

SEEING ABSENCE

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A dissertation submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Philosophy.

Chapel Hill
2013

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ABSTRACT

ANNA FARENNIKOVA: Seeing Absence
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Experiences of absence are recognitions that something is missing from the perceived location or a scene. These perceptions vary in duration and intensity, and occur in the mundane cases, such as seeing no mail in the mailbox, and in the more emotionally-laden cases, such as feeling absence of a loved one. Because of how common these experiences are in daily life, perception of absence should be treated as a core element of basic cognition that has high relevance for the daily functioning of human beings. There is a question, however, whether these experiences are, in fact, perceptions. Do we really perceive absences, or do we only think or believe that something is absent? My dissertation defends the claim that we can perceive absences. I present a model of perception of absence based on the perceptual process of template-projection and matching and the paradigm of violation of expectation, and then use this model to explicate key phenomenological characteristics of experiences of absence. An important consequence of my thesis concerns the function of perception. If detection of absence is critical to our survival, then perception is not essentially only object-presenting. The job of the senses is not just to provide a record of “what is where”, Marr’s postulate about the function of vision, but to report, promptly and efficiently, about what is not where.

For my family

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Introduction

David Marr begins his seminal work *Vision* (1982) with the question, “What does it mean to see?” In this dissertation, I challenge the dominant conception of perception, according to which perception essentially involves engagement with the world of physical objects. I do that by introducing a phenomenon that has been largely neglected in the literature. The phenomenon is perception of absence.

Suppose that you are sitting next to an attractive person, and you want to find out if he is married. You sneak a glance at his hand – no ring. Your experience of absence depends on knowledge of conventions: married people are expected to wear wedding bands. It is also culturally conditioned: in a different culture, checking a different hand would have generated a more reliable result.

It seems natural to treat perception of absence as a fairly sophisticated form of perception. Many experiences of absence, like the example above, depend on cultural knowledge, conventions, or expertise. However, not all cases of perception of absence require expert knowledge. For instance, you may see that a child is missing a front tooth, that a cat is no longer on the mat, and even more primitively, you may see the absence of a dot in a grid of dots. These kinds of cases constitute more basic form of perception.

But are these experiences really a form of *perception*? Can we literally see absences of teeth, cats, and rings? Or do we only think or believe that these things are absent? In what follows, I will defend the claim that we can perceive absences. In addition to representing physical objects, perception represents absences of objects. The core of my defense is a model of absence perception that is based on two empirical paradigms: failed searches and violation of expectation. The model is tailored to experiences of absence in the visual modality; however, I expect my account to extend to other modalities as well.

This result has a number of important implications. It undermines the existing accounts of perceptual content and phenomenal character, and it is revisionary of the more general approaches to perception, such as the causal theory of perception (Grice 1961, Pearce 1976, Strawson 1974) and constructivist approaches (Gregory 1974, Marr 1982). The project also has implications for the empirical research on change blindness, visual search, visual imagery, the role of predictions in perception, and the debate about cognitive penetrability of perception.

This thesis is organized around five chapters. In chapter 1, I introduce experiences of absence and explain their significance. I then present two arguments that challenge their status as instances of seeing: the argument from indiscriminability and the empirical argument. In chapter 2, I consider two responses to those arguments: the cognitive and the perceptual accounts. I argue that the cognitive account has undesirable consequences and then offer positive reasons for adopting the perceptual account. In chapter 3, I defend the perceptual account by presenting a model of perception of absence. In chapter 4, I consider objections and the implications of the proposed model. The first objection appeals to experiences of expected absences, while the second objection says that my theory is just a version of a cognitive account. I reply to these objections and draw implications for the role of expectations in perception of absence and for cognitive penetrability of perception. I conclude by discussing general implications of my project for the prevailing theories of perception, as well as accounts of phenomenal character and perceptual content.

1. The paradox of seeing absence

Intuitively, we see absences of colleagues, coffee cups, power outlets, and shopping carts. The goal of this chapter is to explain why it is problematic to treat these experiences as instances of seeing. I begin by delimiting the relevant class of experiences. I then explain why these experiences are significant, and then present two arguments that challenge their status as instances of seeing.

1.1. What are experiences of absence?

To begin thinking about the phenomenon of seeing absence, consider the following example. Suppose that you are at a café where you've been working on your laptop for some time. You need to make a phone call, so you step outside, leaving your laptop temporarily unattended on the table. After a few minutes, you head back inside. You look at your table. The laptop is gone!

This experience has striking phenomenology. You do not infer that the laptop is missing through reasoning. Rather, you have an immediate impression of its absence. Let's unpack this impression. First, your experience has a distinct qualitative feel: there is something it is like for you to see the absence of your laptop. This is the phenomenal character of your experience. Second, your experience carries certain information. It presents the world as being a certain way – as missing an object – and thus is assessable for accuracy. This is the content of your experience. There is also an emotional dimension in your experience. It is upsetting to lose a laptop, and this contributes to the feel of your experience.

Discovering the absence of a laptop is a jarring event, but our life is replete with more trivial disappearances. We observe that there is no milk in the fridge, notice an absence of a colleague in a meeting, or see that there is no mail in the mailbox. These are the routine cases of perceiving an

absence. What is common to all these experiences is that they involve immediate recognitions that something is missing from a particular place or a scene. We will use this characterization as our working definition of the experiences of absence:

EA Perceptual experiences of absence are immediate recognitions that an object is missing from the perceived location or a scene.¹

EA requires some elaboration. Experiences of absence are often confused with other states also involving absences, so it is important to be clear about the kind of recognition that seeing absence involves. In light of that, I'd like clarify three things about EA. First, I'd like to explain *what* gets recognized in experiences of absence. What are the objects of these experiences? Next, I'd like to explain the sense in which experiences of absences are *immediate*. How do experiences of absence differ from thoughts about absences? Finally, I'd like to talk about the role of *locational* information in the recognition of absences. Do experiences of absence always represent objects as missing from particular locations, and why is this characteristic important?

1.1.1. Subject matter

If experiences of absence involve recognitions, what are the objects of those recognitions? What gets recognized in experiences of absence? The quick reply is that what gets recognized are absences, and this reply is not as trivial as it might initially seem. In order to substantiate this reply, I will contrast experiences with three types of related but distinct phenomena also frequently labeled 'seeing absence.' They are: failing to see, nonveridical seeing, and "virtual" seeing. I will go through these distinctions in turn.

(i) *Failing to see.* First, seeing absence should be distinguished from the mere failure to see an object. When you walk into your office, you will fail to see many objects in your office. Zebras, statues, and vending machines are not in your office, and they will be among many objects which

¹For simplicity, I will be focusing on experiences of absence of a single object, rather than of a group of objects, but my prediction is that there shouldn't be substantive differences in how these experiences work.

you'll fail to see there. But the fact that these objects are absent from your office does not imply that you will see their absences when you view your office. Absence of seeing does not imply seeing of absence. More generally, absence of a representation (visual, emotional, doxastic) does not imply representation of an absence.

To underscore this point, let's return to the laptop example. Suppose that at the moment you discover that your computer is gone from the table, café visitor Bob also looks at your table. You and Bob are similar in the following respect: you both are *failing to see* the laptop on the table. But something more is going on in you than the mere absence of a certain kind of seeing. It is the presence of another kind of seeing: the seeing of an absence. While Bob merely fails to see the absent laptop, you have an additional experience of its absence. You don't just *lack* a representation with content that the laptop is there; you have a representation with content that the laptop is *not* there.

Absence of an object is not the only condition when we fail to see an object. We also fail to see objects when they are occluded by other objects, hard to see, or because we are not properly attending to those objects. Perception of absence, however, is not a mere detection failure and involves successfully detecting an object's absence. This is not to say that absences of objects cannot be seen due to occlusion, inattention, or some psychological condition. We can experience absences in those conditions. My point is that one is not guaranteed an experience of absence solely by virtue of being in those circumstances, however conspicuous the object's absence is.²

(ii) "*Seeing*" *absent objects*. Seeing absence is not the same as 'seeing' things that are absent, where 'seeing' involves visually representing, due to an error or pathology, missing objects *as present*. Consider the experience of a Phantom Limb patient who feels as if the amputated leg is still there. Or take the 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 (the limb, the friend). In

²Lenin's statues used to be a prominent feature of all major city squares in the USSR. Since then, many of the statues have been removed, leaving behind empty pedestals. Given how experiences of absence are defined in EA, one is not guaranteed an experience of absence solely by looking at the pedestal from which a statue is missing.

contrast, experiences of absence report that an object is in fact missing from the scene. When you view the empty café table, your experience of the laptop's absence accurately represents what the world is like.

The distinction between "seeing" an absent object and seeing absence is important because it defuses one common objection to seeing absence. The objection is that seeing absence is impossible because it involves seeing something that is not there. Suppose that this is the best reconstruction of how you perceive the absence of your laptop. We've got ourselves a contradiction. 'Seeing' is used as a success term: you successfully detect your laptop's absence; and yet 'seeing' in this context cannot express success: you see an object that is not there (your laptop). But this analysis rests on a mistake. Seeing absence isn't the same as seeing something what's not there. Intentional objects of experience of absences are not *absent objects*, but *absences* of objects. So, the contradiction is merely apparent.

I hope that these two contrasts show why the claim that experiences of absence are about absences is nontrivial. The final contrast will reinforce this point.

(iii) *Virtual seeing*. Our last distinction is between seeing absence and virtual seeing. 'Virtual seeing' will include ordinary imaginative experiences, remembrance, as well as some cases of amodal perception (e.g., the Kanisza triangle). In virtual seeing scenarios, an absent object is present in one's experience, but the sense of this object's presence does not generate a nonveridical experience. The absent object is not present as strictly seen; more precisely, it is present only virtually, as not strictly seen. Experiences that share this core feature are said to involve a sense of 'phenomenal presence-in-absence' (Noë, Macpherson).

The distinction between virtual seeing and seeing absence may appear less obvious than the contrasts we have considered so far. One might think, for example, that experiences of absence essentially involve a sense of phenomenal presence-in-absence. Conversely, one can argue that we amodally experience certain objects, we also have a sense of their absence. If so, then we are wrong to separate these seeing absence and virtual seeing. In my opinion, this intuition is mistaken. Seeing

absence and virtual seeing belong to distinct psychological types. Below I will lay down basic motivations for this claim, and will continue building my case for this claim in the following chapters.

I think that the main difference is this. Seeing absence and virtual seeing differ in the quality of the impressions they deliver. What it is like to see the absence of your laptop seems different from what it is like to merely imagine it or to remember it. When you see the empty café table, the core phenomenology of this experience is an impression of absence. You do not picture how your laptop would look on the table (imagination); you do not contemplate its visual characteristics (remembrance); nor do you have a sense as if the laptop is there, on the table (amodal perception). Phenomenology of absence perception is the opposite: you have a sense that the laptop is *not* there.

This point extends to amodal perception. In standard perceptual completion scenarios, like the Kanisza figure, the physically absent stimulus appears to be present due to automatic reconstruction of missing sensory information. Similar analysis has been 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 in the experience (Noë 2006). The basic effect of this type of perception is completion of a pattern or of parts of an object by filling-in physical information that’s missing in that object. Experiences of absence, in contrast, involve *a sense of incompleteness*. They are fundamentally impressions of absence, and do not present absent objects as being virtually there.

In sum, virtual seeing and seeing absence involve experiences with distinct perceptual objects or targets. The main target in the experiences of absence is the object’s absence. The main deliverance in imaginative, amodal, and recollective experiences is the object’s past or virtual presence.

1.1.2. Immediacy

My argument has been that experiences of absence are about absences in a way that other perceptual experiences are not. I hope that it gives us a better sense of what gets recognized in the experiences of absence. Let’s now consider the mode of this recognition.

Experiences of absence are immediate and have a perceptual quality to them. They are direct and effortless, and these attributes distinguish them from higher cognitive judgments about absences, such as beliefs and inferences. In order to illustrate the relevant sense of directness, I will begin with some obvious examples and conclude with a pair of the more challenging cases.

Suppose that you need to print something and you discover that the printer is out of paper. You can form this judgment in the following two ways:

- a) You see a blinking red light on your printer and conclude that it's out of paper;
- b) You look inside a printer tray and see the absence of paper there.

It is obvious that you do not see the absence of paper in (a). What you see is the red light, which functions as a sign of absence: it reliably indicated the absence of paper in the past, and you may safely use it now to infer an absence.³ In (b), you see the absence of paper directly, without any mediating signs.

Local signs are not the only mediators of judgments about absences. Memories can serve the same role. Suppose that you are looking for a bottle of ketchup. You open the fridge and peer inside. Ketchup isn't there, and you form a judgment to that effect. You might generate this judgment in two ways:

- c) You look inside the fridge and realize that ketchup isn't there because you recall throwing away the bottle last week;
- d) You look inside the fridge and see that ketchup isn't there.

Unlike (a) and (b), judgments in (c) and (d) are produced by viewing the same stimulus. (c), however, is not a case of seeing an absence. In (c), you judge that something is absent by means of an inference over what you remember. This circuitry is absent in (d), where you see the absence directly.

(b) and (d) illustrate the relevant sense of immediacy enjoyed by experiences of absence. But it's not always obvious whether a given recognition of absence is experientially immediate. This final pair of cases will illustrate this point.

³Blinking red light is a local sign of absence. In a different context, such as a busy intersection, blinking red light will mean something different.

Imagine that you drive up to a store, park your convertible in a good spot, and go inside. When you come out of the store, you realize that your car is gone. This recognition of absence might occur in the following two ways:

- e) You walk toward the spot where you parked your convertible. A different car is in its place, and you realize that your car is gone;
- f) You walk toward the spot where you parked your convertible. The spot is empty. Your car is gone.

(f) is just like our core case of seeing an absence – the laptop example. The status of (e) is less clear. That could be because (e) is underdescribed, so let's add some details to the story. Consider these three ways that (e) might unfold (keeping in mind that your imaginary convertible is red):

- TRUCK You walk toward the parking lot, look at the spot where you had parked your car and see a black truck in its place. You realize that your car is gone.
- KEYS You walk toward what looks to be your car, try to open the door, but the key doesn't work. You look inside and realize that it's not your car.
- NEW PLATES You walk toward what you take to be your car. It looks exactly like your car, but then you notice different license plates. You realize that your car is gone.

It is tempting to construe these cases as involving thoughts about absences, rather than perceptual experiences of absences. These thoughts, to be sure, may feel quite alarming when they occur, but that's not the relevant sense of immediacy. These thoughts are indirect. What do we mean by 'indirect'? We have to go through several inferential steps after the initial act of seeing before we can infer an absence. These steps involve inferences over the available cues or signs (car color or different license plates) and mediate our judgments of absence. For this reason, we might feel tempted to treat (e) in its various incarnations as an instance when we cognitively infer an absence, rather than directly perceive one.

This verdict, however, may be disputed. First, one could say, it does not have to hold across the board. Our intuitions about different versions of (e) may not be uniform. Seeing an obviously different car in the TRUCK case seems to elicit a more immediate impression of absence than inferring

that one's car is gone in the KEYS case. Second, an argument could be made that all three cases can be perceptual, even though they involve mediation by cues or signs. Dretske (1986) and Millikan (2002) argue that it is possible to "bypass" a given sign and directly perceive what is signified by the sign. If this is right, then one could *directly* experience the absence of a laptop even if the reason one notices its absence is because the car looks different.

What, then, should we conclude about the immediacy of (e)? Various accounts of perceptual immediacy have been proposed, however, for our purposes, immediacy means that certain states possess the quality that gives us *prima facie* reasons for thinking of them as experiences or perceptual occurrences, rather than beliefs. Immediacy is the quality that prompts us to describe those states in sensory terms. Cases like (b), (d), or (f) seem immediate because they lack the intervening cognitive and perceptual states. Whether (e) is immediate is not obvious, and I think that our intuitions can actually mislead us about cases like (e). Why that is will be discussed in chapter 3, so let's wait with settling the status of (e) until then.

1.1.3. Locational attributes

The final characteristic we will consider is the role of locational information in experiences of absence. EA says that seeing absence involves recognition that a certain object is absent *at a particular place or a scene*. Is this qualification accurate and why is it significant?

Beginning with the first question, this description seems to fit *visual* experiences of absence. When we see absences of pens, colleagues, or laptops, we perceive their absences at specific locations. Thus, your colleague is seen as missing from her office, the laptop is absent from *that* table, and ketchup bottle is absent from the fridge, rather than from the bookshelf or from the house next door.

Vision is not the only sensory modality that can pick up on absences. We routinely perceive absences via other senses. We feel the absence of a wallet in the pocket, taste the absence of salt in soup, and smell the absence of coffee in the kitchen in the morning. Like seeing absences, hearing,

smelling, and touching absences involve recognitions that a certain object is absent or missing. Moreover, such recognitions typically specify *where* the object is absent or missing, and thus fit EA.

There might be obstacles to EA's universality. EA may not apply perfectly to every modality. There is research showing that some modalities (e.g., audition) utilize locational information to a lesser extent than vision does (see O'Callaghan 2010; see also his 2007:29-41). This, if true, will affect locational attributes of absences experienced in those modalities. We will return to this question in chapter 5, where I will discuss implications of my account of seeing absence for other modalities. Now, let's return to vision. Assuming that locational clause in EA is true of visual experiences of absence, let's ask why this clause is theoretically significant. What does it achieve for an account of seeing absence?

There are two main points of significance. First, it bears on how we conceive of a *scene layout*. Scene layout is a type of a representation that carries information about the geometry of the scene, and informs how various objects are distributed in that scene. In particular, it tells us where the perceived objects are located and how such objects are spatially related to one another and to the viewer (their distance and angles) (Epstein and Kanwisher 1998, Rensink 2000, and Oliva and Torralba 2001). If locational clause in EA is correct, then scene layout will also include information about the distribution of absences in a scene. It will report where absences are located in the scene, and how absences are spatially related to other physical objects and other absences in the scene.

Now, the second point of significance. In addition to enriching job description of a scene layout, locational clause does important delimiting work. It enables us to distinguish *experiences* of absence from *feelings* of absence. Feelings of absence occur when we miss someone or something: for instance, parents feel their children's absence when they leave for college; lovers experience each other's absence when separated, and a toddler might miss a toy that was accidentally thrown away. Feelings of loneliness, existential angst, and nostalgia also frequently involve feelings of absence. In loneliness, one feels like there is no one around; when feeling nostalgic, one misses the sights that are now gone; and when feeling death anxiety, one fears the absence of oneself and nothingness.

Feelings of absence are often affectively valenced: they may be negative (as in loneliness or in death anxiety) or positive (nostalgia might involve mixed affect). Importantly, feelings of absence are intentional states. Like visual experiences of absences, these feelings involve reactions to absences and are about those absences. This poses a question: how do we distinguish between these two kinds of states? How can we tell if one is feeling absence or perceiving one?

One suggestion is to say that feelings of absence have less determinate phenomenology than perceptions of absence do. Thus, feelings of absence are experiences with a very general character. They have an elusive, nebulous feel. According to this suggestion, when one feels her lover's absence, this feeling is quite vague, whereas when one perceives her lover's absence, the experience is somehow more precise or concrete. This proposal is not completely helpful. Perceptual experiences of absence are not always concrete or fully specific. For instance, we can see that something is missing from our desk or in the living room, but we can't tell which object is missing. This perception of absence is vague. Many feelings of absence, on the other hand, are quite concrete: we feel the absence of a particular person or of a particular thing.

This is where the locational clause in EA can help. I think that we can distinguish feelings of absence from perceptions of absence by how such states handle locational information. In perception of absence, absences are perceived at specific locations in the external world. In feelings of absence, locational projection is absent.

I want to emphasize the idea of locational *projection* and not merely of location attribution as the delimiting factor. An example will help. Consider parents whose children had just left for college. As they miss their children, they will experience various things in response to their absence. Plausibly, they will *feel* their children's absence in the house, and they will also *perceive* their absence – at the dinner table or in the living room.

Note that both kinds of states make reference to locations (places in the world). Thus, in feelings of absence, children are felt to be absent in the house, rather than on the playground, and

these feelings could even be tied to a more specific location (the dinner table). Moreover, both kinds of states might share the same trigger (e.g., seeing an empty dinner table).

So, what's the difference? In perception of absence, absence is not merely tied to a specific location in thought; it is projected onto that location and seen at that location. Feelings of absence lack this feature: they are *triggered* by particular places or objects, but they do not project back onto those places or objects. Insofar (or whenever) such feelings do project back onto the triggering places or objects, they transform into perceptual experiences of absence.

Another way of expressing the idea behind projection is in terms of attention. In perception of absence, attention goes to the world, and absences are perceived at specific locations in that world. In William James' terms, perceptual experiences of absence bear "the character of externality". Absences are seen out there, in "real space". Feelings of absence, in contrast, are characterized by internality. Even when those feelings are triggered by the world rather than the mind, once they take root and begin to unfold, they draw our attention from the world into internal states like memories or thoughts.

Let's recap. There are three ways to introduce a given phenomenon: by ostension, definition, and by contrasts, and we have used all three methods to describe the phenomenon of seeing absence. I hope that this gives us a better sense of the kind of visual experiences we are after. We will continue building the profile of experiences of absence as we go along. Now, let's consider why these experiences are significant.

1.2. Significance of experiences of absence

1.2.1. Aspects of absence perception

Experiences of absence are a vital part of our interaction with the environment. Activities like driving, running, and crossing the road rely on speedy and accurate detection of absences – of people, roadblocks, cars, and animals. Regular observations of absences can also be a part of one's hobby or

occupation. Squirrel watchers are asked to report absences of squirrels, and bird watchers record absences of specific birds in their neighborhood.

Experiences of absence are also essential for our life in a society. Consider these examples of experiences of absence with a prominent social dimension.

First, experiences of absence often convey socio-cultural information. Seeing absence of a wedding band on the ring finger signals that the person is not married, and seeing no tie on a job applicant indicates his disregard for the dress-code.

Experiences of absence may also be politically charged, such as seeing the absence of a black moderator in the presidential debates, or seeing the absence of women in a given profession. As an example of the latter, consider a series of ads in the recent airline magazines (2012-2013) which feature best doctors in the United States. In recent issue of Delta's *Sky*, the ad consists of 4 full-page photographs of doctors in a given area and an additional list of doctors in that area. Since all photographs are of male doctors, flipping through the pages elicits an impression of the absence of women. One begins to wonder about the sexist bias in these ads. This bias may be confirmed by further observations of absence. If one reads through the lists on each page, one will note a glaring absence of female names on most of those lists (among 27 listed doctors, only 1 is female).

Experiences of absence can also elicit a moral reaction and be employed in mind-reading. Seeing no adults around a child left in a car causes us to condemn her parents, and seeing no tears on somebody's face indicates lack of remorse. Finally, experiences of absence can have aesthetic dimension. Sculpture of an animal with a missing head might be deemed ugly or daring, and missing rung on a ladder can be judged as graceful or beautiful.

This brief survey indicates that experiences of absence have significance for the key aspects of human life. However, it is easy to overlook their role. We tend to associate absences with relatively abstract states of affairs. We think about the absence of democracy in a certain country, talk about the absence of justice for a certain community, or feel infuriated about the absence of equality at a certain company. However, abstract judgments of this sort are often grounded in concrete observations of

absences. Absence of equality is signaled by seeing no wheelchair ramps in buildings, and absence of affluence is conveyed by seeing no street lights in poor districts. Such concrete observations of absence may be overshadowed by the abstract judgments they ground, however, we shouldn't overlook their role.

1.2.2. Absence-related research

Above we considered examples in which perceptions of absences are embedded in moral, political, social and religious judgments concerning absences. While these aspects of absence judgments are important, in our discussion we will be investigating their *perceptual* core: visual recognitions of absences.

Perceptual recognitions of absences have been a subject of empirical research on perception. It's worth noting that most of this research focuses on perception of *physical* objects and scenes; however, some of its dominant experimental paradigms implicate perception of absence. I will review four representative examples of such paradigms.

(i) *Change blindness studies*. Change blindness (Levin and Simons 1997, Mack and Rock 1998) refers to failure of the subjects to notice drastic changes made to a scene. Some of those changes involve removal from the picture of conspicuous objects, such as a plane engine or a large branch. When the subjects are shown the modified picture, they fail to notice changes made to that picture.

The phenomenon of change blindness challenges the conception of the mind, according to which we interact with the world by forming rich, detailed representations of the external environment. This phenomenon also has import for perception of absence. However, care is needed in how we interpret this import. Change blindness studies (CB studies) explore factors like the subjects' scanning strategy or saccadic movements when they view the changed display. It would be wrong to interpret these items as components of the subjects' perception of absence. The reason is simple. In CB studies, no absence-seeing occurs. When the subjects view the display with a missing object, they

fail to see the removed object (because it is absent). This does not mean that they also experience, or represent its absence. In fact, it is the subjects' regular failure to notice and represent the absence that renders them change-blind. In engine displays, the subjects therefore lack two kinds of seeing: seeing the engine, and seeing the engine's absence.

If that's the correct interpretation of CB studies, what's their import for perception of absence? First, there is a general question why subjects fail to notice absences in natural scenes. If we routinely generate rich representations of the world, why do our representations (sometimes) omit information about absences? This question can be made more specific. Let us distinguish between two types of changes made to a scene: *changes* in objects (a house changing its color) and *removals* of objects (removing a plane engine). They will correspond to two forms of blindness: change blindness and absence blindness. The distinction now enables us to frame a more specific question: what conditions differentially affect change blindness versus absence blindness? Is it ever easier to notice an absence, rather than a difference, and why? To my knowledge, no one has pursued this question, and it seems like a good question to ask.

(ii) *Visual search paradigms*. CB studies can be used to explore conditions in which the subjects fail to notice absences. Since detection of absence routinely occurs in searches, search paradigms may be used to explore the conditions in which the subjects succeed in detecting absences. Searches involve tasks in which the subjects look for pre-specified targets. These tasks take various forms. In standard serial searches, subjects scan the display in search for a target, and detect its absence when they fail to find the target.

Another common search paradigm is parallel search. In parallel search, the target object is placed among distractors, dissimilar from the target with respect to one or two features. The target object then pops out among the distractors. It is seen immediately, and accuracy and speed of its detection does not depend on the amount of the distractors. Parallel search thus differs from regular serial search, in which the amount of distractors can adversely affect success and time of the search (think of searching for a small object in a cluttered drawer).

If objects can pop-out from dissimilar distractors, can absences do the same? Several pop-out studies tested pop-out of negative features in adults and in infants (Treisman and Souther 1985, Treisman and Gormican 1988, and Adler 1998). However, there are reasons to be skeptical of their conclusions. The problem with at least one of those studies is that it misclassified what counts as a negative feature. Kiss and Eimer (2011) present, in opinion, a much better designed study of absence pop-out. The display is a grid of dots, in which one dot is missing. Kiss and Eimer argue that absence pop-out does not have the same curve function as ordinary single-feature pop-out and for this reason cannot a genuine case of parallel search (or pop-out in its technical sense). We won't assess their claims right now, but these studies are good to keep in mind as we think about perception of absence.

(iii) *Gestalt grouping*. Gestalt psychology studies principles of automatic grouping of objects into a single unit or a perceptual whole. Patterns and groupings can be disrupted due to removal of some elements of the group. Baingio Pinna (2010) explores various forms of disruptions, including absence disruptions, and addresses perception of absence in these conditions.

(iv) *Object permanence*. Object permanence (Piaget 1954; Moore and Meltzoff 1999) refers to the capacity to perceive objects as persisting through various kinds of changes, such as occlusion, time, and motion. For very young infants, out of sight means out of mind, and they show surprise when they see an object reappear. For one year olds, disappearance of an object from a field of view is not interpreted as going out of existence, such that its subsequent reappearance elicits less surprise (Bower 1974 has demonstrated this effect in three month old infants). The disappearance stage may be interpreted as detection of absence, and note that having this stage is essential for object-permanence studies. If an infant gets distracted and fails to notice the disappearance, subsequent measures of infant's surprise at the reappearance of the object cannot be used to draw appropriate conclusions about capacities for object-permanence.

While experiences of absence are implicated in all such paradigms, it's worth pointing out that none of these paradigms tests specifically the skill of absence detection. CB studies are concerned with drastic changes in general and not with absences in particular. Search studies typically fail to do

proper conceptual work on stage of a search which involves absence detection. Thus, search studies either (a) assume that absence detection occurs without showing why those cases are not mere detection failures, or (b) code detection of absence cautiously as detection of empty space or “blanks” (Kiss and Eimer 2011), and thus avoid presenting the result as detection of a target’s absence. An important goal of my defense of seeing absence will be to validate it as an important component in various perception research paradigms.

This completes our initial characterization of seeing absence. We have defined experiences of absence as conscious perceptions that represent a particular object as missing from the perceived scene, and we saw that such perceptions 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 now turn to it now.

1.3. The introspection-based challenge

1.3.1. The argument from indiscriminability

The idea that we can experience absences 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?

This shows that putative negative phenomenology – the experiential quality we associate with experiences of absences – is misleading. Upon inspection, even the most striking experiences of absence reduce, or collapse in their phenomenology into positive observations of objects. This observation about phenomenal collapse of absences 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 experiences and the representations of absences is non-visual.
3. If the representational difference-maker is non-visual, then absences cannot be seen.
4. So, absences cannot be seen.

Let's unpack that argument. 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 differ from positive experiences by virtue of some non-perceptual feature. So, goes the objection, there is no actual *seeing* of absence. There are only judgments we make about absences on the basis of the actual positive seeing.

To strengthen the argument from indiscriminability, let's clear some objections that may arise at this point. While all premises in the argument may be disputed, the heart of the argument is Premise 1. We will consider two objections to this premise.

1.3.2. Clarifying the argument: the notion of indiscriminability

Premise 1 says that seeing absence is visually indiscriminable from positive seeing. But is this premise true? After all, in an important sense, experiences of absence 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.

Consider the following counterexample that targets the wrong sense of indiscriminability. 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 two

experiences. The first experience is positive: you are observing your colleague's face. The second experience is negative: you are experiencing the absence of a mustache from his face. This shift in "what it is likeness" seems to speak against visual indiscriminability of positive and negative experiences. So, Premise 1 must be false.

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 qualitative feels or phenomenal characters that yield interesting contrast effects when compared with positive experiences. The problem with absences is that the phenomenal characters responsible for those effects aren't really theirs. Absences lack proprietary appearances – they lack qualities that could generate negative phenomenology. *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.

The point about phenomenal contrast therefore 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 Chapter 2 where we will examine various approaches to defending seeing absence. We now turn to another set of scenarios that will make the problem of phenomenal collapse more vivid and underscore the challenge from introspection.

1.3.3. Strengthening the argument: the fullness of being

It's the end of a long day, and you are ready to pour some wine. You head to the kitchen to grab a corkscrew and open the drawer where it's usually stored. Your first glance reveals that the corkscrew is not there. The drawer is cluttered, but you persist. You look thoroughly, move things around, but no matter how hard you look, the corkscrew just isn't there.

Let's examine your experience when you first look inside the drawer. You see rubber bands, buttons, crayons, batteries and utensils. The drawer is stuffed, and these objects seem to exhaust what you experience. But if these things are all you see in the drawer, where is the experience of absence?

Experiences of absence of this type are common – we frequently detect absences in very crowded scenes or displays (think about a display in grocery store or a busy street). This condition of seeing absence underscores the problem of phenomenal collapse. When we view crowded scenes, positive things we observe seem to pack in our phenomenology, and this fact makes it puzzling how the same tightly packed phenomenology can also present an absence. Sartre captured the same intuition when he discussed the example of Pierre's absence in a café: "the café by itself with its patrons, its tables, its booths, its mirrors, its light, its smoky atmosphere – the café is a fullness of being" (1954:9). So, how can we find absences in the fullness of being, of concrete objects and their qualities?

This generates the problem of phenomenal *absence-in-presence*. We have the intuition that absences can be presented in our perceptual experiences, but when we examine those experiences, the sense of absence is displaced by the plenitude of positive objects we experience. Introspection supports both intuitions and we are left with the puzzle.

Now that we have a better grasp of the problem, I'd like to draw attention to a kind of experiences of absence that can mislead us about the *extent* of the problem. This will allow us to formulate another objection to Premise 1.

Certain kinds of experiences of absence seem to resist phenomenal collapse. Desolate parking lots, abandoned construction sites, empty halls, and other kinds of vacant spaces or surfaces tend to evoke a sense of absence; importantly, this sense of absence seems to *persist* through our examination of such experiences. So perhaps the problem of phenomenal collapse is exaggerated. Not every case of seeing absence collapses into the Sartrean fullness of being. Certain experiences of absence do not, and they seem perfectly discriminable from positive seeing. This refutes Premise 1.

Two responses are available. First, the fact that certain objects have the ability to sustain experiences of absence doesn't provide enough evidence for validating negative perceptual phenomenology. One may argue that we conceptually link such experiences to emptiness. This conceptualization is psychologically entrenched and obscures the character of our experience, leading us to think that negativity resides in our perception – in the visual qualities of our experience – rather than in our beliefs. So, one will conclude, an empty chocolate box can certainly afford a long meditation on an absence (and on moral qualities of a person who took the chocolates). But let's not confuse meditation and contemplations of absence with an actual *perception* of absence.

The second response is this. We are wrong to think that 'empty' experiences of absence are exempt from the problem of phenomenal collapse. They do collapse. Why, then, do we misjudge these cases? I think that the best explanation is presence of a certain bias. We tend to associate seeing absence with seeing empty space. The latter is our exemplar of perception of absence. We think of 'empty' experiences of absence as the paradigmatic cases of seeing absence, and we judge 'busy' experiences of absence (absences seen in crowded displays), as the more marginal instances. Presence of this bias is an interesting fact, which should be explained by a theory of absence perception. However, it *is* a bias. Seeing absence of a corkscrew in a cluttered drawer is no less typical or paradigmatic than seeing the absence of cars in an empty parking lot.

Now that we are warned about the bias, what does it teach us about phenomenal collapse of empty experiences of absence? It teaches us to see that these experiences are not really empty. There is fullness of being even in empty space. When we look at the vacant parking lot, or when we view an empty table, are we not observing positive qualities of these objects? We see their color, texture, and shape. Positive qualities of surfaces are the objects of our perception, and they fill our experience to the brim.

I hope that this discussion shows why the problem of phenomenal collapse afflicts experiences of absence as a class. Busy displays have no place for absences, and neither does colored, textured, and shaped space. All cases of seeing absence fall prey to the claim in Premise 1.

We are now in a position to see how this explanation of Premise 1 forestalls a line of objections to Premise 2. Premise 2 is a conditional. It says that if absence experiences are visually indiscriminable from correlative positive experiences, then their representational difference-maker is non-visual. It is possible to reject this link: one may grant the point about visual indiscriminability, but argue that experiences of absence can still represent absences. What would be the basis of such an argument? One can reject supervenience of representational contents on phenomenal characters. Experiences with different contents can share the same phenomenal character. Thus, even if experiences of absence are look-alikes of positive experiences, denying them proprietary negative phenomenology does not have to rob them of negative contents. They can still represent absences.

This response is available, but it doesn't hold much force. Recall that the initial motivation for positing perception of absence was phenomenologically-driven. It seemed back then that we can see absences. It seemed that experiences of absences pervade our daily life. But if Premise 1 is true and experiences of absence are in fact experiences of presences, then we lose the initial and in my opinion, strong motivation to posit these kinds of experiences. Why not just go along with the cognitive explanation of seeing absence? What do we have to lose?

I now turn to empirical considerations which pose a further threat to the perception of absence.

1.4. The empirical challenge

1.4.1. Representation-based theories

To set up the empirical problem, let's do a quick review of what major theories of perception characterize perception.

Marr's theory (1982) targets levels of processing in object-recognition. The goal of perception is extraction of contours and construction of 3-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). According to this theory, the essential function of perception is identification of whole objects in a scene. Gregory's (1974) constructivist approach

explicates perception as a problem-solving process that aims to recover the objective properties of the world from the impoverished stimuli.

So far this suggests neglect of perception of absence, rather than a problem. So let me make the problem explicit. 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 pens and colleagues, unlike pens and colleagues themselves, lack contours, texture, or color. They therefore cannot furnish the sense 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 (relevant for Marr). Absences don't afford *cues* for building hypotheses about the environment (relevant for Gregory). And absences don't have *parts* which can be integrated into wholes or grouped in any obvious way (relevant for the Gestalt Theory). If the mark of a perceptual act is contour extraction and feature or part integration, absences don't fit the bill.

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.

The introspection-based argument charged absences with lacking *proprietary* appearances. The empirical charge says that absence 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 numerocity, which we, arguably, may represent by means of the perceptual tokens of the general abstract type (Prinz 2006a). 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.

Perhaps some ontology can help us avoid these problems. We've been trying to figure out if any attributes of present objects (colors, textures, or shapes) are shareable in absences, such that those

attributes could launch the process we may confidently call ‘perception.’ Obviously, this project is doomed to failure. No such features can be found in absences. But suppose we change the strategy. Instead of looking for concrete attributes *in* absences, we treat absences as attributes *of* concrete presences. On this proposal, absences don’t share physical qualities with objects; they themselves are qualities of physical objects.

There is an obvious caveat. The mere act of categorizing absences as qualities of presences won’t save seeing absence. We must show that absences are *visible* qualities of presences – things we can notice by means of the senses. Put this way, now this project is also doomed to failure. The fact that absences lack perceptible features is also the reason why absences can’t themselves be perceptible features of anything concrete. But that’s jumping ahead, so here is a more thorough review.

Can absences be perceptible qualities? Let’s review some accounts of what counts as a perceptible feature. Pylyshyn (2001) and Austen Clark (2004) define features operationally. For Pylyshyn, they are qualities that can be related to individuals by a primitive indexing relation, and then bind to produce proto-objects. Clark (2004) develops Pylyshyn’s account and argues that perceptual features are qualities that are automatically assigned by vision to locations in the visual field (he calls this feature-placing). Finally, Rosenthal (2010) argues that perceptual features are dimensions of contrast in feature space.

Perceptible qualities are features that can be ‘placed,’ indexed’ or participate in contrast relations, forming a multidimensional feature space. The first obstacle is Rosenthal’s account: absences can’t stand in contrasts, because they lack features that can contrast. Clark’s and Pylyshyn’s accounts similarly won’t validate perception of absence. It might first seem that they could. Recall the locational clause in EA: in experiences of absence, absences are perceived at specific locations. If locational information matters for absences, then we can stipulate that absences can be feature-placed or visually indexed and thus meet the definition of a perceptible quality. But by virtue of what would absences be feature-placed or indexed? What’s the machinery? Standard perceptible qualities are

identified and “placed” by means of the specialized receptors (or by the combination of products got from receptors). But no such receptors are available for absences. If perception is receptivity, then when we see absences, we – or rather, our receptors – are literally receiving nothing. The puzzle remains.

1.4.2. Ecological absences

Could seeing absence be salvaged on a more revisionary theory of perception, which deemphasizes representations and appearances and posits action as the end goal of perception? Gibson’s ecological approach (1966, 1979) explicates perception as the direct pick-up of information specified in the optical flow. Importantly, what gets picked up are possibilities for action: affordances from objects, like grasping or reaching.

We can submit that absences likewise present adaptively salient possibilities for action. For instance, absence of a poisonous snake on the branch affords reaching for a banana; absence of fruit on the trees affords further rummaging; and absence of predators in a forest affords playing and mating. Given that such absences are salient, they seem to be the kinds of items that we should be able to perceive on the ecological approach.

This inference requires care. For Gibson, it is *events* rather than objects that specify the affordances. Given this clarification, there has been a dispute about what perception takes as its objects on the ecological approach. Consider the event of an apple rolling on the ground. What do we perceive in this case? One answer is that we perceive affordances specified by this event: the apple’s edibility and reachability. On another interpretation, we perceive affordances *plus* the affording event – the apple rolling on the ground (Greeno 1994).

Possibility of absence perception thus depends on how we construe objects of perception and on how we categorize absences. If the former interpretation is correct, then absences may be perceived only if they are affordances. This interpretation would make the prospects of absence perception dim. Explicating absences as affordances seems like a category mistake. Absences do not

belong to the same category as graspability. Affordances are not possible objects, but are possible *actions*. Thus, if absences were affordances, they would have to be possible actions. That seems incoherent. Absence of a banana does not seem to be a possible action that is afforded by a tree; rather, it seems to be an item that affords actions (e.g., looking for more bananas).

This result is not worrisome if we adopt the second interpretation, according to which both affordances and the affording events may be perceived. This interpretation does strike me as a more accurate reconstruction of Gibson, so let's assume for the purposes of the argument that it is correct. Can absences be perceived on the ecological approach? Well, they can't be affordances (they aren't possible actions). Thus, the only way for them to be perceived is if they are the events that specify the affordances (or participants of the affording events.)

The hypothesis, then, is that absences may be perceived if they constitute ecologically salient events or if they are participants in the ecologically salient events. It seems that we find confirmation of this hypothesis in Gibson. Gibson notes that "going out of existence, cessation or destruction is a kind of environmental event and one that is extremely important to perceive" (1979:14). He then offers analysis of these events in (ibid:106-7).

Gibson's analysis targets the kinds of absences that involve radical transformations in the state of matter. But consider an earlier example of an absence: the absence of a snake on a branch. A snake's absence is a non-event. Its absence does not involve annihilation, disappearance or displacement, since the snake was never there. Gibson's discussion on disappearances thus does not provide us with the answer whether these kinds of uneventful, yet salient absences can be directly perceived. In fact, we may guess that his answer is likely to be that such absences *cannot* be perceived. 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 of snakes and bananas lack surfaces, textures, and edges. How, then, would the structured light specify the information about these kinds of absences, if absences lack the properties that can structure light?

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 stimulating.

1.4.3. Cues, traces, and absences

As a way to underwrite 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, shadows, and blackouts. These phenomena are commonly thought to involve an absence of some sort (Casati 2006, Casati and Varzi 1994, and Sorensen 2008b), and there are compelling reasons for taking their negative status to be an irreducible fact about them (Sorensen 2008b).

Suppose these reasons are correct and holes and shadows are indeed fundamentally negative entities. We kill two birds with one stone. Absences acquire publicly available sensible appearances, and these appearances are proprietary. This removes paradoxality from seeing absence and with that, the demand to treat seeing absence as a post-perceptual phenomenon. We perceive absences whenever we see shadows, holes, and gaps.

Our skeptic is unfazed. Shadows and other public absences aside, our life is rife with idiosyncratic yet veridical experiences of absences. Consider seeing the absence of a pen on the desk or the absence of your laptop on the table. Given that these absences fail to deliver perceptible features to the senses, it remains a mystery how their perception is possible. In fact, why not think that we see these absences only metaphorically, the way we see that the problem has no solution or that the tank has enough gas by looking at the gauge? Since it is these kinds of experiences that we care about, the paradox still stands, and so does the skeptic's cognitive resolution.

But are we too quick to dismiss shadows and holes? A more sensible approach, it seems, would be to adopt a 'divide and conquer' strategy. Explanations of how we perceive certain negative entities

won't not extrapolate to all cases of seeing absence. Nonetheless, they can cover a subset of cases and supply us with a partial solution to the problem of seeing absence. As a result, the problem of seeing absence would look less formidable and seeing absence less of an impossibility.

I don't think that the 'divide and conquer' strategy will work. It is important to remember what phenomenon we are interested in. Its main characteristics are captured by EA, and observations of shadows, gaps, and holes don't match these characteristics. These observations either fail to be cases of seeing absence in the sense described in EA, or they are only contingently related to seeing absence.

Take shadows first. It is easy to see how experiences generated by observations of shadows don't fit the profile of the experiences described in EA. Shadows do not elicit impressions of absences. Something seems to be gone when you see the absence of your laptop. Nothing seems to be gone when you see a shadow. Shadows and scenes containing them seem complete. A theory of perception of shadows therefore deals with a different kind of perceptual phenomenon.⁴

Does this conclusion also apply to holes and holes? They have closer ties to experiences of absence, but the relation is still contingent. I just suggested that we typically don't have impressions of absence when we see shadows. I think that the same holds of the majority of cases when we perceive gaps and holes. Take a look at the scene in front of you and note how many gaps you are observing at this moment. There are gaps between chairs and other furniture, between books, blinds, clothing, and floor panels. Majority of these gaps don't elicit impressions of absences of objects. Our senses pick up on many more trivial gaps when we look at the world, and we can agree that the influx of gaps does not generate a constant influx of absence impressions.

It should be acknowledged that certain types of gaps (more precisely, gaps in certain types of contexts), can be quite reliable in generating experiences of absence. Perhaps a gap in a row of chocolates, or a missing cookie in a cookie display always elicit experiences of absence. But even these more reliable cases have a limited bearing on seeing absence. First, these cases are quite rare in

⁴The distinction I have just drawn also applies to the phenomena involving darkness or blackness.

comparison to the many cases of gap-seeing that do not generate experiences of absence. More importantly, accounts of how we perceive gaps in these “reliable” contexts cannot explain why we perceive absences in these contexts. Perception of gaps and holes relies on pick up of luminance contrasts between gaps or holes and the framing background (Pinna and Tanca 2008, Sorensen 2008b:65, and Vision 1997:256). These basic psychological mechanisms are responsible for figure/ground segregation that’s operative in perception of gaps and holes. These mechanisms, however, won’t automatically launch perception of absence. Detection of contrasts in the world is not sufficient for locating absences of objects in the world.

In sum, experiences of shadows, holes, and gaps are only contingently tied to experiences of absence described in EA, so the ‘divide and conquer’ strategy is not our best option. I’d like to clarify two points about this conclusion. First, it should be clear that the problem with the ‘divide and conquer’ strategy is not due to ontology. We are not discriminating against the metaphysical status of negative entities. We may welcome this kind of ontology and affirm the negative status of shadows, gaps, and holes. The problem is that observations of these entities typically do not elicit the relevant kinds of experiences. Even if absences are woven into the very fabric of things, that’s no guarantee (a) that our experiences are always responsive to that fact, and importantly, (b): that whenever our experiences are responsive to that fact, these responses fit EA.

Here is the second point. While gaps and holes don’t guarantee perception of absence, they play a role in seeing absence when it does occur, and it’s important to understand that role. What’s the role? Gaps and holes function as cues that point us to absences. A gap in a row of books can cue us into the fact that a book is absent, and a jarring hole in a building can point to an absence of a wall. There are other kinds of absence cues. Crumbs on a plate betray a cake’s past presence, and scratches and dust marks on the floor remind of an old couch that was thrown away. Thus, things can leave traces or parts behind, or affect objects that are left behind. But it is important to keep the following in mind. We shouldn’t confuse absences with physical signs of absences. While it’s true that certain

things may reliably point to absences, these things are not parts of absences and do not guarantee absence seeing.

Perception of absence is a diverse phenomenon and can be elicited in a variety of conditions. Sometimes scenes in which we see absences are rich in perceptual detail – a stacked fridge, a kitchen drawer, or a store display. Sometimes absence scenes are more minimal. They may be completely empty, or contain traces and signs of absent objects. None of these conditions is atypical. All are paradigmatic. But the most puzzling, it seems, are cases of totally clean absences, like the absence of your laptop on the table. Clean absences have locations, but they lack bounds. Unlike holes and gaps, they are not framed, leave no marks, and offer no features that can participate in contrasts. Our defense of seeing absence will especially be concerned with these kinds of experiences.

2. Defending seeing absence: strategies and the desiderata

This chapter discusses two responses to the paradox of seeing absence: the cognitive account, which denies the possibility of seeing absence, and the perceptual account, which endorses the claim that we can see absences. My agenda is to motivate the perceptual account. Negatively, I will argue that cognitive account has three undesirable consequences. I will then argue that there are several compelling positive reasons to adopt the perceptual account. The final part of the discussion will spell out the desiderata on the perceptual account.

2.1. Seeing absence is believing – or is it? Cognitive response to the paradox

In the previous chapter, we looked at two arguments which challenge the perceptual status of experiences of absence. According to the introspection-based challenge, experiences of absence present us with an illusion. There seems to be proprietary phenomenology to absence, but the looks of absences in fact belong to positive objects. According to the empirical challenge, 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 of the paradox is this. We should admit that the talk of “seeing” absence is metaphorical. Strictly speaking, we never actually see absences. Rather, we come to believe that something is absent on the basis of what we perceive. According to this cognitive explanation, perceptual level is restricted 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. In sum, positive things are perceived; absences of things are conceived.

Let’s call this skeptical response to the paradox ‘cognitive account’ or CA. I will now argue that despite its initial obviousness, CA does not present an easy solution to the problem of seeing absence.

In particular, CA carries problematic implications for (a) perceptual beliefs, (b) cognitive phenomenology, and (c) validity of certain empirical tests.

2.1.1. Strike 1: no negative perceptual beliefs

We may distinguish two basic claims in CA. Negatively, CA says that we cannot perceive absences. By implication, perceptual phenomenology of absence is an illusion. Positively, CA asserts that absences are represented at the higher cognitive level, like judgments or thoughts. This positive claim, when unpacked, faces several problems. The first one concerns the kinds of beliefs we may form about absences.

It is standard to distinguish between two kinds of beliefs: basic and inferential. Basic beliefs are formed on the basis of non-doxastic states, such as perceptual experiences, sensory memories, and feelings. Inferential beliefs, in contrast, are formed on the basis of other beliefs. Described in this way, basicity is a property of a belief's etiology: it tells us about the psychological antecedents of a given doxastic state. Basicity has also been taken to have epistemic import. Thus, basic beliefs are said to differ from the inferential beliefs in the quality or the degree of the justification they receive. The former, but not the latter, have *prima facie* justification (Audi 1993:72-95).

Keeping this taxonomy in mind, let's return to CA. If according to CA, absences can be represented only via beliefs, what kinds of beliefs are they? It seems obvious that we can form inferential beliefs about absences. Take, for example, your belief that your laptop is gone. This belief may result from the deliberation over other beliefs you have. For instance, you may see someone run away from the café, remember reading about recent laptop thefts, and infer that your laptop had been stolen. You can acquire the same belief with fewer inferential steps, for example, if a barista informs you about the theft. But an even more immediate judgment is possible. You can become immediately aware of your laptop's absence by taking one quick look at the table where you had left it.

Assuming CA, this latter judgment seems like a typical perceptual belief. Its production is factorable into two stages. First, you see a positive object: the café table. You perceive its sensory

qualities, such as color and shape. The second stage is cognitive: you form a belief on the basis of this visual experience that your laptop is absent. This belief doesn't require deliberation or calculation, and it is immediately warranted by what you observe. The upshot is this: while CA denies absences entry into perception, absences still can enter our mind at the fairly early cognitive (and perhaps epistemically innocent) stage – the level of perceptual beliefs.

I am now going to argue that this conclusion is problematic. There is a serious obstacle to the view that we can form perceptual beliefs about absences. Take ordinary perceptual beliefs. These beliefs, by definition, are based on how things look. You see a red apple in front of you, and you form a perceptual belief that there is a red apple in front of you. The etiology of this belief is straightforward. There are no intervening beliefs or perceptual states, and it seems basic. Now note that this perceptual belief shares a certain characteristic with other perceptual beliefs: there is a kind of isomorphism, or structural similarity, between its content and the basing perceptual experience. Doxastic content that there is a red apple in front of you mirrors the perceptual content that there is a red apple in front of you.

Problem: content isomorphism is violated in the case of perceptual beliefs about absences. Recall CA's slogan: positive things are perceived; absences of things are merely conceived. Perceptual experiences are always about what's present; negativity enters only at the level of belief. Thus, in the laptop example, the content of your visual experience is that there is a table in front of you with qualities x , y , z . The content of your belief is that your laptop is gone. These are substantively different representational structures.

The analysis of experiences of absence in terms of negative basic beliefs thus faces a hurdle. Negative basic beliefs substantially deviate from the characteristics of standard basic beliefs. While contents of ordinary perceptual beliefs are to a large degree isomorphic to contents of their basing experiences, contents of negative perceptual beliefs are not similarly isomorphic to their basing experiences.

How might CA respond? One option is to bite the bullet and accept that we can't form perceptual beliefs about absences. Beliefs about absences are always based on other beliefs, even if some of them require fewer inferential steps or seem more immediate than others. Call this version of CA 'CA-inferential.' CA-inferential comes with a cost. If one thinks that basic beliefs have a privileged epistemic status in the kind of warrant they possess in comparison to inferential beliefs, then accepting CA-inferential would deprive absence beliefs of this kind of warrant. It would imply, for example, that when viewing the empty café table, your belief that your laptop is absent from the table possesses a weaker degree of justification or is somehow less epistemically privileged than your belief that there is a table in front of you. This seems like a counterintuitive result.

CA can reject this response and insist that negative beliefs in question are perceptual despite their anomalous profile. Beliefs about absences do lack one important characteristic of ordinary basic beliefs; still, they are perceptually-based and therefore count as basic. Call this version of CA 'CA-basic.' Its obvious benefit is that it allows absence-beliefs to enjoy the same epistemic status as standard basic beliefs. But this response may be deemed suspect. CA rejected experiences of absence because these experiences deviate from the standard characteristics of other perceptual experiences. But now CA is willing to accept doxastic states that deviate from the standard characteristics of perceptual beliefs. Swapping one class of unorthodox mental states for another seems arbitrary.

Besides being arbitrary, CA-basic offers poor explanation of seeing absence. Here is what needs to be explained. When we are confronted with ordinary objects, we automatically form perceptual beliefs about those objects. This, plausibly, also holds in the café example: seeing the café table generates positive belief that there is a café table in front of you. Now, on CA-basic, this same experience also generates perceptual belief about an absence. How does it do that? The experiential content is about perceptual attributes of the table. The doxastic content is about the absence of the laptop. So how does one get to the negative content? CA-inferential has a story to tell: it will add some beliefs to the mix and close the gap between the two contents. CA-basic has no story to tell. It

only countenances the gap. Beliefs about absences somehow spring forth from positive experiences. This makes CA-basic hard to accept.

Here, then, are the options. CA-basic is a just-so story about perception-to-belief content jumps. CA-inferential explains the jumps, but restricts what absence beliefs are possible, and with that their epistemic status. One might not take the epistemic consequence seriously⁵, and think that this much is right: positive experiences must be fed into other beliefs before they can generate negative contents. This pushes CA away from anomalous perceptual beliefs in CA-basic toward an inferential account. I will now argue that there is an anomaly in the inferential version of CA as well.

2.1.1. Strike 2: deviant cognitive phenomenology

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. That observation couldn't be used to counter premise 1 of the Argument. However, we may use this observation now to formulate a new objection to CA.

Phenomenal difference between experiences of absence and positive experiences makes perception of absence a perfect candidate for the application of Siegel's method of phenomenal contrast (2006, 2010). Schematically, the method of phenomenal contrast (PC) 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*.

Let us now apply MPC to an example of seeing absence. Imagine that you run into your colleague Bill. You start talking and midway through the conversation it hits you that Bill's mustache

⁵One can argue that this consequence does not follow or say that it follows but fail to be a threat.

is gone. Your experience goes through a shift. It switches from the experience of seeing Bill's face to an awareness of absence of his mustache. These are our contrasting experiences E1 and E2. 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 E1 and E2, even if the difference is not obviously visual.

The proponent of PC wants to show that the difference *is* visual. Thus, she must show that they differ in virtue of the fact that E2 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. So, how would she explain the mustache example? 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 S's phenomenology persists. So shows that phenomenal contrast must arise due to non-doxastic contents.

Let's duplicate this move 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 still *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 won't secure victory for H. CA can say that the phenomenology persists because it tracks certain beliefs that persist – beliefs about how things look. In our case, the persisting belief would be: “It still 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 rival to H.

When inspected in isolation, phenomenal character of experiences of absences collapses into the appearances of positive objects. When contrasted with other perceptual experiences, absence phenomenology resurfaces, but could be an effect of one's cognitive judgments about absences.

Now let's see at what cost CA remains a rival. What must CA presuppose in order to explain phenomenal contrast successfully? CA says that phenomenology of absence is just the phenomenology of *thinking* about an absence. CA therefore presupposes the existence of cognitive phenomenology. This assumption is relatively controversial. What adds to the controversy is the kind of cognitive phenomenology that CA has to posit. This phenomenology turns out to be deviant.

To see why, consider again Bill's camouflaged mustache. According to CA, when you view Bill's face after you learn about the mustache, you *see* things the same, but you *interpret* what you see differently. You now know and believe that the mustache is actually there. Let's call this belief 'B_p.' B_p does not alter absence phenomenology. It still looks like Bill's mustache is gone. Lasting absence phenomenology, *ex hypothesi*, is cognitive, so let's call the belief that sources it 'B_A.'

Here is the glitch. B_A is said to sustain absence phenomenology, but it doesn't make sense why it would. What kind of a belief is B_A? When pitched against CA-basic, CA-inferential came out as a stronger contender. This makes B_A an inferential belief. But now it seems strange why B_A remains impervious to cognitive change. Inferential beliefs are supposed to exhibit a certain degree of flexibility. B_A will be routed through other beliefs, and must be sensitive to and reflective of one's background knowledge. B_A fails to be so. It remains remarkably rigid.

One can reply that negative cognitive phenomenology and corresponding absence-beliefs simply are resilient in this way. Cognitive absence states are special. But then again CA arbitrarily swaps one type of deviant states (experiences of absence) for another (cognitive phenomenology),

and this does not seem right. So perhaps a better response is just to give up on CA-inferential. A natural explanation of why B_A behaves in this way is that it constitutes a perceptual belief. Absence phenomenology stays the same because the underlying belief stays the same, and the underlying belief stays the same because the patch under Bill's nose looks the same. B_A tracks how things look and thereby fits the profile of perceptual beliefs.

Let's summarize. CA-inferential began as a strong contender but then lost points due to cognitive phenomenology. CA-basic does better with respect to cognitive phenomenology, but it posits inexplicable perceptual/cognitive content gaps. Presumably, the proponent of CA will want to reply to these problems and qualify and explain her proposal. I expect that to happen, and I tried to show that it must happen if cognitive explanation is to stay on the market. The proponent of CA can't just assign seeing absence to thought and expect a smooth ride.

2.1.2. Strike 3: empirical asymmetries

I will conclude our evaluation of CA by briefly noting one empirical consequence of this view. Cognitive explanation of seeing absence makes trouble for certain experimental paradigms. Tasks that are taken to be symmetric in these paradigms become asymmetric if we assume CA.

One paradigm directly affected by CA is search studies. Search studies involve various types of detection tasks. In these tasks, the subjects respond to the target's presence or absence in the display. If perception of absence turns out to be a cognitive process, then search studies utilize asymmetrically designed tasks. Successful detection of a target is a perceptual skill, which recruits perceptual systems for its completion. Detection of absence, according to CA, is carried out post-perceptually by the cognitive systems. Search studies therefore tap into fundamentally different skills.

If this implication is correct, then there needs to be reconceptualization of the kinds of processes search studies measure and how these measurements should be interpreted. For example, one important variable in search tasks is reaction time: how quickly the subjects detect presence or absence of the target. How do we compare these measurements? What follows from the fact that

detection of a present target occurs slower or faster than seeing its absence? Interpretation of these measures ought to be done with an understanding that they measure different skills: seeing and thinking. The same point applies to other paradigms that implicate perception of absence, such as change blindness and object permanence studies. Like search studies, these paradigms face the problem of asymmetric tasks and require reconceptualization.

It is now obvious that cognitive account does not offer a simple solution to the paradox of seeing absence. CA faces the problem of deviant negative beliefs, deviant cognitive phenomenology, and asymmetries in certain empirical studies. These considerations do not constitute knock-down arguments against CA. However, they put pressure on CA as a default response to the paradox and motivate the search for an alternative explanation of seeing absence.

2.2. Perceptual response to the paradox

2.2.1. Back to what it is like

We have just looked at one response to the problem of seeing absence – the cognitive account. I argued that CA is not as uncontroversial or straightforward as it might initially seem. By rejecting experiences of absences, CA either must embrace some counterintuitive epistemic results or accept a class of basic beliefs that is no less deviant than the experiences it rejects. The perceptual account of seeing absence avoids these negative implications, so that's one tip in its favor. But there are also positive reasons to accept the perceptual account.

The first motivation for the perceptual account takes us back to what it's like to see absences – to phenomenal character of experiences of absence. I'll refer to it as the phenomenological motivation. The key points in its support come from our initial explication of experiences of absence in 1.1 and the evaluation of cognitive explanation in 2.1. I'll do a quick audit of these points and explain how they may be used to motivate the perceptual account.

The first point is that experiences of absence feel instantaneous and lacking in conscious effort. We seem to be struck by absences, and these states just don't feel like thoughts or inferences. So,

cognitive explanation does not do justice to the phenomenology of absence. 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 1997).

How compelling is this argument? Immediacy of experiences of absence is compatible with the view on which experiences of absence are computed by subpersonal processes or inferences.⁶ These processes may recruit predominantly cognitive mechanisms and produce instantaneous outputs that feel like experiences. To use this response, CA would have to show that the computations in question occur downstream of "pure" perception and produce cognitive outputs that are responsible for absence phenomenology. Showing this won't be easy, and we have already seen why in 2.1. We will use those reasons to construct the second argument from phenomenology.

Here is the second argument. Phenomenology of absence exhibits resilience to change of belief. Negatively, this characteristic means that absence phenomenology is not likely to be generated by cognitive states. (If it were generated by cognitive states, it would have been more sensitive to change in beliefs or background knowledge). CA fails to account for this characteristic, and it is easy to transform this point into a positive argument for the perceptual account. Resilience to change in belief is standardly taken to be a marker of perceptual states (Jackson, see also Fodor 1983); therefore, absence phenomenology is likely to be generated by the perceptual states.

The following example can help drive this point home. Martin Bernetti took a striking photograph of a Venezuelan gymnast Katherine Coronel who looks completely headless while performing her routine because of the angle of his camera.⁷ Importantly, the impression elicited by Bernetti's image is not that of the head being occluded by the gymnast's body. Rather, the gymnast

⁶To adopt this reconstruction, one would have to be comfortable in using the term 'inference' to refer to operations over entities that fail to be premises in the strict sense of the term 'premise.'

⁷Photograph by Martin Bernetti. (2006). *AFP/Getty Images*. Retrieved March 16, 2012, from <http://www.gettyimages.ie/detail/news-photo/la-gimnasta-katherine-coronel-de-venezuela-realiza-su-news-photo/71491475>.

appears headless in the same way that the rider from Washington Irving's *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. Importantly, the illusion of absence persists even when one learns that the image is not a hoax. No matter how much one rehearses the information that the gymnast's head is actually there, the illusion stays. This kind of informational insulation from one's knowledge suggests that the experience of absence elicited by the photograph is a perceptual effect.

Finally, the idea that absence phenomenology is perceptual finds indirect corroboration in language. We often describe our encounters with absences in sensory terms. Recently, a friend showed me the empty headphone case and said: "I lost my headphones. They are gone. See?" The way we use 'see' in such scenarios does not have the same strong metaphorical ring as when we say that we see no solution to a problem or see no justice in the new law. Our language indicates that something more immediate and perceptual is going on.

This bit of linguistic evidence, of course, is just one data point in the case for perception of absence. It does not prove that we can see absences, and it does not imply that we can just read off cognitive psychology from the way we talk. However, how we talk in many cases has something to do with how we see things. Fodor (1983:86-97), for instance, takes patterns in the linguistic use of certain terms (basic-level categories) as indicative of the nature of the representations they designate.⁸ Similarly, patterns in how we talk about experiences of absence can provide partial evidence of the kind psychological processes that these experiences recruit.

To review, the phenomenological motivation is driven by three observations: immediacy and the apparent sensory quality of experiences of absence, their imperviousness to change in belief, and the language we use to describe them. These characteristics make sense on the perceptual account of seeing absence, but become problematic if observations of absences are actually thoughts about absences. There is, of course, an elephant in the room. All three points lose force when faced with the problem of phenomenal collapse (1.3). So, is what we've just said now useless?

⁸These concepts are shallow, which is one of the indicators of the fact that they are perceptual.

Phenomenal collapse is a serious problem for the perceptual account of seeing absence, but I don't think that it cancels the points which drive the phenomenological motivation. We may have a faceoff in the phenomenological intuitions, but it doesn't amount to their mutual annihilation. Phenomenal collapse must be explained, and in the next chapter, I will show how it is explained by the perceptual account. Before I do that, I will try to motivate the perceptual account by an argument that does not hang so much on our intuitions about how experiences of absence feel or strike us. Up next is the ecological argument for seeing absence.

2.2.2. The ecological argument

It may be argued that the perceptual ability to 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) but also about *what is absent from the world, and where it is absent*. Let's work through this argument.

Start with the following claim. Sometimes absences matter for action. Whether a certain object is absent affects how one goes about one's tasks. For instance, grabbing a banana from a branch depends on there being no tree snakes around, and making a U-turn depends on the absence of cars to one's left. Next, in many of these tasks, it seems useful to *represent* the relevant absences. Grabbing the banana or making a U-turn are helped by noticing salient absences. And now, the final point: certain actions benefit when detection of absence occurs perceptually.

The result is a three-step argument, which we can summarize as follows:

The ecological argument

1. Some absences are salient for the execution of certain actions ('Salience').
2. Some of those actions depend on detection of salient absences ('Detection').
3. Those actions benefit when salient absences are detected perceptually ('Perception').
4. Therefore, absences are likely to be detected perceptually.

We will now examine each premise in more detail, but two brief clarifications first.

First, I should explain what the argument concludes. The argument does not conclude that we can see absences; it only provides inductive evidence for that claim. In particular, it says that the ability to perceive absences is a useful ability for us to have, which makes it more likely that we'll have this ability. The argument thus motivates the perceptual explanation of seeing absence by showing what's at stake (the utility of seeing absence). It itself however does not constitute such an explanation (the latter would involve responding to challenges and paradoxes in 1.3 and 1.4).

This leads us to the next question. Why do we need additional motivation for the perceptual account? There is rich, compelling phenomenology of absence, which the cognitive account fails to capture, and which the perceptual account seems to get right. So why isn't that enough to motivate the perceptual account? Couldn't we just point to our experiences and say: Look, doesn't it seem to you that we can experience absences? I don't think this would do. As we have already seen, absence phenomenology is a bit of a flake. It generates conflicting and unreliable intuitions, and therefore doesn't provide a strong enough "push" toward perceptual account of seeing absence.

But perhaps a more important point is this. I think that it will be useful to consider perception of absence apart from its phenomenology. We may achieve better understanding of this kind of perception if we look at it in isolation from the kinds of feelings it typically generates. This will generate a new set of questions than the ones we've been occupied with so far. What use is there in perceptually representing absences – consciously or unconsciously? Why can't the perceptual systems just produce positive representations of objects and events? How does perception of absence work? The ecological argument attempts to get at these questions, and in my opinion, these questions can powerfully motivate the perceptual account. So let's see if the argument succeeds in its motivation.

(i) *Salience*. The argument proceeds in three stages: it begins with the claim about salience, then moves to detection of what's salient, and then finally to perception of what's salient. Premise 1 introduces the idea of salient absences, so let's begin by unpacking that notion.

There are two ways in which objects and events may be salient, corresponding to two types of attention (I will focus only on objects). First, objects may be salient because they are relevant for

one's tasks. The type of attention these objects elicit is called 'endogenous,' and it is driven in a top-down manner by one's goals or desires. Second, objects may be salient because they are perceptually distinctive – they stand out among other objects by virtue of their physical characteristics (such as color or motion). Perceptually salient objects elicit exogenous attention, which operates relatively independently of one's goals or tasks. For example, bright red apples on the fruit stand may grab one's attention even if they are not on one's shopping list.

In sum, salient objects are those objects that are disposed to be attended or perceptually selected among other objects in certain contexts. The ability to select what's salient in the scene is vital for one's adaptive interaction with the environment. For example, a bonobo navigating through the jungle will keep an eye on water, edible fruit, and suitable branches, and discard irrelevant details. These objects are salient for the bonobo, and their rapid detection serves her adaptive interests. But presumably, absences of objects can also be salient. Absence of a snake on a branch is salient for getting the banana, and absence of a leopard (who predares on bonobos) is salient for crossing the forest clearing. In these cases, absences, rather than presences, become objects of interest. How objects look becomes largely irrelevant. It doesn't matter, for instance, which shape or color the surrounding trees are. What matters is that the leopard is absent. Thus, absences may be salient, and this is what premise 1 asserts.

(ii) Detection. Let's move to our next premise. The basic idea is this. If absences of certain objects matter for action, then it makes sense to pay attention to or to detect the relevant absences. Note that this premise uses 'detection' neutrally. Our goal at this stage is to argue only that we have a need to represent absences. How we represent absences – whether the process in question is perceptual or cognitive – will be taken up at the next stage of the argument.

The move from Salience to Detection seems intuitive. We typically represent things that matter for our purposes or actions.⁹ Absences matter for our actions, so naturally they will be the sorts of

⁹For purpose-sensitivity of various types of representations, see Millikan (2004:157-182).

things we would want to represent.¹⁰ This inference may be blocked. One can accept the claim that absences matter for certain actions, but argue that absences do not need to be detected in order for those actions to be carried out successfully. I'll begin by presenting this objection schematically and then illustrate it on the basis of an example.

Suppose that S is about to perform action A and succeeds in performing A. There are two competing explanations for why S succeeds:

E1 S performs A because *O* is absent;¹¹

E2 S performs A because S detected *O*'s absence.

In E1, S fails to detect an object that's absent. As we have established earlier, failure to detect an object that is absent does not imply detection of its absence. Thus, E1 is not equivalent to E2. The objector will then say that we actually don't need E2. All the explanatory work can be done by E1: 'failing to detect' can take care of all the relevant cases, so there is no need to postulate E2.

To see why this objection works, let's return to our bonobo. The bonobo is surveying greenery, spots the banana, and reaches to grab it. Success of her action is conditional on there being no poisonous snakes around. But the bonobo doesn't need to detect their absence in order to get the banana. All that's needed is that the snakes *are* absent. Here is our moral: we shouldn't burden our bonobo with superfluous representations. Absence of the snakes is salient, but their absence does not need to be detected in order for the bonobo to thrive in the jungle. Mere failing to detect will do.

This objection thwarts the inference from Salience to Detection. I will now defend the inference. My argument will be that detection of absence provides better explanation of certain actions than failing to detect. So, the move from premise 1 to premise 2 is justified.

I'll work out my defense using a new example. Switching from bonobos to humans, suppose you are looking for your friend Rob. You agreed to eat lunch together so you check his office. Rob is

¹⁰This inference corresponds to how we've defined 'salience' above. Salience is the disposition to be detected or selected, so if absences are salient, then it seems right to suppose that they would be detected.

¹¹'Because' here is used in a thin, counterfactual sense, as in: S wouldn't have succeeded in performing A had *O* been present.

not in his office. You check other rooms and end up going to lunch alone. What explains this action? My response is: detection of absence. You see that Rob is not in his office and leave for lunch alone. The objector's response is: failing to detect. You *do not see* Rob in his office and leave for lunch alone. I will now show that the second explanation does not work. The objector has no way of unpacking 'failing to detect' that can successfully explain your action. Let's consider her options.

a) Positive seeing response. Let's start with a simpler interpretation. 'Failing to detect' typically means that a certain process is *not* occurring. For us, a process in question is *seeing Rob*. Now, *not seeing Rob* is compatible with a large number of positive things that are occurring. Because you are not seeing Rob most of the time, various things you do at that time cannot be explained by a single state of *not seeing Rob*. *Not seeing Rob* is not specific enough to explain your actions.

There is a fix. To explain your actions at *t*, we could specify positive things that co-occur with your failing to see Rob at *t*. In the office example, what positive things happen when you fail to see Rob in his office? Presumably, you see other objects in his office, such as tables, people, and books. But now things get strange. If failing to see Rob in his office is just shorthand for the things that you do see in his office, your subsequent action makes little sense. You don't leave for lunch alone because you see books and chairs in Rob's office. You leave for lunch alone because you perceive Rob's absence in his office. His absence is the salient bit of information that motivates your action. Insofar as the objector's analysis omits this salient bit of information and only cites presences, her response will not work.

b) Scripting response. Our objector can respond that the interpretation we've just attributed to her is overly simplistic. 'Failing to see,' she will say, is not mere shorthand for what we positively see. The story is more complicated, so it is no surprise that the earlier reconstruction ran into problems.

What should we add to the story in order to complete the explanation? Here is one suggestion. We add counterfactual representations. On this proposal, when we search for objects of interest, our mind activates counterfactual action-scripts: i.e., it runs a command which conditionalizes actions on

certain positive inputs. The script will say: check various locations unless you get signal from *O*. In our example, it will say: check offices until you see Rob. Note that there is no mention of absences here. *Failing to see* reduces to positive exploratory activity (looking inside offices, talking to people) that's conditional on potential signal (seeing Rob).

In response, I think that there is a set of scenarios that the scripting account can explain. Searches sometimes involve activities which (a) generate only positive representations and (b) stop as soon as one spots the target object. This response, however, cannot account for all the relevant cases. To see why, let's draw a distinction between two types of actions. Some of our actions are presence-specific. They are counterfactually dependent on present stimuli. These actions kick when we pick up on a certain signal or detect a specific stimulus, such as reaching for a cookie when you see one. Some of our actions are *absence-specific*. These actions kick in when we become aware of absences, such as checking pockets when you see that your credit card is not in your wallet.

Scripting response will have trouble explaining absence-specific actions. Let's spell this out. We established that we can't explain certain actions by reference only to what we positively observe. (Leaving for lunch alone can't be explained by what you did see in Rob's office.) To solve this problem, we embed positive observations into action scripts. Thus, leaving for lunch alone becomes counterfactually dependent on certain kinds of observations. Which kind? Things get complicated. Suppose that your script tells you that you are to keep checking offices until you see Rob. This explains why you keep searching, but not why you quit and leave. To explain the latter, scripts will get more specific (e.g., check offices 9A, 9B, and 9C, then leave). But now running scripts becomes cognitively costly. We are supposed to maintain complex counterfactual representations which pair positive stimuli with responses. That doesn't seem like the best way to prepare for action. A much simpler set-up would be to allow direct causal links between absence-specific actions and the representations of absences. The latter directly trigger the former; no counterfactual coding necessary.

c) The expectational response. Here is our final attempt to unpack 'failing to see'. The objector may propose to supplement the account with predictive information. When you search for objects,

you expect them to be in certain locations, and this prospective element makes your exploratory activity specific. Here is how this proposal will translate into our example. You expect to see Rob in his office, but you do not see Rob, so you leave for lunch alone (or: you expect to see a credit card in your wallet, but you do not see it, so you check your pockets.) Does this explanation succeed? Can *failing to see* in conjunction with *expecting to see* explain certain actions?

This response inherits the same problem from the previous response. Plausibly, the reason you leave for lunch is because you understand that your prediction has failed and you won't see Rob. But how do you know that your prediction has failed? Absence representations are not available. Your only resources are expectations and positive observations, so given these resources, how do you know when to stop expecting and to conclude that Rob isn't there? Presumably, you conclude that Rob isn't there because your predictive system receives feedback that says something to that effect. It reports that you failed to find Rob. But we don't have enough resources to explain this feedback. Seeing various things in Rob's office plus an occurrent expectation to see Rob in his office is not sufficient to build a representation that Rob isn't there. So, the predictive response fails as well.

This completes the second stage of the argument. In this stage, we set out to show that failing to detect cannot explain certain actions, and that those actions are best explained by detection of absence. I defended this conclusion by arguing that the various interpretations of the objector's proposal fail to provide good explanations of the action in question. This gets us from Saliency to Detection. Our final step is the inference from Detection to Perception.

(iii) *Perception*. Now that we've shown that it is overall useful to detect absences, we need to ask if there is special benefit in detecting absences perceptually. What do we gain from being able to pick up on absences via the senses? Is absence-detection something we should saddle our perceptual systems with, or can all absence-representing be adequately handled by thought?

We've reached the question about utility of perceptual representation of absences. I think that the answer is simple. Utility of detecting absences by the senses is the same as that of detecting ordinary objects by the senses. In other words, whatever benefits ordinary seeing acquires from being

carried out perceptually are the very same benefits that will be enjoyed by perception of absence. What are the benefits? Perceptual processes are fast, automatic, and insulated to a large extent from what we think or know (Fodor 1983 and Pylyshyn 1999). If these qualities confer efficiency on ordinary perceptual processes, then similar efficiency considerations will apply to the process of detecting an absence. Thus, if it can be shown that absence detection benefits from being fast, automatic, and informationally insulated, that would raise the likelihood of perceptual detection of absence.

I will leave a more detailed defense of this point for Chapter 4. Here, I would like to review some negative implications from rejecting the inference to Perception in the ecological argument. There are two related implications for locational information and memory.

The first implication demands a revisit of David Marr and the bonobos. According to Marr, reporting locations of objects is one of the essential functions of vision. We need to know where things are, and we need to know that fast. Presumably, the same goes for absences. We need to know where absences are, and we need to know it fast. Question: how do we represent where objects are absent, assuming that we can represent absences only cognitively?

There are two options. (1) If detection of absence is cognitive, absence representations are thoughts, which report locations of absence. But, assigning the locational information to thought does not seem like an accurate description of how we perceive absences. Consider our bonobo who looks around to check on the absence of snakes before reaching for a banana. She doesn't retrieve the location of an absence from thought. Instead, she perceives the absence of a snake over there, on the branch. (2) Here is the second option. Instead of ascribing locations of absences to a single representation (thought), we can attribute this information to a combination of representations. On this proposal, locations of absences will be specified by an amalgam of what the bonobo positively observes joined to her thought that something is absent. This seems like a cumbersome way to specify locations absences. So, both proposals don't give us an efficient way to represent absences and for this reason seem unlikely.

This conclusion concerns *online* efficiency of absence detection, and there is related concern about *offline* representations of absences. Consider memory. Remembering where objects *were* absent (or remembering where they typically *are* absent) seems like a useful thing to do. The bonobo, for example, might try to store information about the places where snakes or leopards have been absent. How does she store that information? On (1) above, the bonobo will store beliefs about where certain objects were or typically are absent. Doing that will deprive her of the value of using visual memory for storage. On (2), the bonobo will store combinations of representations: visual images of the environment “glued” to thoughts about absences. Doing that will make her memory storage cumbersome. Given these options, it seems much simpler just to store *percepts* of absences.

These negative implications enforce the link between Detection and Perception. We may now review the entire argument. Given that absences are salient for action (Salience premise) and given that it is efficient to represent salient absences (Detection premise), we are likely to represent absences via perception (Perception premise). This completes the empirical argument for perception of absence from the function of vision.

2.3. Two defense strategies

In this subsection, I will do some stage-setting for my account of seeing absence. We’ve already looked at the reasons for why the perceptual account is worth defending, so our next big question is how to best approach its defense. I will review three approaches. Their evaluation will supply us with adequacy conditions for a theory of absence perception, which will help to motivate the account I will propose.

2.3.1. Factive strategy: the logic of absences

The first approach attempts to make use of the logical structure of absence contents. When we introduced experiences of absence, we defined them as positive recognitions that an object is missing from a scene (EA). This naturally suggests reconstruction of ‘seeing absence’ in terms of factive

perceptual states. When you see the absence of your laptop in a café, you *see that* your laptop is absent. Your experience indicates a certain negative fact about the object you are viewing: that your laptop is missing from it.

The proposal, in gist, is to account for seeing absence by subsuming it under a type of seeing called ‘epistemic.’ Epistemic seeing involves perception of facts about objects and implies knowledge of those objects. For example, one may see that this table is a café table, that the menu lists various types of espresso-based drinks, and that the barista is dressed like a hipster. Similarly, one may see that there are no computer outlets in the café, that a cortado is not on the menu, and that the barista is not wearing socks. The latter kinds of experiences are also instances epistemic seeing, with the difference that the perceived facts concern absences, rather than presences, of objects.

Call this defense of seeing absence the ‘factive strategy.’ On the account it proposes, experiences of absences essentially involve pick up of negative facts from the environment. This does not yet give us much clarity. How do we pick up negative facts from the environment? How does this pick-up affect how we represent absences? And what exactly are these negative facts?

One can reply that facts presented in our experiences of absence are *negative propositions*. This step is nearly trivial given construal of seeing absence as ‘seeing-that.’ That-clause takes propositions or perceptual analogues of subject-predicate structures as referents. By implication, negative seeing employs negative propositional contents.

That gives us a more precise proposal: we represent absences by virtue of negation operating on propositional content of our experiences.¹² There are several ways to model this operation. One can say that this process involves application of absence *concepts*, and then explain what these concepts

¹²For Millikan (2004, 2007), negation transformation is a uniquely human capacity that requires language and propositions (see Bermudez 2007 for a counterargument). To model negation transformation for *perceptual* content, one would have to argue that perceptual content has the right sort of a structure (propositional) that can undergo negation transformation.

are like.¹³ Another option is to say that this process assigns something like absence labels or tags to positive perceptual contents. Absence-tags may be understood perceptual analogs of a logical operator/connective ‘not.’ They are not concepts, but instead function as transformation rules over concepts or the propositions composed by concepts.

Consider, for example, how Higher-Order Thought theory of consciousness (HOT) (Rosenthal 1986, Carruthers 1996) might model this process. Take ordinary perceptual experience with positive content *C*. According to HOT, *C* becomes conscious when it becomes a target of a higher-order thought *T*. To get negation into perceptual experience, HOT theorist could again appeal to *T*. She can argue certain higher-order thoughts contain ‘not’ operators, and when those operators are applied to *C*, *C* becomes negative. On this proposal, an experience of absence lies at the nexus of a negative higher-order thought and lower order positive content.¹⁴

So we’ve got our absence concepts and absence-tags, and there are further ways to unpack these notions. The literature on the grammar of negation is vast, and we could go on distinguishing types and subtypes of experiences of absences relative to the form of negation they employ. But before we get swept away into the logic of negation, let’s stop and ask if this strategy is even worth pursuing. Does factive strategy present us with a feasible *defense* of seeing absence?

This strategy has several benefits. First, factive strategy is attractive is 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 (something that lacks an appearance). Instead, it is seeing something true of a positive object or a location: that something is missing from it.

¹³Are absence concepts primitive or derived? Can we model them via prototypes? Do they behave differently than the concept ‘object’?

¹⁴This proposal faces the challenge of explaining why the resultant negative perceptual content is still perceptual, given that it constitutively involves an element (‘not’) from a cognitive state (thought). Note that appealing to a Higher-Order Perception theory of consciousness (HOP) (Armstrong 1968, Lycan 1996) won’t help. If the relevant higher-order state that applies ‘not’ to *C* is perceptual, then we must explain how *this* higher-order perceptual state managed to get negative. So, appealing to HOP only pushes the problem further.

The second benefit concerns the phenomenology of absence. By focusing on the grammar of seeing, factive strategy avoids having to give an explicit account of what it is like to experience an absence. It is neutral on whether absence-tags or concepts 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 what experiences of absence feel like.

The account is not without problems, however. First, epistemic seeing is a type of seeing that *essentially* involves categorization, conceptualization, or some other form of cognitive appraisal of sensory input. 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, factive strategy places it 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 perceptual absence-tags, which does not clarify things one bit. It only pushes the problem further.

To recap: factive strategy 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, this strategy 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. These are the most significant problems with the account. There are two additional problems that are worth noting.

First, explicating intentional objects of experiences of absence as facts does not accord with how our perceptual system seems to treat absences. We seem to perceive absences as bounded units which have particular locations (the absence of your laptop is there, on the table) and can persist through time (if you blink, your laptop will still be absent). Facts, on the other hand, are not perceived as bounded units at locations. If this characterization is correct, then absences presented in the experiences of absence function more like *individuals* than facts.

Another reason is that the factive strategy actually got the logic of seeing absence wrong. Not all seeing absence can be reconstructed factively as ‘seeing that.’ Seeing that *P* involves knowledge that *P*. But take the earlier mustache example. When you become aware of the absence of Bill’s moustache, you do not know that it is absent. The reason you don’t have this knowledge is because Bill’s moustache is not absent. It is present, but camouflaged.

To summarize, factive strategy implies the wrong logic of seeing absence (we can be wrong about absences), lacks the explanatory power (does not validate seeing that *O* is absent as seeing), precludes nonconceptual seeing of absence, and obscures the target phenomenon (our perceptual system does not treat absences as facts). Let’s see if we can find a more promising strategy.

2.3.2. The attentional strategy: striking absences

As has become evident, factive strategy runs into the same issue as the earlier phenomenal contrast strategy: it must be supplemented by a story that explains why recognitions of absences are perceptual states. Our next 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.¹⁵ 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 strategy? 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

¹⁵See 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.

table indicate that what's missing is a laptop and not a vase)? So it seems misguided to look for differences in attention.

2.4. Summary and the desiderata

Let's take stock. The main question we've been asking is if it is possible to perceive absences. Perception of absence presents us with a paradox, and there are two main views about how to handle the paradox: the cognitive account (CA) and the perceptual account. We've seen that the cognitive response is not an easy way out of the paradox and faces several obstacles. To respond to these obstacles, CA can transform into CA-basic or CA-inferential. Both of these forms, however, face problems, and CA loses attraction as a result. This motivates the search for an alternative explanation.

This brings us to the positive case for the perceptual account. There are two main motivations: phenomenological and ecological. The phenomenological motivation appealed to resilience of experiences of absence to higher cognitive states. The ecological argument claimed that certain actions cannot be explained by 'failing to represent' and are best explained by representations of absence, and that these representations should be perceptual in order to be efficient. I supported this claim by showing that none of the reconstructions of 'failing to represent' works. This concluded our motivation for the perceptual account.

In the final part of the discussion, we began to think about how to defend the perceptual account. We looked at the factive strategy, the attentional strategy, and the imagination-based strategy. These strategies share the same defect: they leave room for the cognitive interpretation of seeing absence. So, the only remaining alternative is to look at the vehicles of absence representations.

Here is the upshot. A compelling defense of seeing absence must specify the mechanism subserving seeing absence; crucially, it must show that this mechanism is perceptual as opposed to cognitive. There are three main demands that this mechanism must meet. First, the mechanism in question must be *perceptual*. It must operate on representations in perceptual format, and the

operation itself must be perceptual. Second, this mechanism must explain the *phenomenology* of absence, which involves responding to the problem of phenomenal collapse. The final requirement is *semantic*. If perception also reports what is not where, then the mechanism we posit should enable experiences of absence to do that. In the next chapter, I will attempt to defend a model of seeing absence that meets these demands.

3. 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. I propose that we look for the cues of what this processing might be by examining scenarios when we typically see absences.

3.1. Basis of the model

Consider the situations when we usually perceive absences. You are about to make coffee and discover that there are no beans in the coffee jar; you expect a letter 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.

In these scenarios, you begin to look for an object, expecting it to be at a certain place, and you see its absence when your expectation is disconfirmed. Given that seeing absence often occurs during the time when our expectations are violated, analysis of violation of expectation should provide us with important clues about the type of processing that underlies experiences of absence.

The observation about the link between seeing absence and violated expectations will be our starting point. Here, then, is the plan for this section. We'll begin by reviewing basic features of the expectational mechanism. After that, we will look at failed searches and examine how expectational mechanism operates in those kinds of searches. This will give us the materials for formulating the initial proposal about seeing absence – the mismatch model. We will conclude by testing this model on some examples.

3.1.1. Expectations

There seems to be an intuitive link between an expectation to see an object and seeing its absence. So, what sorts of states are expectations? What does it mean to expect?

When we expect something, we represent what's possible or likely in the environment. This advance information is coded as conditional on contextual cues. For instance, seeing a highway prompts us to expect billboards and racing cars, and seeing a coffee shop brings to mind coffee aroma and paper cups. These kinds of expectations are set by observing regularities in the environment and are sensitive to those regularities. Contextual cues also matter for the endogenously driven expectations – expectations set by our tasks and goals (such as expecting to see Rob in his office because you agreed to eat lunch together). Even though endogenous expectations are largely driven by higher cognitive states, such as intentions and goals, contextual cues can do important work in activating, enforcing, and updating these kinds of expectations.

According to this conception of expectations, expectations are representationally rich states (Clark 2013). Typical expectational states will not predict how *isolated* objects will look or behave; instead, they will associate objects with specific contexts and predict properties and behavior of those objects relative to those contexts. Contextual enrichment makes expectations useful. To illustrate, consider the kinds of expectations you might activate when driving around a big city. It doesn't seem useful to activate a general expectation to see fast-moving cars. Since expectations rely on and benefit from contextual cues, your expectations will be relative to the specific kind of environment you'll find yourself in, such as: 'Cars move fast on such and such streets,' or 'Cars move slowly in this neighborhood.'

Hereafter, I will assume that expectational states are rich in the sense just noted. There are three more points about expectations that I'd like make, and these points will help clarify some of the aspects of the expectational mechanism that will be relevant for our account of seeing absence.

First, expectations should be distinguished from *feelings of anticipation*. According to this distinction, it is possible to expect something, and yet be completely unaware that one is expecting something. This may happen in two ways. First, expectations can operate unconsciously and lack the

phenomenology entirely. We'll refer to these expectations as implicit expectations.¹⁶ But even consciously held expectations – those that you'll be able to report or access introspectively – may produce no sense of anticipation. Your current expectation to see trees outside may be fully transparent to you, but elicit no feeling of dread or anticipation about this state of affairs. Expectations can be unexciting.

Second, expectations do not always involve anticipatory or preparatory processing. Anticipatory processing consists in attentional and/or motor preparation for the expected stimulus. This type of processing has benefits: expected stimuli are detected faster and more accurately. On the notion of expectation used here, preparation and expectation are distinct processes. Expecting an object may not deploy attention in a way that facilitates detection, and it may not prepare us for action. Expectations can be passive and fleeting; they can be disinterested and leave us unmoved. Suppose that you are passing by a library, which triggers an expectation to see computers inside. Their image flashes before you mind. This image does not have to trigger any state of preparedness. While computers are probable or likely objects for that context, they are not *salient* objects. For this reason, anticipatory preparation is unnecessary.

Finally, expectations can take various psychological forms. *Cognitive* expectations recruit semantic or declarative memory and utilize more abstract information. *Perceptual* expectations, in contrast, remain close to the senses. The latter represent advance information in sensory format proprietary to a given modality; thus, we may distinguish between visual, gustatory, auditory, and proprioceptive forms of perceptual expectations. There is a question, however, if we ever activate expectations in just one format. It seems plausible that contextual cues often trigger multimodal anticipatory states. When driving up to the beach, you may anticipate cry of the sea gulls, the feel of the sand, and smell of the ocean. These images will fuse into a single expectational state about the beach, and it is possible that many of our expectations follow this pattern.

¹⁶Note that implicit expectations can still influence one's experience – the experience wouldn't have felt the way it did, had one not expected that *P*.

That's it for the expectations in general. We now turn to expectations in contexts, specifically, to expectations in the context of searching.

3.1.2. Failed searches

Begin with the following two observations about searches. (1) Searches are processes in which we typically see absences. (2) Searches are processes that set and control expectations. Here, we will attempt to bring these two points together, and we will do that by looking at the paradigm of failed searches.

Searches pervade our daily life. Think about this morning and recall how many things you were looking for after you woke up (cellphone, matching socks, an expected email, and keys). If you are lucky, you succeeded in finding some of these objects. But some of those searches probably failed. A matching sock is nowhere to be found, somebody took your coffee mug, and the email is not in the Inbox. Your expectations fail and you see an absence. Let's explore this failure.

Searches fail only at their last stage, but it is important to understand the entire process. We may break up the process into the following three stages: template activation, projection, and matching. Starting with the first stage, a search begins with the activation of a template of the searched object. Here, 'template', roughly, will mean a representation of the searched object that's retrieved from memory. We can think of templates as mental images, but this notion will be revised later. The next stage is projection. Once activated, template of an object is projected and compared with the incoming sensory information: probable locations of this object. And now, a stage that's critical for our account. If the world is found to be incongruent with the projected template, the perceptual system registers predictive error. This 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, and Summerfield and Koehlin 2008). As a result, we see an absence.

My proposal, in gist, is to explain experiences of absence by the mechanism of a *mismatch* that subserves violation of expectation in failed searches. Let's try out this mechanism on an example.

Consider this familiar situation: you are late for a meeting, so you are about to grab your keys and head out of the door. You are certain that you had brought your keys into the house, but the keys are nowhere to be found. Here is the breakdown of this process. When you remember about grabbing your keys, you activate their template in working memory. This template doesn't have to be a high resolution image of your keys. To find the keys, it's enough to remember one of the distinctive features, such as their keychain color. Next, you project this template and match it against the places where you typically leave your keys – countertops, tables, and bookshelves. You perceive their absence by registering a mismatch between the template of your keys and the places you scanned during the 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. Here, then, is the model at first pass:

The Mismatch Model (beta)

Visual experience of absence of an object consists in a mismatch between a template of that object and a percept of the observed stimulus, caused by the violation of expectation.

Looking for keys in the house or for a favorite dessert at the bakery are intentional searches. We set out to find a certain object and take necessary actions to fulfill that goal. One might point out that all searches are intentional, and that it is part of a definition of a search that it is always driven by the subject's goals. This use of the notion of a search does not conform to how this notion is used in cognitive science. One of the common experimental tasks uses displays in which objects "pop out" among dissimilar distractors. These tasks are referred to as 'parallel searches.' In these tasks, one 'finds' or locates the target solely because of the target's physical characteristics, and not because one forms an explicit intention to find it.

Following this practice, suppose we extend the notion of a search to detection of perceptually salient objects, as well as to objects whose presence is expected only implicitly. Can the mismatch model explain these types of cases?

Here is why this question matters. Implicit searches resemble intentional searches, but resemblance, of course, isn't perfect. Implicit searches are *implicit* and will therefore deviate in important ways from standard intentional searches. But: like intentional searches, implicit searches frequently involve violation of expectation, and like intentional searches, they may generate experiences of absence. So, *whether* these cases can be handled by the mismatch model becomes theoretically significant. It also becomes significant *how* the model will handle such cases. Does the model apply straightforwardly or require modifications? Do we need to add or remove some elements from the explanation? Answering these questions will help us achieve a better grasp of the key elements of the explanation we are proposing and the phenomenon we are trying to explain.

Let's look at some examples of implicit searches. (1) One example involves the phenomenon of looking at nothing (Ferreira 2008). People look at the previously occupied ('blank') region when they get a linguistic cue of an object that has previously occupied that region. Suppose you are talking to some people, and one of them leaves the room in the middle of a conversation. If somebody mentions that person's name a few minutes later, you will inadvertently glance at the chair where she sat during the conversation. This is a case of looking at nothing. (2) Here is a slightly more common example. You are walking, it's a pretty day, and you hear a bird sing. You automatically look up, but you can't find the bird. The sound of presence leads to a sight of absence. (3) And finally, our most familiar example – seeing the absence of a laptop on the café table. As you are walking back to your table, you do not explicitly expect to see your laptop. You might be completely distracted and think about something else. However, you may have an implicit expectation to see your laptop, because you remember leaving it on the table. This expectation was triggered by the sight of the empty coffee table, and its violation led to perception of an absence.

Both cases may be understood as implicit searches. In looking at nothing, hearing a linguistic cue prompts one to check if the cued object is still at its location. Since the object is not there, one experiences its absence. Similar explanation is available for the bird case, and we may conclude that implicit search case in general conform to the following basic pattern. Certain cues automatically

activate templates of certain objects, which, in turn, set off implicit expectations to see those objects at specific locations. These expectations are violated, and we perceive an absence.

Let's summarize some of the lessons we have learned from the two types of searches about perception of absence and see what it implies for the mismatch model. I'll briefly introduce two lessons here, and their role will emerge more clearly as we consider other kinds of experiences of absence in the following section.

First, we have made substantial use of the notion of implicit expectations. Implicit expectations, to remind, are states that are unaccompanied by feelings of anticipation and may operate completely unconsciously. The fact that implicit expectations can launch experiences of absence pushes us away from the earlier understanding of object templates we use to perceive absence as conscious mental pictures. Expectations, along with the templates they source, may be projected unconsciously. Whether it is still useful to identify object templates operative in perception of absence with images will be discussed in a bit.

The second lesson concerns particularity of experiences of absences. (1) If there is a red apple in front of you, and you see that apple, your visual experience will be of a particular apple. (2) If I remove the apple from the table when you are looking away, and you become aware of its absence when looking back at the table, your visual experience will be of a particular absence (or the absence of a particular apple). In searches, however, we often see absences of objects whose tokens we never experienced directly. Suppose I describe my favorite coffee mug to you and ask you to look for it; and suppose further that you can't find my mug. Since you've never seen my coffee mug before, the absence you will experience will lack the same kind of particularity as my own experience of my mug's absence. This feature of experiences of absence might seem puzzling, and it will become more prominent in the next set of experiences of absence we are about to consider.

3.2. Extending the model

3.2.1. Why extend?

We have just examined one type of experiences of absence – those that occur in searches, and we established that the Mismatch Model can successfully explain those cases. Our goal in this section is to determine if our model can generalize to other types of experiences of absence. But before we proceed, let me explain why we should bother about extending the model in the first place.

There are two main purposes that the extension will serve, and I'll begin with what seems to be the most obvious one. First, testing the scope of the model is something we ought to do if we are providing a model-theoretic explanation. One of the core explanatory virtues of any model is its capacity to cover all the relevant cases. So, checking on whether our model can cover all cases we would like for it to cover seems like a reasonable thing to do.

This task, however, becomes much less pressing if we recall what we initially set out to do. Our main ambition was to show that we can perceive absences. This involves defending the perceptual account against the cognitive explanation of seeing absence. So, showing that the Mismatch Model can validate at least *some* experiences of absence already means that we've done well. Our success should seem even more certain given that the kinds of experiences the Mismatch Model defends are not some quirky phenomenon, but are an essential part of our daily life. Given these considerations, our initial reasons for scope-testing and extensions have lost their obviousness. So are we being overly ambitious? Should we just skip to objections and implications?

I think not. Trying to extend the model is not a case of over-achieving. The reason is this: without the extension to other cases of seeing absence, our defense of the *current* cases of seeing absences may seem questionable. It might seem mystifying why the provided explanation defends a certain class of experiences of absence, and yet fails to validate the rest. Are other kinds of experiences of absence so vastly different from our current cases that they demand a completely different strategy? Why wouldn't they be amenable to the perceptual explanation provided by our model?

Extending the Mismatch Model to other cases will preempt these worries. There is another reason for the extension. Like our analysis of implicit searches, analysis of other types of experiences

of absence may furnish us with useful materials for refining the model, and there are some things in the model that actually stand in need of a revision. For instance, we need to be more precise about the character of the templates used in the experiences of absence. We also need to clarify the representational level of mismatches in which object templates participate. At this point, these and other elements of the model are not precise enough. As a result, the current formulation of our model overextends to some cases which, intuitively, do not count as experiences of absence.

This should motivate the extension of the model, so let's consider our cases.

3.2.2. Deviant absences

While searches are a common source of our experiences of absence, there are other conditions in which we frequently see absences. Relative to these conditions, we can identify two more types of experiences of absence: those elicited by deviations in different types of patterns, and observations of disappearances. Since deviant absences inherit many features from implicit searches, so we will consider them first.

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. These experiences involve automatic responses to a deviation in a pattern, where 'deviation in a pattern', roughly, corresponds to the notion of a violation in a regularity in the environment.

The notion of the environmental irregularity may be too rough to help make sense of deviant absences. Instead of trying to make the definition of a deviant pattern more precise, I will give examples of the various forms of patterns, deviations in which tend to produce experiences of absence. There are three main forms. One form is a *static* display, such as a row of buttons on a blazer or a cookie display. Second, patterns may also take form of *temporal* sequences, such as a luggage slide down the conveyer belt at the airport. Finally, patterns may be regularities we implicitly pick up

in the environment, such as the number of fingers on a human hand, or the fact that dogs typically have tails. We will refer to these types of patterns as static, temporal, and statistical patterns.

It has been argued that observation of deviant patterns involve violations of expectations (Bubic et al 2009). Thus, experiences of absence they elicit may be naturally explained in terms of mismatches. Let's test this explanation on an example. the case of one might learn about a missing item in a museum display. Suppose you are walking along a row of photographs. The row is long, and multiple viewings of the photographs set the expectation to see more photographs down the line. Due to your expectations, you begin to implicitly project a template of a photograph as you walk along. Then all of a sudden, you come across a big gap in the row of photographs. Because the gap presents a deviation in a pattern, it will disconfirm your prediction about seeing more photographs. The mismatch this disconfirmatory act will produce will generate an experience of absence. (Seeing missing buttons or fingers will produce experiences of absence via similar mechanisms.)

It will help gain clarity on this type of seeing absence by showing how it contrasts with other types of experiences of absence. some general features of deviant absences that will bear on our account, and then draw some lessons.

First, note that deviant absences are a very natural extension of our story about implicit searches. Both paradigms rely on the notion of a violation of implicit expectations.¹⁷ This raises the question whether the two paradigms are actually distinct. Why not just treat deviant absences as special cases of searches, and in particular, why not treat them as a type of an implicit search? The reason we can't do that is because there is only a partial overlap between these two paradigms. Some, but not all deviant absences involve implicit searches. (Conversely, some, but not all implicit searches involve deviant absences).

The reason why deviant absences in general shouldn't be subsumed under implicit searches is because the type of a detection process they involve doesn't fit the pattern of implicit searches. This might sound implausible, especially given our earlier remarks about pop-out searches. Static patterns

¹⁷Violation of an implicit expectation does not imply implicit violation of expectation.

seem very similar to pop-out displays, and didn't we just admit that pop-out tasks are searches? We did say that, but I think that it's actually misguided to think of pop-out tasks as searches. Thinking of them as searches might be useful in the context of cognitive psychology, where validity of an experimental paradigm or tasks in question may not depend on certain fine-grained distinctions. For our purposes, however, distinctions will matter. In light of that, a more useful way *for us* to think of pop-out searches is as of *detection* tasks. Here is the basic intuition. In pop-out tasks, it seems natural to say that one is *detecting* the stimulus when viewing the pop-out display. We can also say that one is *locating* the stimulus by employing pre-attentive selection mechanisms. But it's seems wrong to say that one is *finding* or *has found* the stimulus in the display. If one has no purpose or implicit expectation to look for *X*, and *X* pops out on its own, then in what sense is one said to have found *X*? This characterization seems strange.¹⁸

In sum, static displays are not implicit searches because pop-out displays are not implicit searches. This widens the gap between deviant absences and implicit searches. The basic lesson is this. Deviation in a pattern (such as the missing dot) is not necessarily a thing we are implicitly or explicitly looking for. Noticing deviant absences may be outside our implicit or explicit interests. For this reason, it would be inaccurate to say that we notice deviant absences because we are looking for the objects whose absence constitutes the deviation.

This completes our distinction between deviant absences and implicit searches. I now turn to a new contrast: between deviant absences and ordinary 'search' absences – absences seen during intentional or explicit searches.

Here is the main point of contrast. In intentional searches, detection of absence is driven in top-down, and is guided by one's goals and tasks. The environment may be completely silent about an

¹⁸This leads to the question about what counts as an implicit search. Since we used pop-out tasks to introduce the notion of implicit searches, this question becomes murky. I think that we may define implicit searches as searches that involve implicit expectations to find the target. The best example of an implicit search is seeing the absence of your laptop, as well as the bird case. The phenomenon of looking at nothing might be a borderline case.

absence (recall clean absences), and even if there are hints of an absence, such as traces of what's absent, the information is incomplete and there will be room for guessing. Detection of deviant absences, in contrast, is driven largely in a bottom-up manner. The world tells us nearly all we need to know about an absence, and we cooperate. We "take in" the deviant pattern, allowing stimuli to reach consciousness, and it is sufficient to perceive an absence. To illustrate, consider again a display with a grid of dots, in which one dot is missing. This display provides complete specification of this absence. In particular, it communicates *that* something is absent, *which* object is absent, and *where* it is absent, and all this information is available by a single glance at the display.

In sum, deviant absences jump out automatically, take no effort to be noticed, and they are nearly always specified by the environment. There is a caveat. The way we've described experiences of deviant absences actually make our model superfluous. If the world is doing all the work in supplying an absence, what's the need for projection, comparison, and matching? Haven't we said that it's enough to look at the display with a deviation to perceive an absence?

This question invites us to revisit the role of bottom-up processes in perception of absence and clarify how these processes work in deviant absences. Consider "clean" absences: absences that offer no cues or signs of the object that's absent. When absence cues are unavailable, top-down processes become critical for the interpretation of an absence. In bottom-up conditions, however, the world offers more help in the interpretation. But it's not completely up to world if we perceive a deviant absence, and in those cases, perception of absence must still be a cooperative, dynamic process. Why do we need cooperation? Why can't the world just tell us what's absent in the case of deviant absences? Doesn't it seem to give us all the relevant information when we perceive the grid with a missing dot?

In a sense, it does, but this claim must be qualified. Consider the blank space where the dot used to be. Blank space will pop out from the display by virtue of the contrast it forms with other dots. But to perceive blank space is not yet to perceive an absence. Moreover, to perceive certain contrasts is not yet to perceive an absence. Absences ought to be distinguished from cues of absences,

and contrasts and blank space are mere cues. The role of contrasts and other parts of the display is to suggest the image for matching, but they can't do all the work. We are supposed to see the absence of a dot and not merely blank space, and to see the absence of a dot, pick up of luminance contrasts won't be enough. What would be enough is projecting and matching a dot image against blank space. Only then do we perceive an absence. So, while the role of bottom-up processes, cues, and signs in deviant absences is critical, it's not sufficient, and the mismatch model provides the missing piece.

Finally, let's return to the question about particularity. One interesting feature of deviant absences is that they are rarely particular. When you discover that a photograph is missing in a museum display, you perceive its absence even though you've never seen that photograph before. Similarly, seeing the absence of a license plate on a car, or noticing that a door is missing a handle does not require any kind of previous acquaintance with tokens of those objects. This might seem like a strange result, but it's premature to worry. If particularity was initially defined in terms of objects with which we can be directly acquainted (via a suitable causal chain), given that absences of objects are not objects, our acquaintance with absences might work differently. This will bear on the question about how we should specify particularity conditions for our experiences of absence. We will return to this point in the section on implications (chapter 4).

3.2.3. Disappearances

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. Since there are various causes of loss of perceptual contact, there will be variation in the representational and phenomenal features of experiences of absence of this type. I will give several examples to illustrate the range of the variation.

The viewer may lose contact with an object if the object *vanishes* – pops out of existence, gets instantly relocated, or becomes invisible (e.g., Harry Potter disappearing under the Invisibility Cloak

or teleporting by apparition). The phenomenology of vanishing is that of a traceless and instantaneous disappearance. We see plenty of disappearances of this sort in the movies or on a computer screen: think of the routine action of deleting letters when editing an electronic document, or look at the flickering cursor on the screen. Many ordinary solid objects probably cannot disappear in this way without violating the laws of nature. For these objects, there are three other types of disappearances.

One is *destruction*, when an object goes out of existence. For instance, you may see a Jenga tower crash or witness a slower destruction, like an Alka Seltzer tablet dissolving in water. Other scenarios in which we see disappearances involve *occlusion*, when one object becomes hidden by another object. Experiences like seeing a coin fall through the crack, or perceiving the absence of a friend when she leaves the room are all caused by occlusion. The viewer may also be responsible for occlusion: recall the time when you moved seats in an attempt to get a better view of the speaker, only to lose sight of the speaker entirely. Finally, we observe disappearances when the object becomes *too small to be seen*, such as watching a plane disappear in the sky, or watching one's house recede into the distance when driving away.

It should be noted that an impression of disappearance – how the object's absence is experienced, is not always reflective of its method of disappearance. Swift destructions or occlusions can look like vanishings. For instance, a rapidly accelerating rocket at some point will seem to have vanished from the sky, and if the trick is done well, the coin will appear to have magically vanished from the hand. It therefore seems useful to designate vanishing as a special type of phenomenology of disappearance, even though strictly speaking, solid observable objects can't vanish.

We have just looked at the four forms of the phenomenology of disappearance. Let's now look at the characteristic that is common to this type of experiences of absence and see if the Mismatch Model can account for this type.

When we experience disappearances, we first observe an object and then see its absence because our perceptual contact with that object is interrupted. Presence and then an immediate absence of perceptual contact with an object distinguishes experiences of disappearances from other

types of absences: search absences and deviant absences. In deviations, such as observing a temporal sequence, we experience the absence of an object whose token we have never seen before (though we could have encountered its type). Similarly, in search absences, we may see the absence of an object that we have never encountered. An experience of disappearance, however, is always an experience of absence of a specific object – the object we have just been observing and perceptually acquainted with. For this reason, experiences of disappearances are essentially particular.¹⁹

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 a succession of positive percepts. Mismatching is necessary to transform this succession of positive experiences into an experience of absence.

In sum, without the mismatch explanation, our experiences of disappearances reduce to the temporal complexes or successions of positive stimuli. Driven by that observation, one could reinstate Sartrean claim about the fullness of being for disappearances. The reformulated question would be: how can a temporally full being (the event of a disappearance) present an absence? If a disappearance is just a chain of events in which one positive experience supersedes another, where do we find absences in the chain of presences? Our answer, again, is that negation lies in the juxtaposition (only here, what's juxtaposed are the events stretched in time), and this is how the Mismatch Model would explain disappearances.

¹⁹An interesting case involves a scenario, in which you hear a loud sound, turn around, and see smoke in the distance. Have you just witnessed a disappearance without being directly acquainted with the object that has disappeared? Or is it a case of an inferred absence, when you use smoke as a sign to infer that something has just disappeared?

3.3. Refining the model

I have just shown that MM can explain three main types of experiences of absence: those elicited by visual searches, deviations in 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 subserve experiences of absence, as well as elucidate further the role of perceptual memory and expectations in perception of absence. There are three main qualifications we can draw from this survey. The first two qualifications concern mismatches and the participating templates. The second qualification discusses possible sources of the templates. After reviewing these qualifications, we revise the Mismatch Model and then see if it can handle in its revised form an important challenge to sufficiency of the explanation it provides.

3.3.1. Qualifications

The first qualification on mismatches is that mismatches involved in perception of absence must be at the right level, specifically, they must occur at the object-level. Mismatches occur throughout various levels of visual processing, and many mismatches functionally have nothing to do with absence seeing. These, for example, include mismatches used in adjustment of retinal disparity in perception of depth, in transsaccadic alignment of images in perception of motion, as well as perception of contrasts in pop-out displays. Since we are concerned with experiences of absences of objects, seeing absence will involve *object-level* mismatches generated by processes like visual searches and disappearances. We then saw that this restriction helps us to better handle two other types of experiences of absence. In particular, it enabled us to delimit experiences of absence involving deviant patterns and disappearances from the related positive experiences (seeing blank space or contrasts in the grid of dots, seeing a temporal contrast between two events).

Why impose object-level restriction on mismatches rather than on the images that participate in the mismatches? The reason is the following. It is possible to form and project an object-level image,

yet due to a distraction or time-limitations, produce a mismatch that is not at the right level, e.g., registered unconsciously or not processed to the sufficient degree. For instance, in a museum, one could come to expect to continue seeing photographs while walking along a long row of photographs. When encountering a gap in the display where one photograph is missing, one could vaguely note the difference due to a mismatch, but get distracted by a friend and not process the mismatch properly. To block this possibility, the Mismatch Model requires that the mismatches, and not merely the associated images, occur at the object-level.

Second, mismatches will vary in their perceptual profiles because the processes that produce them will employ images with somewhat different characteristics. For example, some projections of absent objects will involve relatively detailed representations of absent objects. Other images will be sparse and will activate only a few features definitive of the expected object. Richness of a projected image will be sensitive to task-demands and one's expectations. For example, Esterman and Yantis (2010) hypothesize that the tasks which involve exemplar expectations (e.g., expecting to see a particular house) utilize vivid imagery to a higher degree than tasks which involve category expectations (e.g., expecting to see *a* house). In light of this, it is plausible to suppose that an experience of absence of a particular object, such as seeing that one's favorite cup is missing from the drawer, will implicate imagery to a higher degree than seeing absence of *a* cup in a drawer.

Another kind of variation in perceptual profiles of mismatches stems from whether the mismatches involve *conscious* imagery. Recall that MM' uses the word 'template' to refer to perceptual representations of absent objects, but we have also occasionally used the word 'image' to refer to these representations. The problem with using 'image' is that it may be interpreted as suggesting that an experience of absence of an object always involves, as its part, conscious visualization of that object. In other words, it involves having pictures in the mind. However, representations of absent objects may be projected implicitly and never surface in one's awareness as pictures. To avoid the association of images with pictures, we will replace the term 'image' with the

term ‘template’ in the final formulation of MM, to refer to the representations of absent objects that participate in mismatches.

There will be other sources of differences in templates. For example, templates used for tracking moving objects may draw upon object-files (Kahneman et al 1992). Object-files are representations maintained in order to represent objects as persisting through space and time (motion). Such templates, plausibly, will be functionally more involving than the templates one will need to perceive the absence of a dot in a grid of dots. Because of the various forms that such visual representations might take, the term ‘template’ in the final formulation of MM will refer not to a single type of a perceptual representation but to a family of different sorts of object-level visual representations in play in such processes.

In light of these qualifications, let’s see if they can help the Mismatch Model handle one worry about the account.

3.3.2. Testing qualifications: a worry about sufficiency

Suppose that your partner decides to surprise you by fixing up your apartment while you are away. When you get back, you register all sorts of inconsistencies with how you expected your place to look. The couch in the living room looks lighter, artwork is rearranged, and furniture has been moved. According to the Mismatch Model, we see absences of objects when we detect mismatches about those objects. So, is it right to conclude that you will see an absence whenever there is a discrepancy between your memory of the apartment and its new looks?

Suppose we answer in the affirmative. We could simply accept that seeing absence is more widespread than we originally thought. The result is a very liberal account of absence perception: every time you detect a mismatch, you see an absence. Is this consequence problematic? I believe so. Our basic intuition seems to be that we can see differences without seeing absences. For example, you may notice that your favorite couch got reupholstered, or that things scattered around your desk look different, without taking anything to be absent or replaced. The point generalizes. Our expectations

are constantly frustrated when we interact with the world, and the resultant disconfirmation responses have been explained by the mismatch detection. But it seems unreasonable to think that every violated expectation – and the associated mismatch – must elicit an experience of the absence of an object. Many mismatches only generate perceptions of changes in objects or in spaces that they occupy.

Thus, the above account of absence perception is too liberal; one may mismatch and not see an absence. What follows? If seeing absence relies on the same mechanism of mismatch as certain paradigms of *positive* seeing (those involving expectancy violations), then mismatches cannot demarcate seeing absence from positive seeing. The proponent of CA can quickly turn this result in her favor. If the Mismatch Model is incomplete, then we are under pressure to look for another representational vehicle of absence perception in order to complete it. Seeing absence will be in trouble if this new ingredient turns out to be cognitive.

The force of the objection, then, is not just that the Mismatch Model fails to give us a complete picture of what goes on in experiences of absence. It is that the completed model may fail to validate these experiences as genuine states of seeing. I think, however, that the search for the new ingredients of experiences of perception is unnecessary, and that the objection can be defused by introducing qualifications on mismatches instead of adding new vehicles to mismatches. The basic shape of my response will be that mismatches of the appropriate type are sufficient to account for seeing absence. In fact, no new qualifications on mismatches are necessary; we only need to unpack the restrictions introduced earlier.

First, note that the Mismatch Model restricts absence mismatches to those occurring at the object-level. This removes some of the bite from the objection. When you enter the remodeled apartment, your visual system will rapidly pick up on changed features in the apartment and will update scene representations. Many of these mismatches will be too low-level to constitute experiences of absence. But what about the mismatches at the right level? To elaborate on the example, suppose that you are nearing home and you can't wait to crash on your favorite red couch.

You enter your apartment and see a gray couch instead. Two reactions are possible. You may experience absence of your old couch and get upset, or you may hop on your couch noting its new cover. Both reactions involve object-level mismatches, so in virtue of what do they add up to different experiences?

There is an intuitive way to respond to the objection. Seeing a gray couch cues you that your old couch is gone because it does not occur to you that your couch could be reupholstered. A different set of expectations (knowing about the reupholstering) or a different sort of change (stains on the couch) would not result in an experience of absence. To generalize: S experiences absence of an object instead of a mere change in an object when S takes the detected cues to be incompatible with persistence of that object.

There are two worries about this response. First, aren't there counterexamples? Couldn't there be cases when one notices change in an object incompatible with its persistence conditions, and not experience its absence? Conversely, couldn't one notice change in an object consistent with its persistence conditions and still experience its absence? Second, bracketing the counterexamples, doesn't this response make my account of seeing absence cognitive?

Beginning with the first set of questions, such cases are certainly possible but they do not undermine the proposal. Mismatches signal absences by virtue of their interaction with the subject's expectational set. Success of this process is dependent on a variety of factors. For instance, if you care about your couch, you will be disposed to see the change you notice in its location. Moreover, the absence of your couch will be hard to miss if you see an empty spot in its place. But there are cases when analysis of a mismatch is flawed or gets interrupted. If you encounter a fascinating new object in place of your couch (such as a giant fish tank), or if you look only briefly at where your couch used to stand, you may bypass an experience of absence and only see difference.

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 of mismatches can be interrupted or helped by various factors, and salience of an object, tasks, and properties of the visual scene have impact on absence-seeing just as they do on positive seeing. Given that such factors affect the analysis of mismatches, should we incorporate them into the Mismatch Model to block the overgeneralization concern? Doing this would misjudge the nature of the current project. 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 the tasks they are embedded in and the expectations engaged by those tasks. Settling when or how frequently these conditions are met is beyond the scope of my project.

In sum, the Mismatch Model 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 associated experiences of absence can be generated without their typical causes (without expecting to see the object or its absence), the Mismatch Model does not have to take a stand on this issue. With these qualifications in hand, we are ready to formulate the final proposal about seeing absence.

The Mismatch Model (MM)

Visual experience of absence of an object consists in an object-level mismatch between a template of that object held in visual working memory and a percept of the observed stimulus.

3.4. Evaluation

The Mismatch Model is based on two empirical paradigms. The first paradigm is violation of expectation. We turned to this paradigm because violation of expectation is an event that is typically responsible for our seeing of absence. This paradigm suggested the main mechanism of perception of

absence: the mismatch vehicle. Another paradigm is failed visual search. This paradigm allowed us to qualify the main components of the mismatch mechanism: the kinds of templates that participate in mismatches and the level at which mismatching occurs.

One benefit of the Mismatch Model is that it can explain three main types of experiences of absence: experiences of absence that occur during visual searches, those elicited by deviant patterns, and disappearances. This shows that the Model has a wide explanatory scope. But the scope is not too wide. Another benefit of the Model is that it offers principled grounds for blocking an implausible view, according to which for every object or scene we perceive, we experience an absence of whatever that object or scene lacks. For instance, given that a café table lacks a vase, a newspaper, and a hedgehog, this view would imply that you are experiencing absences of all those things. That consequence might strike one as absurd. Intuitively, we experience absences that are salient for our current tasks, and among those absences that are salient, only some will be selected and perceived. The Mismatch Model handles this intuition by designating visual working memory as the source of the projected images. Given that only a few images of different in kind objects can be activated in working memory at once (Luck and Vogel 1997), only a few absences of different objects will be seen at once.

Let us now consider how the Mismatch Model fares with respect to the desiderata on a theory of absence perception stated in the previous chapter (section 2.4.) To remind, the Mismatch Model should be able to:

- 1) Explain the distinct semantic function of experiences of absence;
- 2) Validate the perceptual status of experiences of absence;
- 3) Explain why experiences of absence undergo phenomenal collapse and the puzzle of phenomenal absence-in-presence.

It turns out that the Mismatch Model does well on all three counts. We'll begin with semantics.

3.4.1. Semantics

The requirement on semantics is two-fold. The basic requirement on the Model is to explain how the mismatch vehicle enables perceptual experiences to represent absences. By virtue of what do such experiences carry information about absences? A test for meeting this requirement consists in showing that the Mismatch Model can delimit experiences of absence from the related positive experiences considered in chapter 1: failing to see an object, nonveridical seeing and “virtual seeing”, where the latter encompasses imagination and amodal perception. What explains representational differences between these experiences and experiences of absence? Let’s see if the Mismatch Model can meet these demands.

Consider the empty café table from the laptop example. On its own, the table cannot tell us *that* something is missing from it or *what* object 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 interesting 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. Representing absence, I argue, involves relating the percept of the table to the template of the laptop in form of a mismatch.

The proposal that mismatches are responsible for representing *that* something is absent is supported by two pieces of evidence. First, we have correlation of mismatches with perception of absence in ‘violation of expectation’ paradigms. Second, alternative explanations do not succeed: (1) percept of the world cannot represent an absence (because it is positive); (2) an image of an object cannot represent an absence (one may imagine an object without having an experience that it’s absent); (3) layering an image on a percept cannot represent an absence, because template-percept layering would only double *positive* content of an experience (recall the problem of the fullness of being in 1.3.3). So, negation must lie in the opposition of these elements. This gives us an argument by elimination.

In sum, the mismatch mechanism provides us with ‘that’, ‘where’, and ‘what’ of experiences of absence. Let’s illustrate. Suppose you are looking for your favorite red cup in a drawer. Template of your cup embedded in a mismatch specifies *which* object is absent. Percept against which the template is matched (percept of a countertop) denotes *where* the red cup is absent. Tokening of an object-level mismatch signals *that* something is absent by registering opposition between a percept and a template. This gives us the ingredients for specifying ‘what is not where’: the slogan about the function of perception I have adapted from Marr.

In sum, embedding an object’s template in an object-level mismatch is a step that is missing in imaginings and ordinary positive seeing (the viewing of the table as such). The Mismatch Model can also explain why seeing absence does not reduce to a mere failure to see an object. I will use an earlier example about Bill’s camouflaged moustache to illustrate this point. Consider the moment 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.²⁰ This does not imply that you are seeing the absence of Bill’s moustache. Because you have not remembered about Bill’s moustache, you are not projecting its template and so no mismatching is occurring. Nonveridical seeing can be handled in similar manner. Consider a patient who feels as if the amputated limb is still there. The Mismatch Model will say that the reason the patient is not experiencing the absence of her limb is because the patient is not matching the template of the limb with what she is observing – at least not at the conscious level.

3.4.2. Perceptual account

²⁰This case parallels Wright’s camouflaged moth example (1977) that illustrates Dretske’s distinction between simple and epistemic seeing (Dretske 1969:4-77, 2004, and 2006). (i) In the moth example, you see a tree with a camouflaged moth on the trunk. You see the moth simply, because light from the moth is travelling to your eyes. You don’t, however, see *that* the moth is there, because you are ignorant about its presence on the tree. (ii) When you experience the absence of Bill’s moustache, you simply see Bill’s moustache because light from the moustache is travelling to your eyes. You don’t, however, see *that* there is a moustache on Bill’s face because it appears absent to you. The moustache example thus presents a case in which simple seeing of object *O* co-occurs with one’s nonveridical experience of *O*’s absence and with absence of epistemic seeing of *O*.

I have demonstrated that MM can demarcate experiences of absence from other types of perceptual experiences and offers a viable explanation of the semantic function of experiences of absence. 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 2009).

Moreover, both kinds of representations related by this matching process are within the visual domain. Templates of absent objects are generated and maintained in sensory memory and thus are visual in format. So is the incoming sensory information against which these templates are matched. Given that both of the matched items and the comparing process are visual, it seems plausible to regard the entire mismatch structure as visual. MM thus confirms that experiences of absence should be placed in the visual domain and not the higher cognitive domain.

Several arguments may be pressed against this conclusion, and we will look at them in detail in chapter 4.

3.4.3. Phenomenal collapse

Finally, the Mismatch model can explain phenomenal collapse and offers a viable response to the puzzle of phenomenal absence-in-presence. Let's start with phenomenal collapse.

In chapter 1, we looked at an introspection-based argument against the possibility of seeing absence. The objector pointed out that if we examine our experiences of absence, we will see that the phenomenology of absence is just the phenomenology of seeing things in the world. We experience those things attentively or surprisingly, but the phenomenology is all positive. For instance, if we focus on our experience of absence of the laptop from the table, we will see that what we in fact are conscious of is just the table. The objector thus takes the observation of phenomenal collapse to indicate that there is no such thing as negative phenomenology.

I think that the claim that experiences of absence phenomenally collapse is in fact correct and important for our understanding of experiences of absence. Moreover, phenomenal collapse is a

natural consequence of the Mismatch Model. It should be noted, however, that according to this Model's explanation, phenomenal collapse of absences will *not* undercut there being proprietary phenomenology of absence. Let me explain both of these points.

If seeing absence involves mismatches, collapse of an experience of absence 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 the sense of absence evaporates.

My proposal, in sum, 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? Here is the argument again:

The Argument from Indiscriminability

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

First, the mismatch interpretation of phenomenal collapse makes the core premise of the Argument (Premise 1) unmotivated. From the fact that the looks of absences 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 Premise 1 is false. The Mismatch Model 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 an experience 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 just appearances of positive objects.

There is one more phenomenon that the Mismatch Model should explain. Recall that we underscored the problem of phenomenal collapse with help of examples of experiences of absence that seem to be “saturated” with the fullness of being (e.g., seeing absence of chocolate pudding in the overflowing fridge). Analysis of these experiences then allowed us to formulate the puzzle of phenomenal absence-in-presence: the puzzle of how we sensorily pick out absences if positive objects completely fill our experience. How does the Mismatch Model resolve the puzzle? The Model agrees with the claim that we cannot find absences by adding one kind of being onto another: by layering the imaginary fullness onto the real. The solution is to say that an experience of absence emerges at the *collision* of positive and imaginary being. Negation lies in the incongruity.

There is one remaining bit about phenomenal collapse that needs to be explained. It seems that some experiences of absence (such as seeing an empty parking lot or a drained swimming pool) are able to resist phenomenal collapse and maintain a sense of absence through introspection, while other experiences of absence, such as seeing absence of a pudding in a full fridge, are more fragile and readily collapse. Let’s call the first group of experiences of absence ‘sparse’ and the second group of ‘crowded.’ Why is that? The difference between sparse and crowded experiences of absence with respect to phenomenal collapse may also be explained in terms of mismatches and attention.

Why do crowded experiences of absence so easily transform into positive experiences? Plausibly, because positive objects one sees demand attention. Seeing lots of interesting objects is perceptually exciting and engages recognitional processing. Perception gets busy with identifying and inspecting those objects. This loads working memory, stops mismatching as a result, and absence qualia deteriorate.

Sparse experiences behave differently and resist phenomenal collapse. My hypothesis is that we conceptually link empty spaces and vacant objects to absences. These conceptual ties can remain

active through introspection and feed the feeling of absence. Moreover, this feeling of absence is unlikely to be inhibited by positive perception. Positive objects in sparse experiences – vacant parking lots, drained swimming pools, and empty seats – are visually unexciting and so are not likely to steal one’s attention. These conditions give sparse experiences of absence a higher chance to persist.

There is one remaining question. We’ve been talking about collapse of phenomenology of absence as transformation of that phenomenology into positive experiences due to the role of attention. But what is the phenomenology that is getting transformed? Is there something more we could say about phenomenal character of experiences of absence?

We can again turn to the Mismatch Model. According to MM, mismatches are vehicles of experiences of absence. I’d like to suggest that the role of mismatches isn’t limited to that. Mismatches are not just the underlying vehicles of experiences of absence; they also surface qua mismatches in the phenomenology of absence.

Let’s call this proposal MP. MP assumes that mismatches are the sorts of things that can feature in our phenomenology – the sorts of things we can be conscious of. Why think that we can? First, this supposition finds reflection in a number of empirical paradigms test our ability to detect mismatches: for example, in comparative search tasks, subjects are asked to search for a mismatch between two displays by comparing them side by side (Pomplun et al 2001). But mismatch detection isn’t just an artifact of a lab. We are frequently aware of clashes and incongruences in ordinary life. For instance, we may see that somebody’s tie clashes with his shirt, or that the design of a sofa is incongruent with style of the house.

These experiences point to specific kind of phenomenology. My proposal is to model our awareness of absence-signaling mismatches after this kind of awareness, with two important qualifications.

First, recall that the relevant kinds of mismatches relate templates of absent objects and percepts. This specification carries into the phenomenology of absence. When we experience absences, the

kind of incongruity we experience isn't the sense that certain qualities of objects look different. It is phenomenology of objects looking absent.

The second qualification takes a bit more work. The proposal to explicate phenomenology of experiences of absence as awareness of mismatches seems to have the following counterintuitive consequence: mismatches become intentional objects of experiences of absence. But how can mismatches be intentional objects? Are we willing to admit that experiences of absence are *about* mismatches?

There is an argument to ground this intuition. Explicating intentionality of seeing absence in terms of mismatches doesn't accord with behavior of absences as phenomenal objects. Perceptually, absences seem to behave like individuals: as locatable, persisting bounded units. They have rough boundaries, they persist through time, and they can be perceptually tracked when they move through space. Moreover, absences are experienced transparently. Absences seem to be out there, in the world. They don't behave like sense-data or afterimages.

Now let's compare these characteristics to properties of felt mismatches. Mismatches don't appear to be out there, in the world. While it seems natural to say that a certain place contains an absence, it seems strange to say that a certain place contains a mismatch. Mismatches also don't seem to be the kinds of things that we can perceptually track, or observe as bounded units (how can mismatches be bounded?).

Properties of mismatches therefore do not correspond to properties of perceived absences. Attributing objecthood and transparency to mismatches seems like a category mistake. Of course, perfect preservation of properties shouldn't be expected in reductive analysis. But our analysis is not inter-level. We are still at the level of conscious phenomenology. At this level, the way we are aware of mismatches just doesn't seem to match the way we are aware of absences.

Fortunately, there is a less problematic way to unpack MP. My proposal is this. Felt mismatches shouldn't be understood as intentional objects of experiences of absences. Instead, they are modes of appearances. Mismatches are ways of perceiving objects and space. On this interpretation, seeing

absence involves a ‘mismatchy’ way of seeing the world. This way of seeing is accompanied by special attentional (or more broadly, perceptual) selection that treats certain segments of the world as bounded (trackable, countable) units. When these units are perceived under the mismatch mode, they are experienced as absences.

Treating mismatches as modes avoids the implication that experiences of absence are *about* mismatches or experienced incongruences. It also preserves the insight that absences are perceived transparently, as individuals in the world. This reconstruction thus preserves all the important features and obviates the need for an amodal explanation.

It is important to clarify that one can adopt the Mismatch Model without adopting MP. Thus, crediting mismatches for generating experiences of absence (MM) does not imply that we are consciously aware of mismatches whenever we experience absences (MP). MM rests on an empirically based argument that begins with analysis of the paradigm of failed searches and extrapolates this analysis onto other cases. My account is not derived from the observation that experiences of absence feel ‘mismatchy.’ In sum, MM points to MP but it is not derived from MP.

3.4.4. Comparisons

In conclusion, it will be useful to compare the Mismatch Model to two defenses of seeing absence we have considered in the previous chapter.

The Phenomenal Contrast strategy (2.1) pointed to the fact that experiences of absence phenomenally contrast with positive experiences, however, did not rule out the interpretation on which these contrasts stem from beliefs about absences rather than experiences of absences. The Mismatch Model can validate these contrasts. Experiences of absence differ from various types of positive experiences by virtue of mismatches they involve. Since mismatches are perceptual, the phenomenology they produce does not stem from belief.

The factive strategy (2.3) analyzed experiences of absence as seeing that something is absent – a kind of factive seeing involving negative propositional contents. I argued that positing negatively

tagged contents is equivalent to a homunculus response: experiences that represent absences do so because their contents are tagged as absences. I have argued that the mismatch mechanism can serve as the suitable vehicle of tagging. An advantage of this mechanism is that it does not make experiences of absence essentially conceptual.

The attentional strategy (2.3) pointed to special attentional modulation that occurs in experiences of absence, which involves processing associated with visual surprise or loss of salience of perceived object. The Mismatch Model can explain these forms of modulation in experiences of absence. Expecting to see an object transforms visual character an experience by allocating attentional valence to certain elements of the experience while inhibiting selection of others. The Mismatch Model also makes progress on our criticism of the attentional strategy, which said that attentional modulation is not sufficient to explain seeing absence. I have clarified sufficiency of mismatches when we talked about the semantic requirement a few pages back.

Finally, we have considered an account, which attempted to improve on the attentional strategy by arguing that seeing absence involves attentional modulation of positive percepts plus imagery of absent objects. The problem with this variant was two-fold: conscious imagery is not necessary for seeing absence, and it is not sufficient to explain the representational function of those experiences of absence in which it is involved. How does the Mismatch Model compare? The model says that representations of absent objects (templates) are necessary for perception of absence and grants that in certain experiences of absence, such templates take the form of conscious imagery. The model, however, allows for those templates to be projected unconsciously, which enables it to accommodate a wider range of experiences of absence. In addition, the Model implies that conscious templates become sufficient to account for perception of absence only if they are embedded in a mismatch.

I have argued that the Mismatch Model succeeds in meeting the key desiderata on a theory of perception of absence. I have also shown that the Mismatch Model adopts key insights from possible defense strategies but offers an explanation of seeing absence that is superior to those strategies. It is time to look at the objections and implication to the account I have presented.

4. Objections and Implications

In this chapter, we will consider objections and the implications of the Mismatch Model. The model faces two major objections. The first objection appeals to experiences of *expected* absences. Because these experiences involve *confirmation* of expectation, they undermine necessity of mismatches for seeing absence. The second objection says that the Mismatch Model is best interpreted as the cognitive account. By appealing to expectations, the Mismatch Model shows a violation of modularity by perception of absence, which undermines its status as perception. I will respond to these objections and examine implications from these objections for the role of expectations in perception of absence and for the modularity of perception.

4.1. Absences and confirmation: are mismatches necessary?

4.1.1. The problem

I have drawn key features of my model from scenarios that involve violations of expectations in failed visual searches. But it is possible to see absences without any failure of expectation. A landscape artist traveling to a desert will expect to see no trees there. Sunset-watchers will expect the sun to disappear behind the ocean line. Do experiences of expected absences pose a problem for the Mismatch Model?

Before we attempt to answer, let me clarify some features of the cases under consideration. First, the viewers *expect* to see absences in these cases. The landscape artist does not merely lack expectations to see trees in the desert. She positively expects to see the absence of trees in the desert. Second, the viewers' predictions to see these absences are *accurate*. The landscape artist rightly expects to see no trees in a desert; similarly, sunset observers do not fail in their prediction when the sun disappears behind the ocean line.

Do experiences of absence involving confirmation of expectation challenge the account of perception of absence in terms of mismatches? *Prima facie*, yes. When an object's absence is unexpected, perception registers predictive error by detecting disparity between a template of that object and what is perceived (Bar 2003). But our desert visitors and sunset watchers do not error in their predictions when they perceive absences of the relevant objects. On the contrary, their predictions are accurate. If, however, predictive error-signals and mismatches are correlated (Andy Clark 2013, Bar 2004; see also Summerfield and Egner 2009), then mismatches cannot account for experiences of expected absences.

This gives us the following argument against the mismatch account of seeing absence:

The argument from expected absences (EX-beta)

1. Experiences of expected absences do not involve mismatches;
2. If experiences of expected absences do not involve mismatches, then mismatches are not necessary for seeing absence;
3. Therefore, mismatches are not necessary for seeing absence.

Suppose that the objector is right, and experiences of expected absences fall outside the scope of the Mismatch Model. Given that these experiences are common, this result significantly limits the range of experiences of absence that the model can explain. But is this consequence so bad? Why not just bite the bullet and be satisfied with the narrower scope of the model? After all, the model succeeds in explaining many other kinds of experiences of absence, and thus vindicates the main claim we set out to prove: that we can see absences. The central ambition of the project is satisfied.

The main force of the objection from expected absences is *not* that it limits the amount of cases of seeing absence that the model can explain. Its main threat is that it undermines success of the model for the cases which the model *has* claimed to explain: those involving violation of expectation. Here is why. Experiences of expected and unexpected absences seem to lack salient differences in their perceptual content and phenomenology. Both kinds of experiences serve to inform us about absences, and both kinds of experiences present us with immediate impressions of absences. If this is

right and experiences of expected and unexpected absences do not differ in their core content and phenomenology, then it is not clear why such experiences should differ at the level of vehicles. So, have we been looking at the wrong vehicle for absence perception?

Given this clarification, here again is the objection from expected absences in its complete form:

The argument from expected absences (EX)

1. Experiences of expected absences do not involve mismatches;
2. If experiences of expected absences do not involve mismatches, then mismatches are not necessary for seeing absence;
3. Therefore, mismatches are not necessary for seeing absence;
4. If mismatches are not necessary for seeing absence, then mismatches do not constitute the relevant vehicle to account *for any* case of seeing absence;
5. Therefore, mismatches do not constitute the relevant vehicle to account for any case of seeing absence.

4.1.2. Responses to the problem

I will evaluate three responses to the argument from expected absences, and then present my own response to the argument.

(i) *The disjunctive response.* The first response targets the conditional in premise 4. Premise 4 was motivated by the claim that experiences of expected absences do not significantly differ in their content and phenomenology from experiences of unexpected absence. One can argue that the relevant differences do exist, and that these differences indicate that the two kinds of experiences do *not* have to share the same representational vehicle.

What could the relevant differences be? One could argue that experiences of *unexpected* absences involve violation of expectation – an important element that experience of *expected* absences lack. Violation of expectation engages special processing which alters how we attend to the world. This, in turn, affects how we experience an absence. This point about attentional modulation may be extended to cases of *confirmation* of expectation, thus, experiences of expected absences will

get their own phenomenology and special representational content. On this view, the representational content of experiences of absence is richer than we have initially presented it to be. It will not merely report that a certain object is absent, but will in addition designate whether the absence is expected or not.

On this basis, one can conclude that there are substantive differences between the two types of experiences of absence, and that these substantive differences motivate a *disjunctive* account of experiences of absence. On this account, mismatches will explain experiences of unexpected absences, and some other vehicle would account for the experiences of expected absences. According to this account, mismatches remain explanatorily vital even if they are not implicated in *all* cases of seeing absence. So, premise 4 in EX is false.

Does this response to EX succeed? Let's grant, for the sake of the argument, that in addition to reporting locations of absences in the world, our experiences of absence also designate whether absences are expected to be the world. Suppose further that this information also enriches the phenomenology of these experiences. These enrichments should not obscure the *defining* features of the experiences we are to explain. The main function of any experience of absence is to represent that an object is missing from a scene. This generates its core phenomenology: an impression of absence. These features are shared between the experiences of absences irrespective of whether the absences they present are expected or not. If so, then the disjunctive account is unmotivated. Because experiences of expected and of unexpected absences are alike in their *core* experiential features, it is unlikely that they would *substantively* differ in their vehicles. So, the claim in premise 4 still holds.

(ii) *The doxastic response.* Another line of defense is available. One could argue that experiences of expected absences do not undermine the Mismatch Model because they are not experiences, but *beliefs*. The Mismatch Model is in the business of confirming that the cases we naturally tend to regard as perceptions of absence are in fact perceptual experiences. But if representations of expected absences are not experiences, then we shouldn't worry about the fact that they cannot be explained by the mismatch mechanism. *Beliefs* about absences are outside the scope of

the Model. Thus, even if we grant that putative experiences of expected absences do not involve mismatches, mismatches still present a viable mechanism to account for genuine experiences of absence (those involving violation of expectation). This undermines premise 2 in EX.

Why think that the representations of expected absences are beliefs? Hume took forcefulness and liveliness to be marks of sensory experiences (impressions), which distinguish them from beliefs or suppositions (ideas). Applying this point to the present case, one could say that our awareness of expected absences is *not as forceful, lively or immediate* as our experiences of unexpected absences. This observation, if correct, would offer *prima facie* support for the claim that the representations of expected absences fall on the side of belief.

Let's see if this point can hold ground. For Hume, contrast case for the liveliness of sensory impressions is memory. Memories of the world, unlike first-hand impressions of the world, are listless and faded. But, experiences of expected absences do *not* seem to be as listless and faded as memories. This speaks against the present suggestion that experiences of expected absence are beliefs.

The proponent of the doxastic response could fight back. Liveliness is a degreed property. Even beliefs can be lively to some extent, so, for all we know, experiences of expected absences might be lively beliefs. To win her case, the proponent of the doxastic response must show that experiences of expected absences fail to approximate experiences of unexpected absences in liveliness. If the experiences differ, then this pushes experiences of expected absences closer on the side of beliefs.

Are experiences of expected absences less lively, forceful or immediate than experiences of unexpected absences? Not obviously so. It should be granted that seeing the absence of one's laptop is a striking experience. But much of the vivacity of this experience is due to emotions, such as shock and disappointment. If we bracket emotions and focus solely on the perceptual qualities of this experience, seeing the absence of a laptop may not appear as a *substantially more* vivid impression than seeing the absence of trees in the desert. More importantly, if we compare experiences of

expected absences to the more trivial, widespread cases of *unexpected absences* (e.g., finding no pen in the drawer), the experiences seem phenomenologically on par.

There is another sense of immediacy, which has to do with *instantaneity* of an experience, rather than its vivacity or saturation. Instantaneity may be unpacked in terms of *effortlessness*, or in terms of how *fast* one becomes aware of a given object. Given this explication, it is not clear that expected absences are slower or take more effort to make an impression on the mind than the unexpected cases. In fact, the opposite might be the case. There is empirical evidence showing that the anticipated objects and events are detected more rapidly than the unexpected ones (Nobre et al. 2007, Vangkilde et al 2012). For this reason, expected absences may be noticed even faster than unexpected absences.

The doxastic response therefore does not succeed in showing that our awareness of expected absences is less experiential than our awareness of unexpected absences. So, the proponent of this response has not offered us a good reason to assign experiences of absences to the class of beliefs. So, premise 2 still goes through.

(iii) *The multi-level response.* I now turn to the third attempt to block the objection from expected absences. One can argue that experiences of absence always involve mismatches, and experiences of *expected* absences are no exception. This makes experiences of expected absence amenable to the mismatch explanation. So, premise 1 is false.

But this proposal may be immediately rejected as implausible. Why think that experiences of *expected* absences involve a violation of expectation? If you know that there will be no trees in a desert, why would you still expect to see the trees? This idea seems counterintuitive.

To motivate her response, one can make use of the distinction between perceptual and cognitive expectations (3.1), so let's run it on a specific example. Consider the experience of seeing the absence of Twin Towers. Supposing you know that the towers are not there, why think that when you'll visit the site, your expectations will be violated? Here is why. Your experience recruits two levels of expectations. Since you know that the Towers are not there, you will *cognitively predict* their

absence, and this prediction will be confirmed. Your perceptual expectations, however, will run differently. The absence of the Twin Towers is so poignant that you just can't believe your eyes. Their image is so deeply ingrained into your memory, that you can't help but picture them at the place where they used to stand (a process, involving template activation and matching). This causes a violation of expectations, and you perceive an absence.

The multi-level response denies that experiences of absence can involve confirmation of *perceptual* expectation. According to this explanation, absences can enter our perceptual experiences only by surprise. And note that this feature nicely explains why our experiences of absence feel sensory and immediate. They feel immediate because they are forceful, and they feel forcefully, because they are fundamentally surprising.

What should we think about this way to block EX? I think that this response gets certain things right. We shouldn't underestimate the fact that expectations compose complex, multi-level structures, and we shouldn't presuppose that all the levels always operate in concert. I therefore grant that certain experiences of expected absences involve fragmentation within one's predictive system. But this can't help us with every case of seeing an expected absence. Consider disappearances which we bring about intentionally, like deleting words in an electronic document. We *know* that when we press 'delete,' a letter or the entire word will disappear and we see them do that. Positing violation of perceptual expectation in these cases of observations of absences is completely unmotivated, and this holds of many other cases. When we see a plane disappear behind the cloud or watch the sun set behind the ocean, there is simply no reason to appeal to a split between one's perceptual and cognitive expectations to explain these experiences. Our expectations can be perfectly in tune. So premise 1 still stands.

Let's review our strategies. The first response attempted to capitalize on the differences between experiences of unexpected absences and expected absences in order to motivate a different vehicle for the latter. The second objection to EA denied the phenomenon in question: there are no *experiences* of expected absences. The third objection suggested that the absences in question are

expected only cognitively and therefore still involve mismatches when experienced. I have argued that neither of these objections to EX succeeds. Thus, the original point still stands: either both kinds of experiences of absences use mismatches to signal absences, or neither kind of the experience does.

I am going to argue that the two kinds of experiences *do* share the same mismatch vehicle and that the Mismatch Model can account for experiences of expected absences.

(iv) *The mismatch response.* Let's look again at how we have characterized the mismatches involved in the perception of absence in the Mismatch Model. Per our definition, mismatches do not relate what is *predicted* with what is observed. Rather, they relate *templates* of missing objects with what is observed. The projected template, depending on an expectation that generated the template, can serve two functions in perception of absence: it can signal what objects the viewer expects to be present, or it can represent the objects the viewer expects to be absent. In light of this function of templates, 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. Mismatches subserving perception of absence are not essentially clashes between our expectations and the world, but contrasts between our memory and the world. 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. Suppose further that your perceptual and cognitive expectations are in tune, and you are disinterested in the fact whether your colleague will show up. 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 call up her image from memory, match it against what you perceive (meeting room and other colleagues), 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 space 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.

4.1.3. Are expectations necessary for seeing absence?

I've just argued for the dissociation of mismatches (and corresponding experiences of absence) from violation of expectation. At this point, the reader may wonder how critical expectations are for seeing absence. If mismatches are to be understood as discrepancies not between what we expect and what we see, but between what we hold in memory and what we see, perhaps we should sever the ties between seeing absence and expectations entirely.

Before we answer that, let's ask about the role of expectations in seeing absence. What is it that expectations do for the experiences of absence? Expectations explain why we activate, project and match templates of certain objects. When we expect an object to be present, this expectation causes us to form and project a template of that object. As a result, we see its absence via a mismatch. We have also seen that this causal role applies to negative expectations: when we expect an object to be absent, we similarly project its template and confirm its absence through a mismatch.

In sum, expectations explain why certain mismatches occur. But are they necessary? Can mismatches generate experiences of absence without expectations? If so, then we should cast the Mismatch Model as a memory-based, rather than an expectation-based, account. Three reasons support this decision.

First, as already noted, we often see absences when we do not know what to expect. When we search for parking space or cookies, we are ignorant about our chances of finding these items. Our forecast is vague. Second, we can perceive absences without making any kind of forecast about an object's presence or absence. Pop-out and deviant absences were cases in point. Third, we can see

absences randomly. For instance, you may suddenly notice that Susanna is not wearing a green sweatshirt today after an image of a green sweatshirt pops into your head. This experience of absence is just a fluke – no positive or negative expectations about the sweatshirt are in play here.

Scenarios like these speak against casting the Mismatch Model as an expectational account and challenge any expectation-based account of perception of absence like Sartre's. Sartre claimed that expectations are essential for seeing absence: "It is evident that non-being always appears within the limits of a human expectation" (1956, p.7).²¹ We have already departed from Sartre in arguing that seeing absence does not require imagination. If projections and matching of the templates of absent objects can be governed by processes that do not substantially draw upon expectations, then we have our second point of departure: seeing absence does not require expectation.

The defender of the expectation-based account of perception of absence can fight back. She will dismiss the scenarios I have cited as genuine counterexamples. First, she will say, there is nothing random about your seeing absence of a green sweatshirt on Susanna. You could have formed an *implicit expectation* about the sweatshirt because it is St Patrick's Day or because you have often seen Susanna wear it before. This expectation disposes you to carry out a detection task: "Is Susanna wearing a green sweatshirt today?" Perceptual expectations do not have to be set by perception but can correspond to one's beliefs or wishes. For instance, you may know that your friend is not coming to the party, but secretly hope that she will, which will cause you to project her image. The mismatch that will result from this projection will embody violation of expectation. Perception of deviant patterns (seeing absence of a dot in a grid of dots) similarly implicitly engages predictive

²¹In Sartre's *Being and Nothingness* (1956), Sartre's main examples of seeing absence involved violation of expectation (expecting Pierre to be in a café, expecting fifteen hundred francs in a wallet). This seems to suggest that violation of expectation is necessary for seeing absence, for Sartre. However, 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*). This psychological state can be met by positive expectations to see absences. For example, when the landscape artist expects to see the absence of trees in a desert, she posits their absence as a possibility (even as a high probability.)

mechanisms. Viewing the display instills expectations to see a uniform grid of dots, and observing deviation in this pattern leads to a violation of expectation.

As for cookie quests and other searches with unknown outcomes, these tasks may be analyzed as engaging *equiprobable positive and negative expectations* – a stipulation that fits the theoretical notion of expectation. (Bubic 2009) discusses a target detection paradigm in which the subject forms equal expectations about the target’s presence or absence, and he categorizes this task as an expectational task.) Finally, one can appeal to arguments that the primary function of *any* projected imagery is predictive and thus involves expectations (Moulton and Koesslyn 2011). So have we been rash in divorcing the Mismatch Model from the expectation-based accounts?

One worry is this: by divorcing mismatches from expectations, we cheapen experiences of absence. By appealing to the bare act of mismatching, the model seems to imply that it is possible to perceive an absence of an object solely by virtue of generating an image of that object and mismatching it.²² Thus, one can imagine a potato while looking at the table, project its image, and establish a mismatch between its image and the table, and experience its absence on the table. If that’s all it takes to see an absence, then we can simulate this process and see the absence of any object we wish, at any time we wish. That doesn’t seem right.

I think, however, that we can handle this problem without bringing expectations back into the model. Perceptual experiences are spontaneous, and this also applies to experiences of absence. We can’t experience absences at will. Only spontaneously generated mismatches can yield experiences of absence. Back to the potato example, projection of a potato template must transform into a detection task (is there a potato on my office?) in order to produce an experience of absence. Without spontaneous projection and mismatching, one will merely have thought about a potato’s absence. So, if we can show that spontaneous projections may be launched without expectations, then stripping the account from its expectational garb still works.

²²Thanks to Susanna Siegel for bringing up this question and for the discussion.

4.2. Absences, concepts, and modules: are mismatches cognitive?

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. We will begin by considering general considerations for reading the Mismatch Model cognitively, and then pursue the question about the perceptual status of experiences within the framework of the debate about the modularity of mind.

4.2.1. Absences and concepts

Here is one way to motivate the interpretation on which the Mismatch Model is fundamentally a cognitive explanation of seeing absence. 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 2006). Thus, even if the mismatch operation introduces computational burden into the 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, 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 (1969) argues, “simply”. For example, a toddler viewing a car for the first time will see the car despite her ignorance about the car. If, on the other hand, we *must* use concepts to see absences, then failure of absences to be represented at the nonconceptual level is 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.²³ 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

²³To 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 a feeling that the desk somehow looks different.

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:

Imagine a large wall covered with identical posters of Marilyn Monroe, where one poster is conspicuously absent.²⁴ 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.

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.

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

²⁴I am modifying Dennett’s Marilyn wallpaper example (1992:354-5).

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.²⁵

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 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.²⁶ This suggests that the perception of absence belongs to the perceptual, rather than the post-perceptual domain.

But suppose one has a more conservative conception of seeing. Since absences cannot be seen without top-down contributions by memory, seeing absence is not completely parallel to ordinary

²⁵Dretske (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 will see absence of a spy.

²⁶Esterman 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.

seeing. From that it does not follow that seeing absence is post-perceptual. Our discussion has showed 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 (like seeing absence of a dot in a grid of dots) must be at the higher level of cognition than the perceptual recognitions of tables, uncles, and picnics.

There is another way to frame the worry that perception of absence according to the explanation we have been proposing is cognitive. There is a close link about treating a certain process as perceptual, and treating it as modular. Given that paradigmatic perceptual processes are standardly regarded to be modular, violation of modularity by perception of absence is a significant result. This poses a dilemma: either perception of absence is not genuine perception because it is not modular, or perception of absence is genuine perception, but there is something wrong with the notion of modularity which renders it non-modular. So, the notion should be revised. The next section develops this line of argument and considers its consequences.

4.2.2. Absences and modules

Modularity is the view that the mind is composed of specialized, autonomous, and mandatorily operating computational systems (Fodor 1983, 2000). Candidate modular processes include: face recognition, language comprehension, cheater detection mechanism, and emotional systems, and visual processing. The debate about modularity of vision has been standardly applied to the perception of material objects (Fodor 1983, Carruthers 2006, and Prinz 2006b).

Should the modularity thesis be extended to perception of absences of objects? In this section, I am going to argue that it cannot be so extended; perception of absence shows a violation of modularity, on the standard construal of modularity.²⁷ The hallmark of modularity is informational

²⁷This qualification is important, because we will later ask questions whether modularity should be reconfigured given the strange results it yields for perception of absence.

encapsulation, and perception of absence fails to be sufficiently encapsulated to count as a modular process.

Why is this result significant? Modularity is a projectible property, so, classification of a process as modular allows us to form useful predictions about the behavior of that process. It also supports certain commitments in philosophy of science and epistemology. Suppose you hold that perceptual observation possesses a certain degree of theoretical neutrality. One way to ensure its neutrality is by arguing that perception is encapsulated: it typically runs its course independently of our wishes or beliefs (Fodor 1984). Now suppose we show that perception of absence is not similarly insulated; thus, it lacks theoretical neutrality characteristic of ordinary perception. This result is problematic, for it seems that at least some experiences of absences of objects are observationally or epistemically on par with ordinary experiences of objects. So, could the problem be with our test of informational encapsulation?²⁸

With these concerns in mind, here is our plan for this section. I will first argue why perception of absence is a content-specific phenomenon. Then I will argue that perception of absence is a true top-down effect from cognition on perception and therefore is not modular. After that I'll show that this penetrability effect is novel, and that it illuminates the notion of informational encapsulation and the modular status of some ordinary cases of object-perception. For this argument, we will focus on a type of seeing absence that poses the most serious threat to modularity: experiences of absence that occur in searches. Since modularity of a process is largely a matter of its informational encapsulation (IE), the core of the argument will be that these experiences recruit *unencapsulated* computational processes.

Encapsulated processes are processes that consult only a limited database proprietary to the module in the course of their computations. Unencapsulated processes recruit extra-modular information when interpreting the input, for example, in an attempt to provide the best interpretation

²⁸The problem could also be with the link between informational encapsulation and theoretical neutrality. For Fodor (1983, 2000), informational encapsulation implies theoretical neutrality, where the latter is a weaker notion than infallibility or complete objectivity.

of the input all things considered. A breakdown of encapsulation occurs when cognition penetrates perception: i.e., when what we believe influences what we see.²⁹

This clarifies the task. To show that perception of absence is a violation of modularity, we must demonstrate that:

H In perception of absence, cognition penetrates perception.

(i) *Stage 0: content-specificity.* There is an important preliminary stage to our argument. For *H* to be taken seriously by the modularist, we need to explain why perception of absence is not a case of trivial penetration and presents a *content-specific* phenomenon.

Let's begin by distinguishing content-specificity from domain-specificity. Domain-specificity is the idea that the representations computed by a module have a proprietary topic or a distinct subject-matter (e.g., faces for the face-recognition module, and emotions for the emotional systems). We may also think of domain-specificity in terms of cognitive competence: there is a limited set of problems that the module is expert at solving. Content-specificity means that the perceptual phenomenon under consideration is *not merely* an artifact of orienting or attending to the stimulus.

All modules generate domain-specific representations (effects), but only some of those effects exhibit content-specificity. Consider the duck-rabbit figure. One might think that you simply pick which percept to impose on the figure and then see it as a duck or a rabbit (Churchland 1988). This, if true, would show that vision does not run autonomously from cognition. Fodor (1988) does not take this to be a counterexample to modularity. Seeing the figure as a duck is a domain-specific effect (it occurs within vision), but it is not a content-specific effect. It is a function of how you attend to the figure, such that orienting to different parts of the figure will yield different percepts. Such mediated influence on perception is parallel to changing what you see by turning your head or opening your

²⁹Siegel (2012) defines cognitive penetrability as follows: "If visual experience is cognitively penetrable, then it is nomologically possible for two subjects (or for one subject in different counterfactual circumstances, or at different times) to have visual experiences with different contents while seeing *and attending to* the same distal stimuli under the same external conditions, as a result of differences in other cognitive (including affective) states."

eyes. When cognitive influence is routed through motor responses or orienting, it does not break modularity.

We are now in a position to explain why the modularist should worry about *H*. Imagine discovering that your laptop is absent from the table where you had left it. Clearly, you would be surprised; perhaps, the table will jump out or you will stare at it in disbelief. But seeing absence is not just a matter of shifting gaze. Seeing that something is *not there* is not just a matter of attending to what *is* there differently. There is more to perception of absence than the zooming of the empty table. Therefore, experiences of absence cannot be dismissed because they are cases of trivial penetration. They are a content-specific phenomenon and require a different explanation from the one provided for the ambiguous figures (Macpherson 2006 for a review).

To review, the hypothesis under consideration is that:

H In perception of absence, cognition penetrates perception.

where penetration is understood as content-specific and non-trivial. We now turn to the competing explanations of perception of absence. There are two main rivals to *H*.

One could dispute that the effect in question is *on perception* and explain it as follows:

C In perception of absence, cognition penetrates *cognition*.

C holds that perception of absence is not genuine perception. It belongs to the level of post-perceptual processing (basic beliefs), which Fodor takes to be non-modular. If so, then we have an unproblematic case of beliefs influencing other beliefs. We will address this view in stage 2 of our argument.

Alternatively, one could grant that the effect is perceptual, but argue that the effect is *not from cognition*. Thus,

P In perception of absence, *perception* penetrates perception.

P holds that the actual penetrators of experiences of absence are more proximal perceptual states like images and not their distal causes like beliefs or desires. The effect then would be intra-modular penetration, which is unproblematic for Fodor. We will tackle this view in stage 2.

(ii) *Stage 1: Is this an effect on perception?* Suppose you want some coffee. You remember leaving your cup in the kitchen and head there to get your cup. You check the counter, the cupboard, but no luck. The cup isn't there. *H* models this process as follows:³⁰ 'I want to find my cup' (cognitive state) --- 'My cup is not there' (perceptual state) --- 'My cup is not there' (cognitive state).

But do we really have an effect on perception? There is an alternative explanation on offer. Consider *C*: 'I want to find my cup' (cognitive state) --- 'My cup is not there' (cognitive state):

The proponent of *C* thinks that we have mischaracterized the effect. There is no such thing as *perception* of absence. We can think about absences, but we cannot literally *see* them. What we have, then, is an effect of thinking ('my cup should be in the kitchen') on thinking (judgment that the cup is absent). The effect is post-perceptual, and the modularity is intact.

There are several ways to motivate *C*, but we will look at the one especially pertinent to the modularity debate. Standard outputs of perceptual input-analyzers are *shallow*: they are basic-level categories like DOG or CHAIR (Fodor 1983, p. 86). Absence-representations, it may be argued, are not shallow and therefore are not perceptual.

The argument is straightforward, but there is a worry about circularity. We want to show that process *X* is non-modular. This requires showing that *X*'s output is perceptual. Now, we cannot argue that *X*'s output is not perceptual on the grounds that *X* fails to possess some modular characteristic (e.g., shallowness), for that would just beg the question. So could shallowness be used as a diagnostic tool without begging the question?

Here is one try. Shallow outputs represent basic-level objects (Rosch categories). More generally, "the input systems deliver representations that are most naturally interpreted as

³⁰The relevant set of cognitive states should be belief-desire pairs: "I believe that my cup is in the kitchen" and "I want my cup," but I am simplifying the picture here.

characterizing the arrangement of things in the world” (Fodor 1983:42). Now, absence-representations do not characterize *things* in the world (they characterize absences of things in the world), and they are not on the Rosch list. Does this make them non-perceptual? Note that for Fodor, it is a principled question why basic-level categories are shallow and count as perceptual suitable outputs. It is because they meet a range of characteristics, spanning from language to phenomenology. And it is far from clear that absences fail that test.³¹

Could one, then, blame concepts? Absence representations are essentially conceptualized; therefore they are not sufficiently shallow to be perceptual. But for Fodor, perception reaches high-level vision which involves concepts. Shallowness is a matter of how abstract or complex the concepts are (e.g., PROTON is not shallow). This speaks in favor of the following symmetry: for category *C*, recognitions of *C*-objects are (roughly) as shallow as recognitions of absences of *C*-objects.

‘Shallow’ support for *C* turned out to be shallow. Appeals to lists or concepts do not show that the effect is post-perceptual. But how do we confirm that the effect is perceptual?

In the modularity literature, it is common to cite changes in the perceived sensory features or relations as proof of cognitive penetration. Thus, expectations are said to make colors, shapes, or distances look differently.³² But this is not the effect we are after. *H* does not mean that *thinking* about absences has the effect of making things *look* different. The claim is different: it is that perception of absence *itself* is a perceptual effect. Seeing absence is not just a manner of attending. When we see absences, things don’t just look brighter or bigger – things look absent. This effect extends to the very

³¹I think that the main reason for treating absences as shallow outputs should be this. Absences are *salient items* in the environment: they are items we must detect in order to carry out our tasks successfully. If this reasoning is correct, then the human visual system should not be limited to constructing representations which characterize the arrangement of things in the world. If absence detection is adaptive, then the perceptual system will develop a mechanism for constructing representations which characterize the distribution of absences in the world.

³²Siegel (2012), Prinz (2006b), and Macpherson (2012) appeal to these types of effects, and Fodor (1983, 2000) acknowledges that these kinds of effects are perceptual. It should be noted that these effects may not be cognitively accessible. The subject may not be aware of any change in her perceptual states, so, we can test for these effects by something other than conscious reportability.

trivial cases of seeing absences which occur without zooming or violation of expectation. Those cases are equally under the scope of *H*.

My strategy for showing that experiences of absence are perceptual was to look at the core processes that generate such experiences, and I argued previously that these processes recruit the perceptual mechanism of mismatching. According to this account, seeing the absence of your cup involves detecting incongruence between the visual image of your cup and what you positively perceive (the counter top). Given that both elements are perceptual, the resultant representation is perceptual. If the Mismatch Model is correct, and I argued that it is correct, then experiences of absences are perceptions and not cognitions. So, *C* is false.

(iii) Stage 2: Is this an effect from cognition? Here is the argumentative path so far. Experiences of absence are content-specific effects (2.2), and in particular, they are perceptual effects (3.2). The next step is to show that the effect is from cognition.

This seems easy enough. Our target cases of seeing absence happen during searches, and searches are paradigmatic examples of endogenously guided processes: conducted in light of the agent's goals, beliefs and expectations. Consider searching for your cup in the kitchen. Why do you see its absence? We may appeal to beliefs and expectations (you remember leaving your cup in the kitchen) or to wishing (you really want the cup to be in the kitchen). These states determine how you conduct your search and influence the resultant experiences of absence. We've got a straightforward case of beliefs influencing what we see.

Why, then, go for *P*? Recall MM. Perception of absence is realized by the mismatch operation, which registers incongruence between projected images of absent objects and positive percepts. This process is mediated by imagery. On this basis, one could argue that the real penetrators of perception of absence are not beliefs or expectations, but the more proximal vehicles: images or object-templates. Since images enable us to see absences, perception of absence is best construed as a process in which one perceptual state (imagery) penetrates another perceptual state (positive seeing).

Thus, *P*: ‘I want to find my cup’ (cognitive state) --- ‘Image of my cup’ (perceptual state) --- ‘My cup is not there’ (perceptual state).

One way to argue that penetration, contrary to *P*, is cognitive is by appealing to the old divide between sensation and conception. Sensation bombards us with sights and sounds. Conception makes sense of sensation by deploying faculties like memory, the imagination, and understanding. Images are not a part of the stream of sensation and therefore are cognitive.

Given this way to carve things in the mind, cognition (images) directly penetrates perception. We get *H* by appealing to imagery alone. Not so fast. We’ve landed in a contradiction. To show that the effect is perceptual, we cite the mismatch mechanism, which relates *perceptual* elements: images and percepts. To show that the effect is top-down, we classify images as *cognitive* states. We can’t have both.

The reason why experiences of absence break modularity is not due to the use of imagery. It has been argued that visual object recognition extensively uses templates (memory traces) in order to resolve the input. So, there is nothing essentially anti-modularist in the use of imagery by absence-recognition. What matters for modularity is what controls imagery. In object recognition, imagery projections are launched bottom-up. In the cases of searches, images are projected top-down. Our searches are driven by our beliefs and expectations, which control imagery projections. For this reason, the effect of images on absence perception is cognitive.³³ This rules out *P* and gives us *H*.³⁴

4.2.3. Informational encapsulation reconsidered?

I’ve argued that perception of absence presents a true top-down effect from cognition on perception. Because experiences of absence are ubiquitous, this overthrows the claim that the

³³An implication of this discussion is that certain confirmation cases, such as *successful* searches for objects are also instances of cognitive penetration by imagery. Successful search scenarios have exactly the same psychological antecedents as failed search scenarios. Given that the former also involve imagery projections guided by cognition and an effect on perception, they present a violation of modularity.

³⁴For a different case in which indirect penetration by imagery is cognitive, see Macpherson (2012).

perceptual system is thoroughly modular. But, recent work on perception has shown pervasive violations of modularity in object-processing. So what's special about this result?

The result is interesting because it does not fit into the standard penetrability categories. Let's review. First, cognition sometimes *distorts* what we see. Desire makes things look closer (Balcetis and Dunning 2010), and depression makes things look gray (Barrick et al 2002). But images and expectations in perception of absence do not introduce distortion. Second, in *wishful seeing*, the world perceptually conforms to our desires or biases (Payne 2001). But seeing absence involves disconfirmation: you hope to see the object, but see its absence instead. Next, expectations may resolve *scrambled*, indeterminate, or ambiguous input (Summerfield and Egner 2009). But nothing is ambiguous in many cases of absence perception. Finally, expectations can *facilitate* object-detection, by improving its speed and accuracy (Kveraga et al 2009). While expectations can do that for absences, their primary role is not that of *mere* facilitation. They don't just make us see absences faster. They make us see absences, period.

Let me return to the point about distortion. Another interesting feature of penetrability of experiences of absence is that cognition does not make them lose theoretical neutrality. In a sense, experiences of absence are subjective and not neutral. We engage in different search tasks and as a result differ in the sorts of absences we see. Experiences of absence thus are idiosyncratic, but they are not illusions, distortions, private sense-data, or after-images. Whether a certain object is absent can be publicly verified, and objectivity (accuracy and reliability) of absence-detection often matters for survival (e.g., changing lanes when driving.)

In summary, absence perception presents a novel penetrability effect, which, in an important and interesting sense, is objective. In response, one might think that this novel effect should not be typed as failure of encapsulation, and consider revising the notion of informational encapsulation as it applies to experiences of absence. I think that this is the right response and I hope to explore it in the future.

Conclusion

The problem of perception is frequently presented as the problem of interaction with the physical environment, which, in turn, is explicated as the problem of interaction with the world of three-dimensional material objects. I have argued that a critical part of our interaction with the environment is perception of absences of objects in the world. I presented a Mismatch Model to validate the claim that perception of absence is, in fact, perception, and defended this model against several objections. I will conclude by outlining the main implications of this thesis.

(i) *Perceptual content*. First, if perception presents us with absences, then the conservative view of perceptual content is false. Thus, it's not the case that in perceptual experience, we represent only physical properties of objects, such as color or shape. This result, however, should not be interpreted as endorsing a very liberal view of perceptual content, on which perception can represent high-level or abstract properties. Mismatches constitutive of experiences of absence often do not require sophisticated cognitive apparatus, and they can occur at a lower level than representations of abstract properties, such as justice (Prinz 2006a), causation (Siegel 2009, 2010), semantic properties, such as numerocity in higher synesthesia (Matey forthcoming), or natural kind properties, such as being a pine tree (Siegel 2004, 2010). For this reason, the view about perceptual content supported by my model of absence perception is still quite modest.

This result calls for a new distinction in the space of positions about the representational capacities of perceptual content. Rejection of the conservative view of perceptual content is often read as endorsement of what we may call the 'liberal view' of perceptual content: the claim that perceptual experience can represent high-level properties (for example, in Bayne 2009). Experiences of absence undermine this implication. If perceptual content can represent absences, then the conservative view is false and, by implication, the 'rich content' view is true. This, by itself, does not imply that the

'liberal content' view is true. Absences are often represented at the lower level than properties like 'being an uncle' or 'being just.' So, the more rudimentary cases of seeing absence simply don't measure up to the more liberal perceptual contents.

In sum, perception of absence presents us a way of being "rich" without being "liberal." One may still wonder if high-level properties slip into perceptual content through absences. After all, we have been examining experiences of absences of laptops, moustaches and colleagues. These are high-level categorical properties. I think that I can block slippage of high-level material into perceptual content by the following response. On my view, perceptual experiences can represent appearances of laptops and pine-trees, but not natural or artificial kind properties, such as 'being a laptop' or 'being a pine-tree.' So, the claim one sees the absence of a laptop really means that one see the absence of a laptop-like appearance. Explicated in this way, experiences of absence do not support the liberal view of perceptual content.

(ii) *Phenomenal character.* There are also important implications for the accounts of phenomenal character. Consider the direct realist account phenomenal character. For a direct realist, subjective character of perceptual experience is constituted by mind-independent physical objects. Thus, Bill Brewer (2007) says that "The basic idea [in direct realism] is that the core subjective character of perceptual experience is given simply by citing the physical object which is its mind-independent direct object." Direct realism thus immediately disqualifies absences from being suitable determinants of perceptual experiences. Since absences are not physical objects, they cannot be a part of how we perceptually *experience* the world.

Where, then, would the direct realist place absences? Consider how she handles *appearances* of objects: the various ways objects are *represented as* being, such as looking gray under this light or looking elliptical from this angle. According to Brewer (2007), saying that we can experience *appearances* of objects forces "materials pertaining to a person's conceptual thought about the world presented in perception into its account of the most basic nature of perceptual experience itself." On direct realism, absences are thus likely to share the fate of appearances. They won't be a part of the

“most basic nature of perceptual experience,” but should instead be assigned to thought. My account of absence perception rejects this implication, and with that, direct realist accounts of phenomenal character. I’ve argued that perception of absence is a vital part of how we *experience* the world, not of how we *conceive* of the world. If we can experience absences, then citing physical objects cannot account for phenomenal character of perceptual experience.

Let us turn now to the more general approaches to perception.

(iii) *General approaches to perception.* First, the claim that we can perceive absences has obvious implications for the causal theory of perception (Grice 1961, Pearce 1976, Strawson 1974). On the causal theory of perception, to be perceived, *X* must stand in a suitable causal relation to the perceiver, where the relevant causal relation or a process essentially involves transfer and transduction of light. I am overturning this conception. If absences can be perceived (and I argued that they can be perceived), yet fail to be the sorts of things that can reflect light, causal conception of perception has to be given up.

Other approaches to perception implicitly rely on the causal theory of perception by emphasizing the role of *sensation*, the role of *stimulation*, or the role of *optical process* in perception. For William James (2010:62), “the faintest sensations will give rise to the perception of definite things if only they resemble those which the things are wont to arouse.” For Marr (1982), “vision is the process of discovering from images what is present in the world, and where it is.” Both appeal to *representations*, items that resemble or function as proxies of what they represent (things in the world): thus, James appeals to sensations, while Marr speaks of images, which, presumably, may be unconscious. For both accounts, however, perception is essentially a process of recovery or discovery of information about the world from representational proxies (images and sensations). Perception of absence challenges sensation- and resemblance-based accounts of perception by showing that we can perceive things (absences) that are not capable of generating sensations or images.

Gibson’s theory is neither a sensation-, nor a resemblance-based account of perception. Gibson rejected conception of perception as a set of channels of conscious sensations and proposed to see it

as a set of perceptual *systems*: dynamic structures whose job is to pick up energy transformations in the optical flow. Still, Gibson essentially offered a *stimulation*-based account. For Gibson, a theory of perception begins with the description of sources of stimulations (objects, events...) and then describes the relevant forms of transformation of stimulus energy at the receptors. But no such step is possible with absences. Given that absences cannot be sources of stimulation, they cannot be objects of perception on Gibson's theory.

Theory of absence perception is revisionary of all major theories of perception. This implies that any theory of perception needs to be able to accommodate empirical and philosophical results from a theory of seeing absence. Austin 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? Consider also theories of perception that emphasize action, affordances, or sensori-motor contingencies. According to the embodied theory of cognition, meaning of words, objects, or events may be explicated in terms of actions demanded by particular situations. In parallel, we may ask how absence-centered events become meaningful for us. For example, is it meaningful to explicate absences in terms of sets of the affording actions? If I am right and there are absence-specific actions, can sets of such actions serve as analysans of experiences of absence? I leave these questions for future research.

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