

# Between Perception and Thought

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## 1. Introduction

There is a difference between seeing and thinking—for example, between seeing the red lines on your COVID test and judging that you have COVID. Block (2023) is interested in the nature of this border—or more broadly, in the nature of the border between *perception*, which includes not just seeing but also hearing and touching and perhaps smelling and tasting, and *cognition*, which involves “capacities for propositional thought, reasoning, evaluating, and decision making” (p. 13).

There have been a number of proposals lately about how to understand this border (Clarke & Beck 2023). Block pursues an approach grounded in representational format: whereas perception is constitutively nonpropositional, nonconceptual, and iconic (NNI), cognition is constitutively none of those things. Paradigmatically, it is the opposite: propositional, conceptual, and discursive (PCD).

Block's format approach can be challenged from two directions. *The challenge from below* questions whether perception is fully NNI (Beck 2023; Green 2023; Gross this issue; Quilty-Dunn this issue). For present purposes, I'll set this challenge aside. Instead, I'll focus on *the challenge from above*: that much of cognition is not PCD.

Block anticipates this challenge. He grants that mental imagery is post-perceptual and iconic (pp. 229–31) and that “mental maps” used in navigation may be NNI, at least in part (pp. 123, 169, 268, 302). To address these and other alleged cases of NNI cognition, Block deploys two strategies, which I'll call the *cognitive envelope strategy* and the *shoehorning strategy*. I'll ask whether these strategies provide Block with the resources to draw a format-based border between perception and cognition.

My answer will be that they do not—at least, not if Block's aim is to draw a border between perception and *cognition in general*. But partly for that reason, I'll suggest that this isn't the border we should interpret Block as drawing. Rather, we should interpret Block as drawing a border between one elite *species* of cognition—namely, propositional (conceptual, discursive) thought—and everything below it, including perception. And that leaves the border between perception and cognition in general unexplained. To fill this gap, I'll recommend my stimulus-dependence account (Beck 2018) and reply to objections Block raises against it. A key point, here, is that my stimulus-dependence account and my interpretation of Block's format account are compatible since they concern different borders. Moreover, by putting these two borders together we can recognize a category of mind that is crucial to understanding human infants and nonhuman animals—namely, nonpropositional cognition, which sits between perception and propositional thought.

## 2. Clarifications

I take Block to be interested in drawing a border between perception and cognition. This project should be distinguished from two others, one more ambitious and one less so.

The more ambitious project is to identify necessary and sufficient conditions for perception and cognition. Block is explicit that this is not his aim (pp. 21–22, n. 3). Thus, it would be no objection to his project that it fails to distinguish perception from sensation, or cognition from emotion; nor that it fails to fully explicate phenomena that are common to perception and cognition, like representation.

The less ambitious project is simply to identify some constitutive features of perception. While this is certainly one of Block's aims, it's clear even from the book's title that he wants more. He wants the constitutive features to illuminate "a joint in nature between perception and cognition resting on differences in format" (p. 1).

My question is how to reconcile this intermediate aim with the existence of NNI cognition. How can there be a format-based *joint in nature* between perception and cognition if representations with the same NNI format show up on both sides of the border?

Considering examples of mental imagery, Block addresses this question early in the book.

But why don't these examples and the existence of conceptualized percepts show there is no joint in nature? The answer is that the joint is between perception on the one hand and types of states that may use perceptual materials, but not constitutively, on the other. (p. 15)

In other words, Block holds that perception is separated from cognition because it alone is *constitutively* NNI.

One worry, however, is that there may be some *kinds* of cognition that are constitutively NNI, and this proposal wouldn't explain why they aren't part of perception. I'll return to this worry below in discussing analog magnitude representations.

Another worry is that this proposal limits the utility of the border. Ideally, a border between perception and cognition should help with some hard cases by providing a usable criterion (Green 2023). But the criterion of being constitutively NNI is not usable. For suppose we find a representation that is NNI. The criterion won't tell us whether it belongs to perception or cognition since NNI representations show up on both sides of the border.

In other contexts, Block seems to recognize the importance of a usable criterion. When discussing the proposal that perception is constitutively restricted in the properties it can represent but that cognition is not (e.g., while perception and cognition can both represent colors, only cognition can represent justice), he takes it to task for just this shortcoming: "But that observation won't help us with distinguishing a perceptual and a cognitive representation of the same property" (p. 44). Block is right; but the point cuts two ways.

### 3. Cognitive Envelopes

Block concedes that "perceptual materials"—materials that are NNI—can be enclosed in a "cognitive envelope," as when you use imagery to determine if a sofa will fit through a doorway. Sometimes Block seems to take this to mean that perceptual materials are placed in working memory. But if that's right, then we need to ask why being in working memory makes something cognitive. And if the answer appeals to a non-format property—say, being broadcast in the non-

modular global workspace; or being stimulus-independent—then the real work of distinguishing perception from cognition is no longer being done by format.

So, when Block talks about perceptual materials being placed in a “cognitive envelope” he must instead mean that they are joined to a representation that is PCD, with the result being a hybrid representation, like the sentence “My grandmother looks like this \_\_\_” in which the blank is filled in by a picture. If that’s right, then it’s open to Block to say that cognition is distinguished from perception by virtue of always being at least partly PCD. NNI materials show up, but only in a “cognitive envelope”—an envelope that is PCD. We thus get a usable criterion: if a complete mental representation is even partly PCD, it’s cognitive; if it’s entirely NNI, it’s perceptual.

But this interpretation presupposes that “perceptual materials” (NNI representations) can only show up outside of perception in a “cognitive envelope”—a structure that is PCD. One reason to doubt this is that it seems possible to engage in mental imagery without simultaneously embedding that imagery in a propositional structure. For example, it seems possible to daydream in imagery—say, mentally rotate Tetris pieces in your mind’s eye—without enclosing the imagery in cognitive envelopes that are PCD. I say this seems possible, but admittedly it’s hard to prove because human adults always have PCD cognition available. So, I instead want to focus on a clearer case: infant and animal cognition.

#### 4. Animal and Infant Cognition

Human infants, rats, pigeons, and monkeys are not merely perceivers. They engage in reasoning, evaluating, and decision making. But it’s doubtful that their cognition is always propositional. One reason is that evidence for a facility with logical reasoning, which Block takes as a marker for propositional representation, is relatively thin—as Block himself points out (pp. 187–88). For example, infants fail at even the most basic tests of disjunctive syllogism before 17 months and don’t pass a more demanding test until age three (Mody & Carey 2016). Success at similar tasks among nonhuman animals are limited as well, suggesting that infant cognition and the cognition of some animals is nonpropositional and nonconceptual.

Block might agree; he says that infants have “proto-concepts” rather than concepts (p. 267). But if so, this puts him in a bind since his main argument that perception is nonpropositional is that perception lacks logical structure (Ch. 4). There is no negation or disjunction in perception, he says, since you cannot perceive something as *red or green* or as *not red*. Thus, if he gives up on logical structure being a mark of propositionality, he loses his main argument for perception being nonpropositional. Alternatively, if he sticks with that criterion, he seems committed to the existence of nonpropositional cognition, at least in animals and infants.

There are also specific examples of cognitive representations in animals that do not seem to involve logical form and are plausibly NNI. Camp (2009) posits hierarchical tree-like structures that support transitive inference about social dominance in monkeys. Likewise, I have argued that some forms of practical deliberation in animals can be entirely constituted by analog magnitude representations (AMRs), which have an analog, and hence iconic, format (as Block agrees—p. 224) and represent quantities such as number, duration, rate, and area (Beck 2015). AMRs can play a desire-like role (by encoding utilities) along with a belief-like role (by representing how things are); and they can be embedded in a formal framework, such as expected utility theory, that makes no appeal to representations with logical form. We can thus see how AMRs on their own can support sophisticated practical reasoning. No “cognitive envelopes” are required. (Maybe we should call them “cognitive postcards.”) It seems likely that some organisms—maybe some

birds or fish or even mammals—have AMRs and use them in practical deliberation but lack PCD cognition.

To see how this might work, consider the long-tailed hummingbird, which frequently flies over half a kilometer in search of nectar. Given its tiny size and high energy consumption, it needs to optimize its searches. If it returns to a depleted source too soon, nothing will be there. But if it waits too long, a competitor might get the nectar first. To determine precisely when the source has replenished, the bird needs to represent the rate at which each source replenishes after depletion and multiply it by the duration since the source was last depleted. Using artificial flowers in a controlled environment, experimenters have shown that hummingbirds will optimize their foraging runs in this way (Gill 1988). The crucial point is that this entire process can be carried out over AMRs. Propositional representations aren't needed.

## 5. Shoehorning

Let's review. Block says that it's okay for mental imagery and other NNI representations to enter into cognition so long as they're in a "cognitive envelope." If that means an envelope that has some non-format property, then Block is implicitly presupposing a perception–cognition distinction that isn't grounded in format. Alternatively, if it means an envelope that is PCD, it faces the problem that mental imagery, AMRs and other NNI representations can enter cognition unenveloped. Either way, the idea that the perception–cognition border can be drawn in terms of format is in trouble.

Block might reply by trying to shoehorn these NNI representations into either perception or PCD cognition—a strategy he takes with respect to "core cognition," which he argues is really a "heterogeneous mixture" of kinds that can be neatly separated into perceptual kinds and conceptual kinds. But while this may work for some kinds, it won't work across the board.

Take the long-tailed hummingbird, which computes AMRs of the amount of nectar in various distal flowers to decide which flower to visit. These AMRs are clearly not perceptual since the nectar is outside the range of perception. Nor are they PCD.

Similar points can be made about mental imagery (as Block also acknowledges—p. 48) and monkeys' social dominance representations. They cannot be shoehorned into either perception or PCD cognition.<sup>1</sup>

## 6. Two Borders

Suppose I ask you to explain the difference between a youth hostel and a hotel. You reply with the distinction between a seven-star hotel (yes, there is such a thing) and a youth hostel: the difference is that the seven-star hotel includes a butler, a limousine, and a Michelin-starred restaurant. Now, you've drawn a border of sorts, but it's really the border between a seven-star hotel and everything below it, including hostels and other hotels. We still haven't learned how youth hostels differ from hotels in general.

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<sup>1</sup> Block says that imagery is not perception. But could Block instead say that by "perception" he intends a broad category that includes imagery and other forms of NNI cognition? Not if perception is supposed to be about the "news" (p. 119). And not without trivializing cognitive penetration: no one doubts that your beliefs about what your grandmother looks like can influence how you visualize her.

I think Block's account is a bit like that. Although he advertises it as concerning the border between perception and cognition, it really concerns the border between an elite species of cognition—propositional thought—and everything below it, including perception and the remainder of cognition. This interpretation leaves intact most of Block's insights throughout the book. But we still haven't learned how perception differs from cognition in general.

Admittedly, Block does not usually write as though he's marking the border between propositional thought and everything below it. If he did, there would be no reason for him to insist, as he often does, that cognition is merely paradigmatically, and not constitutively, propositional. But he does occasionally flirt with the view. Most notably:

Is the existence of possibly nonpropositional nonconceptual forms of cognition such as perceptual memory enough to get in the way of a joint between perception and cognition? Perhaps what these cases show is that it would be best to describe the joint as between on the one hand perception and on the other, propositional and conceptual cognition. (p. 302)

This is the closest Block comes to explicitly acknowledging that his border concerns a species of cognition rather than cognition in general. And even here he only says "perhaps." Still, I think this is exactly what he should be saying, only more vociferously!

But notice that if this is right then there remains another border to characterize—namely, the border between perception and cognition in general. I'll discuss that next.

## 7. Stimulus-Dependence

Perception may go beyond sensation in being representational (Burge 2010), but it retains an aspect of sensation insofar as it is grounded in the senses. Cognition, by contrast, is freed from the senses and can run offline. Because the senses function to extract information from proximal stimulation, this means that perception is tethered to proximal stimulation in a way that cognition is not. I have thus proposed drawing the border between perception and cognition in terms of *stimulus-dependence* (Beck 2018). Perception causally depends on proximal stimulation for its maintenance. For example, vision is stimulus-dependent because it is causally sustained by light on the retina. That's why you can't see in the dark, though you can think, visualize, imagine, and remember just fine.

Block characterizes the stimulus-dependence approach as "pre-scientific" (p. 33). (His own format approach he of course calls "scientific.") His assumption seems to be that only distinctions that reveal a deep, hidden nature are genuinely scientific. But that's too strong. While some scientific distinctions turn on a hidden property—say, the distinction between gold and fool's gold—many others are relatively shallow. For example, it would be a mistake to think that the distinction between herbivores and carnivores needs to boil down to some hidden property, like the presence of a particular digestive enzyme. Rather, the distinction wears its essence on its sleeve. Still, it is a useful distinction that supports a range of inductive generalizations. If we learn that a newly discovered dinosaur species is carnivorous, that allows us to immediately increase our confidence in various hypotheses about it. On the stimulus-dependence account, the distinction between perception and cognition is like that.

Block raises two objections to the stimulus-dependence approach. The first is that what he calls "minimal immediate direct perceptual judgments" are just as stimulus dependent as the perceptions they conceptualize (p. 42). But while it's true that such judgments depend on proximal

stimulation for their *initiation*, they are not dependent on proximal stimulation for their *maintenance*. If you see Times Square and then close your eyes, you can continue to hold the minimal immediate direct perceptual judgments you formed about Times Square in mind. So, they are stimulus-*independent* in my sense.

The second objection Block borrows from Quilty-Dunn (2020) who claims that my account in (Beck 2018) makes perception nonconceptual by fiat since it rules out the possibility that concepts could be tokened in the visual system, which Quilty-Dunn thinks should be treated as an open empirical matter. But my stimulus-dependence account was developed with an eye towards the empirical evidence. Because I thought the empirical evidence suggests that perception is nonconceptual, I was happy to propose an account that treats perception as such. This was by design, not fiat. It's also an odd objection for Block to raise since he thinks that perception is constitutively nonconceptual. Surely, he should think it counts in favor of a view if it respects the nature of perception! That said, I've since modified my account and it no longer has this consequence, as I'll now explain.

## 8. Non-Exclusivity

Block's account of the perception–cognition border presupposes the following thesis.

*Exclusivity*: a capacity or representation is perceptual if and only if it is not cognitive.

This is a perfectly natural assumption, but it is one that I have come to believe we should reject.

In work in progress with Casey O'Callaghan, we take perception and cognition to be distinct but non-exclusive faculties, where each faculty is a collection of capacities. A capacity belongs to perception if it can be exercised in a stimulus-dependent manner and to cognition if it can be exercised in a stimulus-independent manner. Because some capacities can be exercised in each manner, the two faculties partially overlap. Just as the executive branch is distinct from the legislative branch even though the vice president belongs to both, perception and cognition are distinct but non-exclusive categories. This account allows that a given conceptual capacity might be exercised perceptually on some occasions and cognitively on others, evading Quilty-Dunn's worry.

One virtue of this account is that it readily handles many of the cases that trouble Block. As Block argues at length (pp. 226–229), the capacities and mechanisms underlying visual perception overlap significantly with those underlying visual imagery. On our view, those capacities and mechanisms belong both to perception and to cognition. When they're exercised in a stimulus-dependent manner (e.g., when you see a couch move through a doorway), they are exercised perceptually. When they're exercised in a stimulus-independent manner (e.g., when you *visualize* a couch move through a doorway), they are exercised cognitively. There's no need for cognitive envelopes or shoehorning.

The same is true of AMRs—for example, AMRs of approximate number. Block is right that approximate number can be perceived, as when you see how many jellybeans are on the counter. But it isn't always perceived. For example, the number sense is known to be activated by seeing Arabic numerals. But just as seeing the word "red" is not the same as seeing the color red, seeing the numeral "1" is not the same as seeing the number one. It is also activated by mental arithmetic, as when you do subtraction and multiplication in your head. Block might reply that this is the activation of numerical concepts, but there are known dissociations between the activation of

numerical concepts, which are precise and located in frontal language areas, and approximate numerical representations, which are governed by Weber's Law and located in the intraparietal cortex. For example, in an fMRI study approximate arithmetic (e.g. Is  $4 + 5$  closer to 8 or 3?) was associated with activation in the intraparietal cortex whereas exact arithmetic (e.g. Is  $4 + 5$  equal to 9 or 7?) was associated with activation in the inferior frontal cortex and angular gyrus (Dehaene et al. 1999). Likewise, parietal damage impairs approximate but not exact arithmetic, while damage to prefrontal language areas impairs exact but not approximate arithmetic (Lemer et al. 2003). Thus, while it's true that the numerical concepts in frontal cortex are PCD, these shouldn't be confused with AMRs of approximate number in the parietal cortex, which are NNI and can be activated in perception or cognition. Our view accommodates this naturally: when the approximate number representations are exercised in a stimulus-dependent manner, they are exercised perceptually; when they are exercised in a stimulus-independent manner, they are exercised cognitively.

## 9. Two Borders Revisited

I want to reiterate that my account and my interpretation of Block's account are compatible since they concern different borders. Mine concerns the border between perception and cognition in general. His concerns the border between propositional thought (an elite species of cognition) and perception/NNI cognition. If he accepts my interpretation, Block is thus free to endorse my account of the first border. And I even see some hints that he might be so inclined, as when he writes, "We do not normally count perceptual imagery as perception, since imagery does not function to be stimulus-dependent" (p. 48).

If there are these two borders, one might wonder about their relative importance. Is one comparatively insignificant?

I believe that both are important. On the one hand, if we want to understand more sophisticated forms of thought—the kind of thought that underlies our use of language and that many nonhuman animals probably lack—we'll want to focus on Block's border between propositional thought and perception/NNI cognition. On the other hand, if we want to understand the minds of human infants and nonhuman animals—or even many of the more primitive aspects of our own minds—we will need to go beyond Block's analysis. That's because much of what happens in these minds is sandwiched between perception and propositional thought.

## Acknowledgments

Thanks to the members of York's Philosophy of Perception Reading Group for working through Block's book with me and to Brandon Ashby for written comments. I presented an early version of these comments at the Pacific APA Symposium on Ned Block's book in April 2023. Thanks to all those present for discussion, and especially to Ned Block for his reply. My work on this paper was supported by Social Sciences and Humanities Research Council of Canada Insight Grant 435-2022-0976, and the Vision: Science to Applications Program, thanks in part to funding from the Canada First Research Excellence Fund.

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