PMID: 12536137
- Leclair-Visonneau L, Oudiette D, Gaymard B, Leu-Semenescu S, Arnulf I (2010) Do the eyes scan dream images during rapid eye movement sleep? evidence from the rapid eye movement sleep behaviour disorder model. *Brain: A journal of Neurology* 133:1737–1746
- Perkins R, Bayne T (2012) Representationalism and the problem of vagueness. *Philosophical Studies* 162:71–86
- Sebastian MA (2013) Not a HOT dream. In: Brown R (ed) *Consciousness Inside and Out: Phenomenology, Neuroscience, and the Nature of Experience*, Studies in Brain and Mind. Springer Press
- Slight IG, Scholte HS, Lamme VAF (2008) Are there multiple visual short-term memory stores? *Plos One* 3:1–9
- Sperling G (1960) The information available in brief visual presentation. *Psychological Monographs: General and Applied* 74(11):1–29
- Tye M (1997) *Ten Problems of Consciousness: A Representational Theory of the Phenomenal Mind*. The MIT Press
- Tye M (2002) *Consciousness, Color, and Content*. The MIT Press
- Wright C (1975) On the coherence of vague predicates. *Synthese* 30(3-4):325–65