

## Seeing absence

Anna Farennikova

Published online: 1 November 2012  
© Springer Science+Business Media Dordrecht 2012

**Abstract** Intuitively, we often see absences. For example, if someone steals your laptop at a café, you may see its absence from your table. However, absence perception presents a paradox. On prevailing models of perception, we see only present objects and scenes (Marr, Gibson, Dretske). So, we cannot literally see something that is not present. This suggests that we never literally perceive absences; instead, we come to believe that something is absent cognitively on the basis of what we perceive. But this cognitive explanation does not do justice to the phenomenology. Many experiences of absence possess immediate, perceptual qualities. One may further argue that the ability to detect certain absences confers strong adaptive advantage and therefore must be as primitive and fundamental to humans as seeing positive things. I argue that we can literally see absences; in addition to representing objects, perception represents absences of objects. I present a model of seeing absence based on visual expectations and a visual matching process. The phenomenon of seeing absence can thus serve as an adequacy-test for a theory of perceptual content. If experiences of absence are possible, then we have another reason (following Siegel) to reject the view that perceptual content is restricted to colors and shapes. Furthermore, if the proposed account is correct, then we have grounds for dissociating seeing absence from other imagery-based phenomena termed “perceptual presence-in-absence” (Noë, Macpherson).

**Keywords** Perceptual content · Visual experience · Perception of absence · Phenomenal character · Memory · Imagination

---

A. Farennikova (✉)  
Department of Philosophy, University of North Carolina at Chapel Hill, 240 East Cameron,  
CB#3125, Chapel Hill, NC 27599-3125, USA  
e-mail: anyavf@live.unc.edu

## 1 Introduction

You've been working on your laptop in the café for a few hours and have decided to take a break. You step outside, leaving your laptop temporarily unattended on the table. After a few minutes, you walk back inside. Your eyes fall upon the table. The laptop is gone!

This experience has striking phenomenology. You do not infer that the laptop is missing through reasoning; you have an immediate impression of its absence. Our life is replete with more mundane examples. We discover that there is no milk in the fridge, notice an absence of a colleague in a meeting, or see that the keys are missing from the drawer. These are routine cases of perceiving an absence.

However, absence perception presents a paradox. On prevailing theories of perception, we see only present objects and scenes (Marr 1982; Gibson 1966; Dretske 1969). So we cannot literally see something that is not present. This suggests that we never actually *perceive* absences; instead, we come to *believe* that something is absent on the basis of what we perceive. But this cognitive explanation does not do justice to the phenomenology. Experiences of absence possess immediate perceptual qualities. One may further argue that the ability to rapidly detect absences confers adaptive advantage and must be as fundamental to humans as is seeing positive things.

In this paper, I argue that we can literally see absences; in addition to representing objects, vision represents absences of objects.<sup>1</sup> The phenomenon of seeing absence can therefore serve as an adequacy-test for a theory of perceptual content. If experiences of absence are possible, then we have another reason, following Siegel (2006), to reject the view that perceptual content is restricted to colors and shapes. Furthermore, if the proposed account is correct, we have additional support for the argument that perception involves memory and imagination.

Here is the plan. In Sect. 2, I introduce the phenomenon of seeing absence and explain why it might be considered problematic. In Sect. 3, I consider and reject several strategies for defending the claim that we can see absences and the accounts of absence perception that go with them. In Sect. 4, I propose an alternative account of absence perception based on the paradigm of failed visual searches and a visual matching process. In Sect. 5, I reply to objections. I conclude by discussing the implications of my model of absence perception for other modalities and for the role of imagination and memory in theories of perceptual content.

## 2 The paradox of seeing absence

Intuitively, we see absences of clouds, colleagues, electric outlets, and shopping carts. These experiences are common and we often characterize them in sensory terms. In this section, I will show that the claim that such representations are

---

<sup>1</sup> My main focus will be on visual experiences of absences of physical objects such as laptops or keys. In the conclusion, I will discuss how my model of absence perception may be applied to other sensory modalities. I will restrict my use of 'seeing absence' or 'perceiving absence' to refer only to the conscious experiences of absence, and will note when the unconscious perception of absence is at issue.

perceptual faces serious challenges. I will begin by clarifying the class of experiences that is problematic. I will then give two reasons for why this class of experiences is problematic and conclude by considering a skeptical response to the possibility of seeing absence.

## 2.1 The phenomenon

We should be careful to distinguish seeing absence from three types of related but distinct phenomena.

First, seeing absence should be distinguished from a mere failure to see. One might fail to see an object due to inattention or impairment (e.g. visual neglect), or because it is hidden, partially occluded, or in a blindspot. In these cases, one fails to detect a present object. Seeing absence, however, is not a mere detection failure and involves successfully detecting an object's absence.

Second, seeing absence should not be confused with "seeing" things that are absent, where the latter involves representing, due to perceptual error or pathology, missing objects as present. Consider experiences of a Phantom Limb patient who experiences the amputated leg as still being there. Or take the awkward moment of mistaking someone else for a friend. Experiences of this sort are non-veridical: they represent as present something that is not really there. In contrast, the function of experiences of absence is to report that an object is in fact missing from the scene. For example, when viewing the empty table at a café, your experience of the laptop's absence accurately represented what the world was like.

The third phenomenon involves amodal completion. In standard perceptual completion scenarios, like the Kanizsa triangle, the physically absent stimulus appears to be present due to automatic reconstruction of missing sensory information in the experience. Similar analysis may be extended to our everyday perception of occluded objects or backs of objects, where the information about the strictly "unseen" parts is said to be phenomenally given (modally or amodally) in the experience (Noë 2006). The basic function or effect of modal and amodal perception, therefore, is to "virtually" *complete* present objects or patterns by filling-in missing physical information. In contrast, absence experiences explicitly reveal to the viewer what is *incomplete* or *lacking* from the scene. They are fundamentally impressions of absence, and do not present absent objects or absent parts of objects as being virtually there.

In sum, experiences of absence are conscious perceptions that represent a particular object or a group of objects as missing from the perceived scene. Such representations differ in both their semantic function and in their phenomenal character from mere failures to see, from nonveridical seeing, and from imaginative or amodal seeing. While experiences of absence seem both possible and pervasive, a case can be made against treating them as cases of genuine seeing. I turn to it now.

## 2.2 The introspection-based challenge

The idea that we can experience absence might be challenged from two directions. The first challenge comes from introspection. Imagine an ordinary café table: dark,

with a slightly scratched surface. Then imagine how the table would look had your computer been stolen from it. These experiences seem visually indistinguishable. Indeed, what more is there to seeing the absence of the laptop than looking at the table and seeing only it? Upon inspection, even the most striking experiences of absence reduce, or phenomenally collapse, into positive observations of objects.

The above observation about phenomenal collapse suggests the following argument against the possibility of seeing absence:

*The Argument from Indiscriminability*

1. Absence experiences are visually indiscriminable from correlative positive experiences.
2. If so, then the representational difference-maker between positive representations and absence-representations is non-visual.
3. If the difference-maker is non-visual, then absences cannot be seen.
4. So, absences cannot be seen.

Let's unpack that argument a bit. We began with an observation that experiences of absence possess immediate sensory quality. The objector then invites us to zoom in on that quality. The zooming-in reveals that experiences of absences and positive experiences are look-alikes; seeing an absence of a laptop from the table is just the experience of attending to the table. This, according to the objector, shows that what is truly perceptual in perception of absence is positive seeing. But if this is right, then putative experiences of absences represent absences and thus differ in their content from positive experiences by virtue of some non-perceptual feature. So, goes the objection, there is no literal *seeing* of absence. There are only judgments we make about absences on the basis of the actual seeing.

But is premise 1 true? After all, in an important sense, absence experiences and positive experiences do *not* feel alike, so perhaps premise 1 is not very plausible. To fully appreciate the content of premise 1, it is important to be clear about the notion of indiscriminability that the argument requires.

Here is a candidate counterexample to premise 1. Suppose that you are absent-mindedly glancing at your colleague's face during a meeting. Suddenly, it occurs to you that his mustache is gone. There will be a marked qualitative shift between these experiences. This shift in "what it is likeness" may be taken to speak against visual indiscriminability of positive and negative experiences.

Unfortunately for us, the opponent of seeing absence can still run her argument. No one is denying, she may reply, that experiences of absence have distinctive phenomenal feels that interestingly contrast with phenomenal characters of positive experiences. The problem with absences is that the phenomenal characters responsible for those effects aren't really theirs. Absences lack proprietary appearances. The looks of absences are just the looks of positive objects; *how absences seem is how positive objects seem*. And it is in this sense that experiences of absence are visually indistinguishable from positive experiences.

In short, phenomenal contrast does not undermine phenomenal collapse, and the latter gives the Argument from Indiscriminability *prima facie* strength. This does not mean, however, that we should give up on phenomenal contrast entirely. I will

return to it and other phenomenology-based considerations in the next section in which we will examine various approaches to defending seeing absence. Until then, let's consider empirical reasons which pose a further threat to the perception of absence.

### 2.3 The empirical challenge

To set up the empirical problem, let's do a quick review of what major theories of perception say about the goal of perception and how this goal is carried out.

Marr's theory (1982) targets levels of processing in object-recognition. The goal of perception is extraction of contours and construction of three-dimensional representations of objects, invariant across viewpoints. Gestalt theory focuses on principles of grouping that implement irreducible higher-order properties of perceptual stimuli (Koffka 1935). On this theory, the essential function of perception is identification of whole objects in a scene. Gregory's constructivist approach (1974) explicates perception as a problem-solving process that aims to recover objective properties of the world from the impoverished stimuli.

For these theories, perception is a process that can be traced back to sensory transducers which pick up on sensible features or the appearances of objects. But picking up on appearances can't happen with absences. Absences of laptop, pens and colleagues, unlike laptops, pens and colleagues themselves, lack contours, texture, or color. They therefore cannot furnish the senses with proper material to fulfill the goal of perception. In particular, absences lack suitable *sensible features* to support extraction of invariant information for the construction of representations (Marr). Absences don't afford *cues* for building hypotheses about the environment (Gregory). And absences don't have *parts* which can be integrated into wholes or grouped in any obvious way (Gestalt Theory). If the mark of a perceptual act is contour extraction and feature or part integration, absences don't fit the bill.

Let's summarize. The introspection-based argument charged absences with lacking *proprietary* appearances. The empirical charge says that absences lack *appearances* altogether—features to stimulate the sensory transducers. Given that absences lack any looks, they are worse off than abstract properties like uncles, justice, and numerosity, which we, arguably, may represent by means of the perceptual tokens of the general abstract type (Prinz 2006). They are even worse off than the unobservables like the radiation and blood cells. The eye can detect blood cells when aided with a microscope. But microscopes and X-ray machines will not endow a laptop's absence from a café with visible features. No clever device can help us see something that is not there to be seen. It follows that in saying that we can see absences, we commit ourselves to seeing something that cannot appear. So how is that we manage to see absences? On standard theories of perception, this should be impossible.

Could seeing absence be salvaged on a more revisionary theory of perception that deemphasizes appearances and posits action as perception's end-goal? Gibson's ecological approach (1966) explicates perception as the direct pick-up of information specified in the optical flow; importantly, what gets picked up are

possibilities for action: stable affordances from objects, like grasping or reaching.<sup>2</sup> We can submit that absences likewise present adaptively salient possibilities for action: absence of a venomous snake affords reaching for a banana; absence of predators near the herd affords playing and mating. Since these absences are functionally significant, shouldn't we be able to see them? It's not obvious how. On the ecological view, we read off data about present objects from the structure they impose on light by reflecting it off their surfaces and edges. But absences lack surfaces, textures, and edges. How, then, can structured light specify information about absences, if absences lack the properties that do the structuring?

The empirical problem therefore cross-cuts the prevailing theories of perception. Independently of what perception is hypothesized to recover—action affordances from the ambient array, or the objective properties of the world from the retinal stimulation—absences lacks suitable features to enter the ambient array and to stimulate the retina. There is just nothing there to do the entering and the stimulating.

#### 2.4 The skeptical response

We have looked at two arguments that challenge the perceptual status of experiences of absence. According to the introspection-based argument, experiences of absence present us with an illusion of there being proprietary phenomenology to absence. But even the most vivid absence-qualia collapse into the sensible qualities of the present objects. According to the empirical argument, seeing absence presents us with a paradox. Pervasive phenomenology of absence clashes with the inability of absences to have any phenomenology.

The most obvious resolution is this: we should admit that the talk of “seeing” absence is metaphorical. Strictly speaking, we never *see* absences. Rather, we come to believe that something is absent on the basis of what we do perceive. Let's call this skeptical response the ‘Cognitive Account’ (CA). Its slogan is this: positive things are perceived, while absences of things are merely conceived. It restricts the perceptual level to information about positive features and objects. Data about absences is not available at that level and exists at the level of higher cognitive processes, such as judgments or thoughts.

As a way to overwrite what is at stake in this debate, I want to defang an objection which may arise at this point. One may worry that in our discussion of the perception of absence, we have been unjustly ignoring a certain class of negative entities. Consider holes, gaps, shadows, and blackouts. These phenomena are commonly thought to involve an absence of some sort, and there are compelling reasons for taking their status as absences to be an objective, irreducible fact about

<sup>2</sup> More carefully, it is events rather than objects that specify the affordances. Thus, absences may be perceived in so far as they participate in the ecologically salient events. Accordingly, Gibson notes that “going out of existence, cessation or destruction is a kind of environmental event and one that is extremely important to perceive” (1979, p. 14) and offers analysis of these events in (*ibid*, pp. 106–107). His analysis, however, does not apply to absences that do not involve radical transformations “in the state of matter.” Consider seeing absence of a snake on a branch. A snake's absence is a non-event: it does not involve annihilation, disappearance or displacement of a snake (the snake was never there). Gibson is silent on whether such uneventful, yet salient absences can be directly perceived.

them (Sorensen 2008). Suppose these reasons are correct. We kill two birds with one stone: absences acquire (publicly available) sensible appearances, and these appearances are proprietary to absence perception. This, in effect, removes the demand to explain perception of absence in cognitive terms. We see absences whenever we see shadows, holes, or gaps.

But our skeptic is unfazed. Shadows and other public absences aside, our life is rife with idiosyncratic yet veridical experiences of absences. Consider seeing an absence of your favorite dessert from the bakery display or an absence of a shopping cart by the store's entrance. How are such experiences possible if absences of desserts and shopping carts fail to deliver perceptible features to the senses? Indeed, why not think that we see these absences only metaphorically, the way we see that the problem has a solution or that the tank has enough gas by looking at the gauge? Since it is this class of experiences that the skeptic cares about, the paradox stands, and so does the skeptic's cognitive resolution.

Given this clarification, let us consider why one might want to disagree with the skeptic. There are three considerations against CA in favor of the perceptual account of seeing absence.

First, CA does not do justice to the phenomenology of absence. Many experiences of absence feel instantaneous and lacking in conscious effort. This claim relies on introspection, but there is a more robust empirical measure. For example, in experiments that control for stimulus exposure and response times, detection of a target's absence and decision time are too brief to generate a conscious decision strategy (e.g., Lin and Murphy 2007).

Second, phenomenology of absence exhibits resilience to change of belief. Martin Bernetti (2006) took a striking photograph of a Venezuelan gymnast Katherine Coronel who looks completely headless while performing her routine because of the angle of Bernetti's camera. Importantly, the impression elicited by Bernetti's image is not that of the head being *occluded* by the gymnast's body. Rather, the gymnast appears headless in the same way that the rider from *The Legend of a Sleepy Hollow* appears headless. (In fact, this effect is so striking that one is tempted to check if the photo has been digitally manipulated). However, the illusion of absence persists even when one learns that the image is not a hoax. This kind of informational insulation from one's knowledge suggests that the experience of absence elicited by the photograph is a perceptual effect.

Third, it is plausible that the ability to automatically detect absences confers strong adaptive advantage. To survive, we need to be reliably and efficiently informed not only about "what is present in the world, and where it is" (Marr's postulate about the function of vision<sup>3</sup>), but also about *what is absent from the world, and where it is absent*. This reliability may require automaticity, which is a function of blocking interference from beliefs and higher cognitive states. If these reasons are correct, then the capacity to sensorily respond to absences of things

---

<sup>3</sup> Marr begins his *Vision* (1982) with "What does it mean, to see? The plain man's answer (and Aristotle's too) would be, to know what is where by looking. In other words, vision is the process of discovering from images what is present in the world, and where it is."

should be as primitive and fundamental to humans as the capacity to sensorily respond to the presences of things.

While these considerations do not constitute knock-down arguments against the Cognitive Account,<sup>4</sup> they put pressure on this account as the default response to the challenges to seeing absence presented in this section. In the next section, we will test three different approaches to defending the perceptual status of absence experiences. Evaluating these approaches will supply us with adequacy conditions for a theory of absence perception and motivate the account I will propose.

### 3 Defending seeing absence: strategies and the desiderata

In this section, I will review three approaches to defending seeing absence. The first approach capitalizes on an important fact about the *phenomenology* of absence. The second approach analyzes the *content* of experiences of absence. The third approach considers the *mechanisms* underlying representations of absence. I will argue that all three approaches fail to address the skeptic's worries; however, the last strategy suggests a promising way to account for absence perception.

#### 3.1 The looks of absences: the phenomenal contrast method

Recall the earlier claim that absences lack proprietary appearances, which served as the basis for the Argument from Indiscriminability. In that discussion, I proposed to set aside the sense in which positive and negative experiences are discriminable: they differ in their phenomenology when compared back to back. But even though this observation won't counter premise 1 of the Argument, we can take advantage of it elsewhere. In fact, it makes perception of absence a perfect candidate for the application of Siegel's method of phenomenal contrast (2006, 2010).<sup>5</sup>

We'll work with the earlier mustache example. Imagine that you run into your colleague Bill. You start talking and midway through the conversation it hits you that Bill's mustache is gone. Your experience goes through a shift. It switches from the experience of seeing Bill's face (call this experience 'EP') to an awareness of absence of his mustache ('EA'). The basic intuition is that there is a difference between what it's like to see Bill's face and what it's like to see an absence of a mustache from his face. If this intuition is correct, it should tip the scale toward the view that there is at least one phenomenal difference between EP and EA, even if the difference is not obviously visual.

<sup>4</sup> For example, the apparent immediacy of experiences of absence is compatible with the view on which perceptions of absence are computed by subpersonal inferences. The proponent of CA will then have to show that such computations occur downstream of "pure" perception.

<sup>5</sup> Schematically, the method works like this. Suppose we are interested in showing that perceptual experiences can represent some property *P*. We then seek out a pair of phenomenally contrasting experiences E1 and E2, where E1 is hypothesized to represent *P*. The next step is to lay out alternative hypotheses of phenomenal contrast between E1 and E2. Then, we argue that the *best* explanation of phenomenal contrast is the hypothesis that E1 does perceptually represent *P*.

Our objective is to show that the difference *is* visual. Thus, we must show that they differ in virtue of the fact that EA visually represents an absence. This latter claim will be our target hypothesis H. We can claim victory for seeing absence if we can show that H provides the best explanation of phenomenal contrast in comparison with its rivals. So let us consider our rival—the Cognitive Account. The proponent of CA thinks that the so-called perception of absence is just a cognitive judgment about an absence. Accordingly, your experience of Bill’s face changes because you form a new *belief* (“He shaved off his mustache!”), not because you form a new *percept* (“His mustache is absent”). Phenomenology of absence is just phenomenology of thinking about the absence.

Siegel blocks this type of a response by a *reductio* argument. Suppose forming a new belief is responsible for S’s change in phenomenology. Then, presumably, if S ceases to hold that belief, then S’s phenomenology associated with that belief would disappear. But phenomenology persists. So, phenomenal contrast must arise due to non-doxastic contents.

Let’s duplicate this dialectic for absences. Suppose, for instance, that Bill tells you that his mustache is not actually gone, but is disguised with some prosthetics and heavy-duty makeup. You trust Bill and cease to believe that his mustache is gone. But things *look* the same. The make-up artists did such a great job that Bill’s mustache seems palpably absent. We are led to a tempting conclusion: if your phenomenology of absence is unaffected by a change in belief, then it must stem from a non-doxastic state: perceptual experience of absence.

This *reductio* argument, however, won’t secure victory for H. The proponent of CA can say that the phenomenology persists because it tracks certain basic beliefs that persist—beliefs about how things look. In our case, the persisting belief would be: “It looks as if there is cleanly shaven skin under Bill’s nose”. Note that this belief refers only to a positive perceptual experience. Thus, CA remains a strong rival to H.

In sum, the compelling phenomenology of absence, as indicated by the laptop or mustache examples, is insufficient to support the claim that we can see absences. When inspected in isolation, experiences of absences collapse into positive seemings: the appearances of positive objects. When contrasted with positive perceptions, phenomenology of absence resurfaces but could be an effect of one’s cognitive judgments about absences. So it is time we consider a different approach to defending seeing absence. Now we will put aside negative qualia and focus on the negative contents.

### 3.2 Negative tags: the recognitional strategy

I defined experiences of absence as positive recognitions that something is missing from the scene. This naturally suggests a reconstruction of ‘seeing absence’ in terms of *factive* perceptual contents. When you (veridically) see absence of your laptop, you *see that* your laptop is absent. Your experience indicates a negative fact about the scene that you are viewing. We should therefore treat perception of absence as an instance of epistemic seeing: a type of seeing which essentially involves categorization, conceptualization, or some other form of epistemic appraisal of sensory input.

According to this analysis, seeing absence of a laptop is factorable into two processes. The first stage consists in the encoding of positive input (sensible features of the table). This is followed by a recognitional stage: interpretation of positive input by applying an absence-concept to it or marking it by an absence label or tag. An output of the interpretative stage is perceptual experience which represents, via an absence tag, a negative fact about your laptop.

The recognitional strategy is attractive because it offers a reconstruction of seeing absence on which the initial paradox does not arise. Seeing absence is not seeing something that is not there. It is seeing a certain fact about a positive object or a location: that it is missing an object (For Wittgenstein, this might translate into seeing a positive object under an “absence” aspect). Moreover, the recognitional analysis is neutral on whether absence-tags ever materialize in one’s perceptual experience as absence-qualia and is thus liberated in its minimal form from the burden of having to make sense of the latter.

The account is not without problems, however. First, recognitional acts seem to require concepts, and yet presumably, infants and certain animals can see absences preconceptually (on at least some theories of concepts): without sophisticated grasp of what is absent. A theory of absence that says otherwise seems too restrictive. Moreover, by making seeing absence essentially conceptual, the recognitional account places seeing absence dangerously close to beliefs, judgments and other cognitive states which the proponent of CA favors.

This brings us to the next point. Even if we grant that ‘seeing O’s absence’ naturally translates into ‘seeing that O is absent,’ this paraphrase does not dispense with the worry that perception of absence is fundamentally cognitive. Without further argument, one is free to read ‘seeing that’ metaphorically—as denoting an act occurring downstream of perception proper. Such cognitive reading won’t be blocked by an explanation that experiences of absence employ special negative semantic markers. This explanation, on the face of it, is a mere “homunculus” solution. Perception of absence is explained by the assignment of perceptual absence-tags, which does not clarify things one bit. It only pushes the problem further.

To recap: the recognitional account explicates seeing absence as an essentially conceptual high-level type of seeing. I will later argue that this consequence of the account, considered on its own, is to be rejected. Importantly, the recognitional account does virtually nothing to deserve consideration as a *perceptual* theory of seeing absence. Clearly, showing that seeing absence *is* seeing should involve more than the stipulation that experiences of absence have negatively marked perceptual contents.

### 3.3 Striking absences: the attentional strategy

As has become evident, the recognitional account runs into the same issue as the earlier phenomenal contrast strategy: both must be supplemented by a story that explains why recognitions of absences are perceptual states. Our final proposal attempts to provide this missing piece by looking at a possible mechanism

underlying experiences of absence. If we can show that the requisite mechanism is visual, then we can validate the claim that seeing absence is genuine seeing.

To meet this demand, one might argue that the perception of absence is associated with special modulation of locations and objects by visual attention. They could be stared at longer due to visual surprise, scanned differently, or ‘zoomed’: appearing larger and in higher resolution when attended focally (Kosslyn 1980). Experiences of absence, in Hume’s terminology, seem “forceful and lively”, and attention can account for these qualities. This seems like a promising strategy, especially in light of the laptop and the moustache examples. It is easy to imagine that the table ‘jumped out’ when you discovered an absence of your laptop, or that the cleanly shaven patch under Bill’s nose stood out when you noticed the absence of his mustache.

Even better, this strategy has precedent. It has been argued that the perception of ambiguous figures involves differential scanning, which can account for the differing perceptual experiences of the same stimulus.<sup>6</sup> We can place a similar explanatory burden on attention. When the stimulus is the same (e.g., the café table), we can appeal to attention as the relevant perceptual mechanism to account for differences between percepts of absence and percepts of presence. Note that this is fundamentally an empirical conjecture: the fact that attention modulates one’s percept of absence may be completely opaque to the subject.

Is this account more feasible than the previous strategies? The problem with using attentional demarcators is this. Some experiences of positive objects may be just as visually striking as experiences of absence. Sometimes objects ‘pop-out’ when unexpected or invoke prolonged eye fixations. So the processing associated with visual surprise is not exclusive to seeing absence. In addition, many cases of seeing absence occur without significant attentional modulation. Think of a habitual search for a pen in a drawer—there may be no zooming or jumping in something as familiar as drawer perception, even when you don’t find a pen.

If all of the above is right, then attentional differences are neither necessary nor sufficient for demarcating seeing absence from positive seeing. More importantly, such differences cannot provide an adequate semantic vehicle of representing an absence. Perhaps ‘zooming’, ‘jumping out’ or a scanning pattern could signal to the visual system *that* something is absent via robust causal correlation. But, they cannot represent *what* is absent (how, for instance, would the zooming of the table indicate that what’s missing is a laptop and not a vase)? So it seems misguided to look for differences in attention.

Let’s take stock. To avoid the paradox, we adopt the reconstruction that perception of absence is seeing positive stimulus in a certain way. Our goal, then, is to show that this way of seeing belongs to the *perceptual*, rather than to the

---

<sup>6</sup> See Tsal and Kolbet (1985) for some empirical results on the role of attentional focus in forming percepts of the ambiguous stimuli. Nanay (2010) takes the relevant attentional differences to be reflected at the level of perceptual content with the result that perceptual content is individuated in a fine-grained way. Price (2009), Speaks (2010) and Macpherson (2006) disagree and take attention-based phenomenology to pose a problem for the view that holds that phenomenal character supervenes on fine-grained contents.

*cognitive* domain. Our survey of defense strategies has revealed the perceptual status of absence representations cannot be validated by the analysis of the phenomenology of absence or by positing negative factive contents. The only remaining alternative is to look at the vehicles of absence representations.

A compelling defense of seeing absence must specify the mechanism subserving experiences of absence; crucially, it must show that this mechanism is visual as opposed to cognitive. There are three main demands that this mechanism must meet in order to validate the perceptual status of experiences of absence. It must (1) operate on the representations in perceptual format, (2) validate the phenomenology of absence (which includes an explanation of why they collapse), and (3) enable the representations of absence to fulfill the main function of perception (put us in contact with the world; report what is where and what is not where<sup>7</sup>). In the next section, I will attempt to defend a model of seeing absence that meets these demands.<sup>8</sup>

## 4 The mismatch model of seeing absence

Our working hypothesis is that experiences of absence essentially involve, but go beyond, mere detection of positive stimuli due to distinct visual processing, and that this processing will explain the distinct phenomenology of absence. I propose that we look for the cues of what this processing might be by examining situations when seeing absence typically occurs.

### 4.1 Elements of the model

Let's think of the situations when we usually perceive absences. You are about to make coffee and discover that the coffee jar is empty; or you expect an important document in the mail but there is nothing in your mailbox; or you make a trip to a bakery only to see that your favorite desert is missing from the display. These situations, in essence, are failed visual searches: you begin to look for an object, expecting it to be at a certain place, and see its absence when your expectation is disconfirmed. Given that seeing absence often occurs due to a violation of expectation, analysis of this process should give us important clues about the mechanisms of perception of absence.

In order to set the stage for my theory, I will first review the basic features of the expectational mechanism. When we expect something, we represent what is

<sup>7</sup> Reporting what is not where in (3) requires meeting two semantic requirements. The mechanism of absence perception must *demarcate* experiences of absence from other types of seeing and it must *individuate* them (distinguish seeing absence of X from seeing absence of Y).

<sup>8</sup> My case that seeing absence belongs to the perceptual domain is cumulative. It requires meeting the format requirement (absence representations must be perceptual in format, Kosslyn 1994), having a certain kind of phenomenology, and fulfilling the function commonly attributed to perception. In Sect. 5, I will address the question whether the fact that absences are represented by perceptual means implies that they can be literally seen.

possible or likely in the environment. This advance information is coded as conditional on contextual cues. For instance, seeing a kitchen will cause you to expect to see a fridge and an oven. When the visual system detects these cues, it activates *templates* of objects predicted to be at the scene. As used here, a visual template of object O will refer to a representation of O in visual format: a template will preserve certain visual attributes of O or aspects of O's topological organization. These templates will be generated in visual working memory: a type of memory responsible for active maintenance and manipulation of visual information. Once activated, the templates are projected and matched against the incoming sensory information: probable locations of the expected objects. If the environment is incongruent with the expectation, the visual system registers predictive error. And now, the point that's critical for our account: predictive error is resolved as a *mismatch* between the predicted state of the world and what is actually observed (Bar 2004; Kumaran and Maguire 2006).

My proposal is to explain experiences of absence by the mechanism of a mismatch which subserves violation of expectation in failed searches. I'll first show how this explanation applies to an everyday scenario, and then apply it to two more types of scenarios which do not involve searches.

Consider this familiar situation: you are certain that you had brought your keys into the house, you look and look, but the keys are nowhere to be found. Here is the breakdown of this process. Prior to searching, you generate a *visual template* of the keys in your working memory. The template does not have to be a high resolution image of your keys—it suffices to remember the keychain color and roughly, its shape. Next, you project this template and match it against the places where you typically leave your keys. Projection may be understood functionally, as a process of holding up the template of a searched object *for the purpose of comparison* of its perceptual attributes with the attributes of the perceived scene. On this definition, projection does not require you having to imagine your keys at their likely locations; i.e., you don't have to picture your keys as being on the shelf (though you may), in order to be able to match their attributes successfully. But, projection requires more than a kind of imagining, in which you attend to the template of your keys merely to observe their properties. In projection, you attend to (or, more weakly, pose) the template of your keys for the purpose of comparing it with the world. An experience of absence of your keys will involve a mismatch between their template and the places viewed during search.

Given that experiences of absence frequently result from failed searches, the mismatch mechanism seems like a good candidate to account for perception of absence in those cases. I will now show that the mismatch account generalizes to other types of absence experiences.

In a museum, you may see that an exhibit is missing a photograph, that a person in front of you is missing a finger, or that your blazer is missing a button. You will see absences of these objects without intentionally searching for them. Experiences of this type involve relatively automatic responses to a deviation in a pattern. The pattern in question may be a static display (a row of photographs), a temporal sequence (projected slides), or a regularity we implicitly pick up in the environment (the number of fingers on a hand). Because deviant patterns are posited to involve

violations of implicit expectations (Bubic et al. 2009), experiences of absence they elicit may be naturally explained in terms of mismatches. For example, walking along a row of photographs will prime you to anticipate more photographs down the line, which will cause you to activate and project their templates. A gap in the row will disconfirm your prediction and generate an experience of absence. Missing buttons and fingers will elicit experiences of absence via a similar mechanism.

Our final test of scope concerns destructions and disappearances: the burst of a balloon, a coin magically vanishing from a hand, or a lover disappearing into the crowd. In these scenarios, we experience absences of objects when we lose perceptual contact with those objects. If experiences of this sort are caused by loss of contact, must we still appeal to mismatches? I argue that we do. Imagine viewing a busy street. Within seconds, you will lose perceptual contact with dozens of cars as they sweep by. It's unlikely that all such disruptions of contact will constitute experiences of absence. The problem can't be helped by restricting perceptual contact to the *attentive* viewing of an object. Consider watching the sun set behind the ocean and intently tracking its trajectory. Now consider the time when the last bit of the sun disappears. Without the mismatch, your experience will be that of attending to the sun, followed by attending to the ocean once the sun disappears—both positive percepts. Mismatching is necessary to transform this succession of positive experiences into an experience of absence.

I have just shown that the mismatch account can explain three main types of experiences of absence: those elicited by visual searches, deviant patterns and disappearances. A survey of these types is useful not just for testing the scope of the account. It also allows us to clarify the kinds of mismatches that subservise experiences of absence. There are three qualifications we can draw from this analysis.

First, mismatches must be at the right level. Mismatches occur throughout various levels of perceptual processing, and many of them have functionally nothing to do with absence seeing.<sup>9</sup> Since we are concerned with experiences of absences of objects, seeing absence will involve *object-level* mismatches generated by processes like visual searches for objects, observations of deviant patterns which activate object-representations, and disappearances.

Second, object-level mismatches will vary in their perceptual profiles because the processes or tasks that produce them will employ templates with different characteristics. For this reason, 'template' as used here will refer not to a single type of a representation but to a *family* of different sorts of object-level visual representations in play in such processes. Let me say a bit more about what kinds of representations make up this family.

One might be tempted to think of visual templates as *images* or *visualizations* of absent objects. But this way to conceptualize templates may invite confusion. 'Images' often refer to mental pictures, consciously or intentionally generated by the subject. Although perception of absence often uses templates of that sort (e.g., an image of your laptop may flash before your eyes when you discover its absence), it does not have to. Templates of objects may be produced at the subpersonal level,

---

<sup>9</sup> These, for example, include mismatches used in adjustment of retinal disparity in perception of depth and in transsaccadic alignment of images in perception of motion.

projected involuntarily, and lack the vivacity of conscious imagery. Consider the task of checking on the absence of cars before changing lanes. This process does not seem to require elaborate conscious visualizations of cars (and it would be inefficient if it did). In automatic rapid tasks like driving, there is no time to generate conscious images of objects, and we often have to rely on implicitly projected templates to detect the relevant absences.<sup>10</sup> In light of that, I will mainly use the term ‘template’ instead of ‘image’ to refer to the representations of absent objects employed in perception of absence in order to avoid their association with mental pictures or intentional imaginings.

This brings us to the third qualification. Processes that produce object-level mismatches will affect the interpretation of these mismatches by engaging different sets of expectations. Why must mismatches be interpreted? If they aren’t, the account overgeneralizes. Consider this example. Suppose that your partner fixes up your apartment while you are away. When you get back, you register all sorts of inconsistencies between how you remember the apartment and its new looks. Would every detected discrepancy produce an experience of absence? It seems not: we can see differences *in* objects without seeing absences *of* objects. Thus, you may notice that things around your apartment look different without taking any particular item to be absent or replaced.

In sum, our expectations are constantly frustrated when we interact with the world, but it seems implausible that every mismatch underlying a violation of expectation indicates an absence. What’s the solution? Intuitively, we experience absences of objects when we take the detected cues to be incompatible with persistence of those objects. In our case, the cue—the mismatch between red and blue—indicates an absence because it is not a part of your (current) expectation set that your couch could be reupholstered. Processes like visual search or observation of a deviant pattern will set the relevant expectations and thus determine the interpretation of a mismatch.

One might worry that these qualifications are not enough. Isn’t it possible to engage the appropriate expectations, token an object-level mismatch, yet not see an absence? It is possible. Analysis or interpretation of mismatches may be interrupted by a variety of factors (inattention, noise, a new task). It would be a mistake, however, to include these factors as boundary conditions on MM. I set out to characterize paradigmatic cases where seeing absence does occur. These cases involve object-level mismatches whose semantic uptake is a function of expectations engaged by the appropriate tasks. Settling when or how frequently these conditions are met is beyond the scope of my project.

With these qualifications in hand, we are ready to put forth the following proposal about seeing absence:

---

<sup>10</sup> To be efficient, these templates may be perceptually sparse and encode only a few features definitive of the target object. Thus, Esterman and Yantis (2010) hypothesize that tasks involving exemplar expectations (expecting to see a particular house) utilize vivid imagery to a higher degree than tasks involving category expectations (expecting to see a house). Here is another source of variation in templates: templates used for tracking moving objects, plausibly, will draw upon object-files (Kahneman et al. 1992). Such templates thus will differ from templates used to represent absences of objects in simple static displays (e.g., a missing dot in a grid of dots.).

### *The Mismatch Model (MM)*

Visual experience of O's absence consists in an object-level mismatch between O's template generated by visual working memory and a percept of the observed stimulus.

#### 4.2 Evaluating the model

Let's consider how MM fares with respect to the desiderata on a theory of absence stated in Sect. 3. To remind, it must validate the perceptual status of experiences of absence, explain the distinct semantic function of experiences of absence, and make sense of phenomenal collapse and phenomenal contrast. MM does well on all three counts.

We'll begin with semantics. Consider the empty café table from the laptop example. On its own, the table cannot tell us *that* something is missing or *what* is missing. While a cake may leave signs of its absence (crumbs and guilt on your partner's face), absence of a laptop from the table can be completely traceless. So, how do we come to represent that the laptop is absent? It is not enough to represent the table, even with some zooming effects. This would be positive seeing: viewing of the table as such. Nor is it enough to visualize the missing computer in your mind. This would be a mere remembrance of the laptop, or imagining what it looks (or would look) like under certain conditions. Representing absence, I argue, involves relating the percept of the table to the image of the laptop in form of a mismatch.

Embedding the image of a laptop in a mismatch is a step that is missing in imaginations, hallucinations and positive seeing (e.g., viewing of the table as such). This step is also missing in a mere failure to see or notice an object. Suppose you are looking at the skin under Bill's nose *before* you remember his moustache. You take yourself to be looking at an ordinary patch of skin and failing to see that there is a moustache there.<sup>11</sup> This does not imply that you are seeing the absence of Bill's moustache. No mismatching is occurring.

I have demonstrated that MM can demarcate experiences of absence from other types of seeing. Crucially, this semantic function is carried out by perceptual means. Visual mismatch is an output of a matching operation: a characteristically visual process involved in perception of objects and scenes (Bubic et al. 2009; Summerfield and Koehlin 2008; Yardley et al. 2012). Moreover, both kinds of representations related by this matching process are within the visual domain: templates of absent objects generated in sensory memory are visual in format, and so is the incoming sensory information. Given that the matched items and the comparing process are visual, it seems plausible to regard the entire mismatch structure as visual.

<sup>11</sup> This case parallels the camouflaged moth example used by Wright (1977) to illustrate Dretske's distinction between simple seeing and epistemic seeing (1969, chapter 2, 2004, 2006). In our example, you are *simply-seeing* Bill's moustache prior to and during your experience of its absence because the light from the moustache is travelling to your eyes. You are failing to *epistemically-see* the moustache prior to and during your experience of its absence because you are not seeing that there is a moustache under Bill's nose.

Finally, MM can explain both phenomenal collapse and phenomenal contrast. Start with collapse. Our opponent says that the phenomenology of absence dissolves once we begin to introspect. I think that this observation is correct and can be vindicated by MM. If seeing absence involves mismatches, collapse of its phenomenology can be explained by the fact that mismatches are difficult to sustain for extended periods of time. In ordinary circumstances, we quickly register a mismatch and move on. For an experience of absence to last longer (which is what the objector's introspective exercise requires), we would have to be repeatedly projecting the object's image and re-generating mismatches. This takes special circumstance or special skill. When repeated projections and matching are unnecessary, our attention is snatched by the positive features of objects, and absence qualia deteriorate.

My proposal, in gist, is to interpret phenomenal collapse as *transformation* of absence phenomenology into positive phenomenology due to attention. Where does this leave us with respect to the Argument from Indiscriminability? First, it makes its core premise (1) unmotivated. From the fact that the looks of absences collapse (transform) into the looks of positive objects, it does not follow that the looks of absences *are* the looks of positive objects. Moreover, there are reasons to think that (1) is false. MM accounts for absence qualia by the ability of object-level mismatches to generate a variety of visual effects at the level of experience. Because mismatch vehicles utilize template-projections in addition to percepts, the distinct "feel" of absence is not merely a function of ordinary objects stimulating the retina. Thus, it is not the case that the appearances of absences are appearances of positive objects.

But just what are the appearances of absences? What is the distinct feel of absence? Caution is needed. Mismatches are highly transient: they quickly collapse into positive perception or into the imagination. This makes it easy to confuse the phenomenology of seeing an absence with the phenomenal properties of the states it resolves into. With that in mind, two accounts are available. One option is to say that the phenomenology of absence is the kind of experience which cannot be elicited by mere imagination or remembrance and is *exclusive* to undergoing an absence-signaling mismatch. But this analysis is not particularly illuminating. How do object templates fuse with percepts of positive objects so as to yield an experience of *absence* and not that of the imaginative presence of the absent object?<sup>12</sup> So consider the next option. Crediting mismatches for absence phenomenology does not imply that we become aware *of* mismatches whenever we experience absences. But perhaps this claim is something we should be committed to. We can hypothesize that mismatches are not mere vehicles and sometimes surface *qua* mismatches in our phenomenology of absence. The phenomenology of absence is the experience of incongruity.<sup>13</sup>

<sup>12</sup> One might respond that absence phenomenology is not analyzable, either due to psychological factors (mismatches are fleeting and collapse, so we cannot properly attend to them), or because this phenomenology is in fact unanalyzable (we have a brute sense of absence, and that's the end of story).

<sup>13</sup> The phenomenology of incongruity may be quite brief and primitive, for instance, when we don't understand which object is absent, or it may be representationally rich, when attention makes one of the elements of the mismatch (conscious image or a positive percept) more prominent in one's experience. Between the two accounts, this is the account I favor.

Whether mismatches can be intentional objects of our perceptual experiences is an interesting philosophical question worth exploring. But MM, as stated, does not carry this implication. Its claim about the necessity of mismatches for seeing absence is an empirically based argument that begins with the analysis of the paradigm of failed searches and extrapolates this analysis onto other cases. My account therefore is not derived from the observation that experiences of absence feel ‘mismatchy.’

In sum, the model of seeing absence I am proposing takes the phenomenology of absence as its starting point but defends seeing absence in terms of empirically motivated vehicles or mechanisms. I have argued that this model succeeds in meeting the key desiderata on a theory of absence perception. I will now consider two pressing objections to my account.

## 5 Objections

### 5.1 Are mismatches necessary? Unsurprising absences

I have drawn key features of my model from scenarios that involve violations of expectations in unsuccessful searches. But it is possible to see absences without any failure of expectation. Tourists traveling to a desert will expect to see no trees there. An observer will expect the sun to disappear behind the ocean line. Their expectations about absences (called ‘negative expectations’ here) are accurate and upon confirmation will result in experiences of absence. Do such cases pose a problem for the Mismatch Model?

*Prima facie*, yes. When an object’s absence is unexpected, vision records predictive error upon the detection of disparity between a template of that object and what is perceived (Bar 2003). But the sunset watchers and the desert visitors do not err in their predictions when they perceive the absences of the sun and the trees. If, however, predictive error-signals and mismatches are correlated (e.g., in Clark (forthcoming); Bar 2003, 2004; Summerfield and Egner 2009), then mismatches cannot account for experiences of expected absences. This significantly limits the range of experiences that the Model can explain. But the problem is not just that of scope. Since experiences of unexpected and expected absences lack obvious differences in content and phenomenology, it is not clear why such experiences should differ at the level of vehicles. So have we been looking at the wrong vehicle?

I will argue that the vehicle is the right one, and that the Model can account for the experiences of expected absences. Let us look again at how we have characterized the mismatches involved in the perception of absence. Per our definition, mismatches do not relate what is *predicted* with what is observed. Rather, they relate *images* of missing objects with positive representations of the world. Projected imagery, depending on an expectation, can serve two functions in perception of absence. It can signal what objects the viewer expects to be present, or it can represent what objects the viewer expects to be absent. In light of this function of imagery, mismatches do not have to signal predictive error and can account for the perception of expected absences.

My proposal, in short, is to dissociate mismatches from failures of prediction, error signals, and sensory surprises. The mismatches are to be understood not as errors or discrepancies between what we expect and what we see, but as contrasts between what we project from memory and imagination and what we see.<sup>14</sup> The following examples can help to make the idea more intuitive.

Suppose you learn that your colleague will not be attending the faculty meeting today, and so you come to expect her absence. You walk into the meeting room, and as you expected, she is not there. How do you confirm her absence? Presumably, you go through the same process of projection and mismatching, as when you expect her to be present. You generate her image, compare it with the attendees, and establish her absence through a mismatch.

Next, consider scenarios where we don't know whether we should expect an object's absence or presence given the available evidence. We look for pens, parking spaces and cookies, all the time unsure if our search for them will succeed. Because present/absent outcomes in those cases are represented with equal probabilities, seeing an absence would reflect no failure of expectation or of prediction on our part. I propose that seeing absence implicated in these types of searches employs the same process of mismatching as seeing absence implicated in searches involving expectancy violations.

At this point, the reader may wonder how critical expectations are for seeing absence. I have argued for a dissociation of mismatches and the affiliated experiences of absence from the violation of expectation. Perhaps we should sever the ties between seeing absence and expectations entirely. First, as already noted, we often see absences when we do not know what to expect. In addition, it seems that we can perceive absences without making any kind of forecast about an object's presence or absence. For instance, you may randomly notice that Susanna is not wearing a green sweatshirt today when an image of a green sweatshirt pops into your head.

Scenarios like these speak against casting the Mismatch Model as an expectational account and challenge any expectation-based account like Sartre's.<sup>15</sup> But one can fight back. There is nothing random about your seeing absence of a green sweatshirt on Susanna. You could have formed an implicit expectation (expectation unaccompanied by a feeling of anticipation) about the sweatshirt because it's St Patrick's Day or because you have often seen her wear it before. This expectation disposes you to carry out a detection task: "Is she wearing a green sweatshirt today?" As for cookie quests and other searches with unknown outcomes, these tasks may be analyzed as engaging equiprobable positive and

---

<sup>14</sup> This definition thus will accommodate those scenarios in which one sees absence an object even if one has never had a first-hand experience of that object (e.g., I will see the absence of your computer in a café if you describe it to me and ask me to look for it).

<sup>15</sup> In *Being and Nothingness*, Sartre claims that expectations are essential for seeing absence: e.g., "It is evident that non-being always appears within the limits of a human expectation" (1956, p. 7). In particular, his case rests on the examples involving violation of expectation (expecting Pierre to be in a café, expecting fifteen hundred franks in a wallet). But Sartre may also be interpreted as proposing a broader condition, according to which seeing absence requires a psychological state in which absence is entertained as a possibility ("The world does not disclose its non-beings to one who has not first posited them as possibilities", *ibid*). I have argued that negative expectations meet this criterion.

negative expectations—a stipulation that fits the theoretical notion of expectation (for example, in Bubic et al. 2009). Finally, one can appeal to arguments that the primary function of *any* projected imagery is predictive and thus involves expectations (Moulton and Koesslyn 2009). So have we been rash in divorcing the Mismatch Model from the expectation-based accounts?<sup>16</sup>

Expectations matter for perception of absence because they explain why we activate, project and match templates of certain objects. In other words, they explain why certain mismatches occur. When we expect an object to be present, we see its absence via a mismatch. I argued that this causal role should be extended to negative expectations: when we expect an object to be absent, we similarly confirm its absence through a mismatch. But these points should not obscure the goal of MM. MM tells us what vehicles are *constitutive* of experiences of absence. It is not an account of their likely *causes*. While it is worth exploring whether mismatches and the affiliated experiences of absence can be generated without their typical causes (without any expectations), my model does not have to take a stand on this issue.

One may still have concerns about the mismatch analysis itself. If my goal was to validate perception of absence, it seems that I have done it a disservice by making it dependent on cognitive states like expectations or background knowledge. I will consider this final objection now.

## 5.2 Are mismatches cognitive? Concepts and absences

The above objection accused my account of undergeneralization: intuitively, experiences of unexpected and expected absences should share the same vehicle, but do not, as a consequence of my model. To show that the Mismatch Model can account for expected absences, I clarified the function of the projected images that are incorporated into the mismatches. My opponent can accept the argument that we use mismatches to represent absences, but point out that by appealing to this mechanism, I have offered cognitive explanation.

Here is one way to motivate this conclusion. One may propose that mismatches work via inferences on positive inputs, and take this to imply that absence-representations must be doxastic outputs of such inferential state transitions. Given this explication, the Mismatch Model may be viewed as an attractive account of how we come to judge that there is an absence, but it cannot work as an account of how we *see* an absence.

As stated, this argument is weak. Inferential processing is taken to be central to many processes in positive seeing (e.g., Kveraga et al. 2009; Fenske et al. 2006). Thus, even if the mismatch operation introduces computational burden into the

<sup>16</sup> The worry is that divorcing mismatches from expectations, we cheapen experiences of absence. Wouldn't a memory/imagination-based account imply that one can randomly form an image of a tiger, mismatch it, and see its absence at one's office? Is it all it takes to see an absence? I think that cases of this sort are indeed possible but not fully random. One may randomly project an image, but unless such projection transforms into a detection task (however strange or pathological), it will remain a mere imaginative experience. Detection tasks spontaneously generate mismatches, and in my opinion, only a spontaneously generated mismatch can yield a genuine *experience* (rather than a mere thought) of an absence.

perception of absence, it does not follow that the output absence representations of this operation are doxastic. What the opponent needs to show, then, is that the inferences underlying perception of absence are not benign. The next set of arguments I will discuss may be viewed as doing just that, but I will not tie them explicitly to this initial objection.

Next, one may argue that the Mismatch Model is cognitive because the mismatches implicated in seeing absence rely on conceptual processing. Seeing absence requires projection of object-templates, and it is natural to treat such templates as concepts. If templates are concepts, then we are left with a troublesome asymmetry between absence perception and positive seeing. While ordinary object perception extensively uses concepts to support the recognition of objects and scenes, it (arguably) *does not have to*. Ordinary objects can be seen preconceptually or, as Dretske argues, “simply.” For example, a toddler viewing a car for the first time will see it despite her ignorance of it. If, on the other hand, we *must* use concepts to see absences, then failure of absences to be represented at the nonconceptual level may be seen as a sign that perception of absence is cognitive at bottom.

Undoubtedly, many experiences of absence are instances of conceptual seeing. We often see absences as a result of a search, and when we search for something, we typically have a good idea of what we are looking for and use conceptualized templates. Moreover, certain absences can only be seen by those who possess certain kind of expertise. For example, only a medical professional can perceive the absence of a thrombosis perfusion on a patient’s ultrasonogram.

However, many experiences of absence do not require expertise or even concepts to occur. Presumably, animals can spot the absence of food or of predators and infants can see absences of mothers and of toys without sophisticated conceptual apparatus. They are reflexively attuned to certain absences. Consider also the *sensing* of absence: the kind of feeling you get when you become aware that something is missing, say, from your desk but you cannot, for the life of you, figure out what is missing.<sup>17</sup> Given that you are failing to recognize what is absent from your desk, you are not applying a specific concept to the sensed absence.

These cases may not be fully convincing. One may respond that an infant reacting to an absence of a toy is using a template that should count as a concept of a toy—only of a more primitive variety, underlying a more basic set of competencies. As for the sensations of absence, one might argue that the templates such experiences draw on are generic concepts that represent superordinate classes of things, such as medium-sized physical objects. My plan now is to present three additional types of cases to strengthen the claim that the templates constitutive of absence mismatches can be cognitively basic:

---

<sup>17</sup> To explain certain results in change-blindness cases, Rensink (1999, 2004) proposes a new mode of seeing called “visual sensing”: awareness that the perceived scene has changed, without corresponding awareness of what this change consists in. The sensation of absence I am referring to here is more specific: it is a feeling that something is missing from a desk, and not merely a feeling that the desk somehow looks different.

- (1) Imagine a large wall covered with identical posters of Marilyn Monroe, where one poster is conspicuously absent.<sup>18</sup> The absence of a poster will pop out for the viewer even if she knows nothing about Marilyn or the posters. An even more primitive pop-out of an absence will be elicited by a grid of dots with one missing dot.
- (2) In experiences of disappearances, objects can vanish too quickly for the viewer to properly grasp which object has disappeared. Memory projections in these cases will not count as concepts because they decay rapidly and cannot be retrieved to support recognition.
- (3) Nonconceptualized templates can be used even in such top-down cases as searches. In *rapid* visual search tasks subjects have to report on presence or absence of prespecified targets and rely on visual working memory. Temporal constraints in those tasks do not allow the subjects to properly conceptualize templates they employ during the search (Kirchner and Thorpe 2006). In *comparative* visual search tasks, the subjects are asked to find changes by comparing two displays side by side. It has been stated “since the stimuli have no semantic content, it is unlikely that abstract, view-invariant representations play a role in comparative visual search” (Pomplun et al. 2001). In *rapid serial visual presentations*, a missing item in a sequence (a blank display shown in place of the target item or the distracters) may elicit an experience of absence even if the viewer hasn’t properly conceptualized the members of the sequence (Miller and Schröter 2002).

Displays in these experiments engage transient, relatively basic perceptual expectations, supported by the rapidly decaying recognition structures (templates). This shows that while time constraints, memory flaws, or lack of the relevant conceptual apparatus may prevent us from appropriately *cognizing* an absence, they don’t have to prevent us from *experiencing* one.<sup>19</sup>

This, my objector will reply, still does not cut to the core of the problem. Seeing absence, as we have defined it, is a recognition that an object is missing; it is a way of seeing positive objects. Per our account, this way of seeing relies on expectations and, more directly, on projections from working memory. Even if projection from memory does not have to slip concepts into the perception of absence, it is still a contribution by the mind. It is an interpretative act and a form of cognition. Granted, my objector concedes, one can see absences without *conceptual* projections. One, however, cannot see absences without *projections*, and this dissimilarity with ordinary seeing disqualifies seeing absence from being perceptual.

One response is to deny the dissimilarity. The view on which positive perception consists in an *upward* sweep of information from retinal stimulation through early vision has been vigorously debated in the literature (Fenske et al. 2006). If reentrant processing is commonplace in ordinary vision, then seeing absence is parallel to

<sup>18</sup> I am modifying Dennett’s Marilyn wallpaper example (1992, pp. 354–355).

<sup>19</sup> Dretske (1969) explicates seeing as an extensional relation: if S sees X, and X is identical to Y, then S sees Y. For example, if you see your neighbor, who, unbeknownst to you, is a spy, then you see a spy. Seeing absence seems to obey this extensional principle: if you notice absence of a colleague in a meeting, and she happens to be a spy, you see the absence of a spy.

positive seeing and not threatened in its reliance on memory-projections—so long as the projections are intramodular. There is reason to think that they are intramodular in seeing absence: the relevant templates constitutive of absence-seeing are supplied by visual working memory and sensory expectations, which are items belonging to the visual domain.<sup>20</sup> Crucially, our discussion has shown that the contribution by the mind in seeing absence can be rather low-level: templates supplied by memory for perception of absence often fall short of concepts and are cognitively more basic than the templates supporting recognition of objects. In light of that, it seems implausible to hold that the most primitive type of the seeing of absence (e.g., a grid of dots with one dot missing) must be at the higher level of cognition than the sensory recognitions of tables, uncles, and picnics.

One may grant even that much but still take the main ambition of the project to be unsatisfied. Even if the Mismatch Model shows that experiences of absence belong to the visual domain, the fact that we can *visually experience* absences does not imply that we can actually *see* them. Unlike ordinary objects, absences of objects cannot reflect light and so cannot be seen in the way ordinary physical objects are seen. So, they cannot be literally seen, and it is their capacity to be literally seen that I wanted to establish.

I think that this objection reveals a bias, rather than an argument, against the possibility of seeing absence. Theories of seeing have been tailored to the perception of material objects, so it is no surprise that absences fail to satisfy their criteria. But what justifies the assignment of genuine seeing only to material objects? We see absences all the time, often by employing relatively primitive, automatic mechanisms, and adaptively, absences of objects are frequently as important as presences of objects. So, restricting seeing only to getting information about what is where, when the information about what is not where is just as critical for the human animal, seems unjustified.

## 6 Conclusion

Seeing absence seems to be an indispensable part of our experience of the world, and I have tried to show that it deserves the label ‘seeing’. Thus, a direct implication of my account is that the conservative view of perceptual content is false, and that the Rich Content View is true: “In some visual experiences, some properties other than spatial properties, color, shape, motion, and illumination are represented” (Siegel 2010). According to my account, perceptual content is enriched by absences. This result, however, should not be interpreted as endorsing a very liberal view of perceptual content, on which vision can represent high-level or abstract properties.<sup>21</sup>

<sup>20</sup> Esterman and Yantis (2010) demonstrate that “visual anticipation of an object category evokes increased activity in corresponding category-selective regions of temporal cortex.” Note that the categorical nature of these expectations does not preclude the authors from classifying such expectations as visual.

<sup>21</sup> Endorsement of the Rich Content View may be taken to be equivalent to endorsement of the Liberal View on which high-level categorical properties can be represented in perceptual experience (for example, in Bayne 2009). My account of seeing absence challenges this identification. If experiences can

Mismatches constitutive of experiences of absence often do not rely on much abstraction or sophisticated cognitive apparatus, and thus occur at a lower level than the representation of abstract properties, such as justice (Prinz 2006) or causation (Siegel 2009, 2010), semantic properties, such as numerosity in higher synesthesia (Matey, under review), or kind properties, such as being a pine tree (Siegel 2004, 2010). For this reason, the account of perceptual content supported by my model is still quite modest.

Another important consequence concerns the function of perception. If the detection of absence is critical to our survival, then vision is not essentially only object-presenting. The job of the senses is not just to provide a record of “what is where”, but to report, promptly and efficiently, about what is not where. This implies that any theory of perception needs to be able to accommodate empirical and philosophical results from a theory of seeing absence. Clark (2004) analyzes perception as feature-placing: the assignment of positive sensible properties to locations in the visual field. For example, what would feature-placing in Clark’s account look like if the relevant features were absences? What are ecological constraints on the kinds of affordances that may be specified by absences?

Finally, my focus here has been on vision, but the Mismatch Model can account for experiences of absence in other sensory modalities. Consider smelling the absence of exhaust in the air, tasting the absence of chlorine in water, or the sensation of missing a step while going down the stairs. These experiences, plausibly, involve incongruences in the relevant modality, and thus may be directly explained by MM. But there are less straightforward paradigms. Hearing silence, perception of holes, and perception of empty space are standardly treated as forms of perception of absence (Sorensen 2008; O’Callaghan 2011; Casati 2006; Casati and Varzi 1994). This is challenged by MM. Does hearing a lover’s footsteps grow silent as she’s exiting the building imply hearing her absence? Yes, if one mismatches the auditory template of her footsteps with the remaining sounds. But if silence refers to a mere failure to hear the lover’s footsteps because they are no longer audible, then one does not hear an absence. By the same token, perception of holes or of empty space counts as absence perception only when mismatches are involved, and it remains to be established whether they are involved. These consequences may lead one to reject the Mismatch Model as unduly restrictive. Nonetheless, the current proposal ought to highlight the need for the critical review of such cases as deserving the label ‘perception of absence.’

---

Footnote 21 continued

represent absences, then the Rich Content View is true. But because absences are often represented at the lower level than uncles and justice, my account does not automatically imply that high-level properties can be represented in visual experiences. One may still wonder if high-level properties managed to slip into perceptual content through absences. After all, we have been examining experiences of absences of laptops, moustaches and colleagues—all high-level categorical properties. On my view, perceptual experiences can represent laptop-like appearances but not a kind property such as being a laptop. So, the claim that one can see the absence of a laptop should be understood as the claim that one can see the absence of laptop-like appearances.

## References

- Bar, M. (2003). A cortical mechanism for triggering top-down facilitation in visual object recognition. *Journal of Cognitive Neuroscience*, *15*, 600–609.
- Bar, M. (2004). Visual objects in context. *Nature Review: Neurosciences*, *5*, 617–629.
- Bayne, T. (2009). Perception and the reach of phenomenal content. *Philosophical Quarterly*, *59*(236), 385–404.
- Bernetti, M. (2006). *AFP/Getty images*. Retrieved 16 Mar 2012, from <http://www.gettyimages.ie/detail/news-photo/la-gimnasta-katherine-coronel-de-venezuela-realiza-su-news-photo/71491475>.
- Bubic, A., von Cramon, Y., Jacobsen, T., Schröger, E., & Schubotz, R. (2009). Violation of expectation: Neural correlates reflect bases of prediction. *Journal of Cognitive Neuroscience*, *21*(1), 155–168.
- Casati, R. (2006). The cognitive science of holes and cast shadows. *Trends in Cognitive Sciences*, *10*(2), 54–55.
- Casati, R., & Varzi, A. (1994). *Holes and other superficialities*. Cambridge: MIT Press.
- Clark, Austen. (2004). Feature-placing and proto-objects. *Philosophical Psychology*, *17*(4), 443–469.
- Clark, A. Whatever next: Predictive brains, situated agents, and the future of cognitive science. *Behavioral and Brain Sciences*, Forthcoming.
- Dennett, D. (1992). *Consciousness explained*. New York: Back Bay Books.
- Dretske, F. (1969). *Seeing and knowing*. Chicago: University of Chicago Press.
- Dretske, F. (2004). Seeing, believing and knowing. In R. Schwartz (Ed.), *Perception* (pp. 337–353). London: Blackwell.
- Dretske, F. (2006). Perception without awareness. In T. S. Gendler & J. Hawthorne (Eds.), *Perceptual experience*. Oxford: Oxford University Press.
- Esterman, M., & Yantis, S. (2010). Perceptual expectation evokes category-selective cortical activity. *Cerebral Cortex*, *20*(5), 1245–1253.
- Fenske, M. J., Aminoff, E., Gronau, N., & Bar, M. (2006). Top-down facilitation of visual object recognition: Object-based and context-based contributions. *Progress in Brain Research*, *155*, 3–21.
- Gibson, J. J. (1966). *The senses considered as perceptual systems*. London: George Allen and Unwin.
- Gibson, J. J. (1979). *The ecological approach to visual perception*. New York: Psychology Press.
- Gregory, R. L. (1974). Choosing a paradigm for perception. In E. C. Carterette & M. P. Friedman (Eds.), *Handbook of perception: Volume I Historical and philosophical roots of perception*. New York: Academic Press.
- Kahneman, D., Treisman, A., & Gibbs, B. J. (1992). The reviewing of object files: Object-specific integration of information. *Cognitive Psychology*, *24*, 175–219.
- Kirchner, H., & Thorpe, S. (2006). Ultra-rapid object detection with saccadic eye movements: Visual processing speed revisited. *Vision Research*, *46*, 1762–1776.
- Koffka, K. (1935). *Principles of Gestalt psychology*. New York: Harcourt, Brace and World, Jovanovic.
- Kosslyn, S. M. (1980). *Image and mind*. Cambridge: Harvard University Press.
- Kosslyn, S. M. (1994). *Image and brain: The resolution of imagery debate*. Cambridge: The MIT Press.
- Kumaran, D., & Maguire, E. A. (2006). An unexpected sequence of events: Mismatch detection in the human hippocampus. *PLoS Biology*, *4*(12), 2372–2382.
- Kveraga, K., Boshyan, J., & Bar, M. (2009). The proactive brain: Using memory-based predictions in visual recognition. In S. Dickinson, M. Tarr, A. Leonardis, & B. Schiele (Eds.), *Object categorization: Computer and human vision perspectives*. Cambridge: Cambridge University Press.
- Lin, E., & Murphy, G. (1997). Effects of background knowledge on object categorization and part detection. *Journal of Experimental Psychology: Human Perception and Performance*, *23*(4), 1153–1169.
- Macpherson, F. (2006). Ambiguous figures and the content of experience. *Nous*, *40*, 82–117.
- Marr, D. (1982). *Vision. A computational investigation into the human representation and processing of visual information*. New York: Freeman.
- Matey, J. (under review). Can blue mean four?
- Miller, J., & Schröter, H. (2002). Online response preparation in a rapid serial visual search task. *Journal of Experimental Psychology: Human Perception and Performance*, *28*(6), 1364–1390.
- Moulton, S. T., & Koesslyn, S. M. (2009). Imagining predictions: Mental imagery as mental emulation. *Philosophical Transactions of the Royal Society London, B Biological Sciences*, *364*, 1273–1280.
- Noë, A. (2006). Experience without the head. In T. S. Gendler & J. Hawthorne (Eds.), *Perceptual experience* (pp. 411–433). Oxford: Oxford University Press.

- O'Callaghan, C. (2011). On privations and their perception. *Acta Analytica*, 26, 175–186.
- Pomplun, M., Sichelschmidt, L., Wagner, K., Clermont, T., Rickheit, G., & Ritter, H. (2001). Comparative visual search: A difference that makes a difference. *Cognitive Science*, 25, 3–36.
- Price, R. (2009). Aspect-switching and visual phenomenal character. *Philosophical Quarterly*, 59(236), 508–518.
- Prinz, J. (2006). Beyond appearances: The content of sensation and perception. In T. S. Gendler & J. Hawthorne (Eds.), *Perceptual experience* (pp. 434–460). Oxford: Oxford University Press.
- Rensink, R. A. (1999). Sensing, seeing, and scrutinizing. *Vision Research*, 40, 1469–1487.
- Rensink, R. A. (2004). Visual sensing without seeing. *Psychological Science*, 15(1), 27–32.
- Sartre, J. P. (1956). *Being and nothingness*. New York: Philosophical Library.
- Siegel, S. (2006). Which properties are represented in perception? In T. S. Gendler & J. Hawthorne (Eds.), *Perceptual experience* (pp. 481–503). Oxford: Oxford University Press.
- Siegel, S. (2009). The visual experience of causation. *The Philosophical Quarterly*, 59(236), 519–540.
- Siegel, S. (2010). *The contents of visual experience*. Oxford: Oxford University Press.
- Sorensen, R. (2008a). Hearing silence: The perception and introspection of absences. In M. Nudds & C. O'Callaghan (Eds.), *Sounds and perception: New philosophical essays*. New York: Oxford University Press.
- Sorensen, R. (2008b). *Seeing dark things. The Philosophy of Shadows*. Oxford: Oxford University Press.
- Speaks, J. (2010). Intentionalism and attention. *The Philosophical Quarterly*, 60(239), 325–342.
- Summerfield, C., & Egner, T. (2009). Expectation (and attention) in visual cognition. *Trends in Cognitive Sciences*, 13(9), 403–411.
- Summerfield, C., & Koechlin, E. (2008). A neural representation of prior information during perceptual inference. *Neuron*, 59(2), 336–347.
- Tsal, Y., & Kolbet, L. (1985). Disambiguating ambiguous figures by selective attention. *The Quarterly Journal of Experimental Philosophy*, 37, 25–37.
- Wright, E. (1977). Perception: A new theory. *American Philosophical Quarterly*, 14, 273–286.
- Yardley, H., Perlovsky, H. L., & Bar, M. (2012). Predictions and incongruency in object recognition: A cognitive neuroscience perspective. In: *Detection and identification of rare audiovisual cues. Studies in computational intelligence series*. Springer Publishing.