# Between Perception and Imagination Philosophical and Cognitive Dilemmas

By

Edvard Avilés Meza

Submitted to Central European University Department of Philosophy

In partial fulfillment of the requirements for the degree of Master of Arts

Supervisor: Tim Crane

Budapest, Hungary

2019

To my father, Jessie; my mother, Zoila and the memory of Dante Gazzolo

Abstract	4
Introduction	
Chapter 1. Imagining the External World	
Constraining Imagination	8
Similarities and Differences between Perception and Mental Imagery	11
Imagery-Perception Interaction	14
Percentual Incompleteness	16
Unconscious Imagination and 'Mental Schimagery'	20
Chapter 2 Seeing by Imagination: An Epistemological Dilemma	
Seeing is Believing: Two problems about Cognitive Penetrability	23
Imagination Under Attack	25
The Epistemological Dilemma	20
Chapter 3 A Metaoografic Theory of the Depatrability of Departies	
A classical second seco	
A Sketch of a Solution	
Metarepresentation and Psychopathology	
Imagination, Metacognition and Perceptual Justification	
Chapter 4. Disjunctivism and Mental Imagery	
Appearances, Reality and Disjunctivism	
Either Hallucination or Imagination	41
Against Disjunctivism	43
Neither Disjunctivism nor Naïve Realism	
Chapter 5. Representationalism and Mental Imagery	47
Representationalism, Consciousness and The Problem of Perception	47
Perceptual Content & The Representation Strategy	49
Against Representationalism	51
Resisting Phenomenal Completeness	53
Chapter 6. Behind the Doors of Perception	56
Beyond Vision	56
Multimodal Mental Imagery	
All Power to the Imagination: Consciousness and Cognition	59
References	62

## Table of Contents

## Abstract

Does imagination play any significant role in veridical perceptual experience? If yes, what are the consequences for epistemology, philosophy of perception and the philosophy of mind? The main proposal of my dissertation is that if the answer to the first question is positive, then we obtain very significant consequences in the cited domains. In particular, I'll focus on the hypothesis that mental imagery plays a constitutive role in amodal completion to show that significant results can be obtained in the debate about the cognitive penetrability of perception and epistemic justification; disjunctivism and the nature of hallucinations; and, finally, representationalism and perceptual content. Thus, I attempt to do four things. First, I argue that explanations of the epistemological problem of cognitive penetrability that blame mental imagery lead to a dilemma about perceptual justification. Second, I propose a solution to the epistemological problem that is consistent with imagery-based theories and avoids the dilemma. Third, I argue that disjunctivist theories that give a positive account of hallucination in terms of mental imagery are false. Finally, I argue that we can generate a counterexample to classical versions of representationalism based on perceptual completions.

# Keywords: Mental Imagery/ Perceptual Experience/Amodal Completion/ Cognitive Penetrability/ Disjunctivism / Representationalism.

## Introduction

When we think about imagination we normally think about concepts like fantasy, fiction, or pretense. But, when we think about perception, we usually come up with ideas like reality, facts, or the external world. Similarly, if I told you that I saw that *p* and you trust me, *prima facie*, you have reasons to believe that *p*. This is generally not the case if I just say I visually imagine that *p*. One explanation is that perception and imagination are very different kinds of mental states. Perhaps, the core difference is located at the level of their functional roles. Whereas perception tells us something about the actual state of the world, imagination usually represents ways the world might be. However, at the same time, perception and imagination don't seem to be totally unrelated mental phenomena. Like perception, imagination has a strong sensory component in its phenomenology and the way it represents (mental imagery) and some psychologists even say that dreaming and hallucination are forms of imagination. In fact, evidence from the cognitive sciences show that sometimes perception and imagery interact, and this interaction plays an important role in our behavior.

If the above is true, the most general question we can formulate is this: how are perception and imagination ultimately related? This is a huge problem in philosophy and cognitive science that I don't plan to solve in my thesis. My goal here is more modest. I just want to convince you that a particular view about the relationship between perception and imagination has substantive consequences for epistemology, cognitive science, philosophy of perception and the philosophy of mind. In particular, the aim of my dissertation will be to *evaluate the philosophical consequences of an empirically-supported hypothesis about the relationship between veridical perception and mental imagery*. The hypothesis in question was proposed by Nanay (2010) and can be spelled out in the following way: *mental imagery plays a constitutive role in veridical perceptual experience.* The basic idea is that in typical cases ordinary objects have properties that we represent in perceptual experience by imaginative states. If this is true, then we literally perceive by imagination. We can even say that, in some sense, fantasy becomes part of our most primitive access to reality. However, I won't make a detailed defense of such hypothesis, I'll rather provide some reasons for its plausibility and mainly, assess its consequences. To do that, I will rely on philosophical analysis and empirical evidence from the cognitive sciences.

The dissertation is organized in the following way. Chapter 1 is a general introduction to the question of how perception and imagination might be related. In this chapter, I also introduce the view

according to which we perceive by mental imagery. The rest of the thesis is an assessment of that view and is organized in two core parts: epistemology (chapter 2 & 3) and philosophy of perception (chapter 4 & 5). Chapter 2 is a discussion of an imagery-theory of cognitive penetrability and a dilemma about perceptual justification. Chapter 3 is a short extension of the previous discussion. Here I propose the sketch of a solution for the cognitive penetrability debate. Chapter 4 inaugurates the philosophy of perception part. In this chapter, I propose an argument against disjunctivism based on some empirical findings of mental imagery. Similarly, chapter 5 discusses representationalism and argues against it on a similar basis. Finally, in chapter 6, I summarize the main lessons from my dissertation and discuss some questions about imagery and multisensory perception for future research.

## Chapter 1. Imagining the External World

You are traveling around the Winikunka mountains in the Andean region of Perú watching the following landscape. You are seeing the landscape, but if someone asks you to describe all the colors of the mountain while keeping your eyes closed, you may do the task by visualizing the mountain in your 'mind's eye'. The first mental event is a perceptual experience, the second one is an imaginative experience. Although these are different types of experiences, they don't seem totally independent. How are perception and imagination related? What are the relevant similarities and differences? Do they interact? Does perception play a role in shaping mental imagery? Can mental imagery play a role in veridical perception? In this chapter, I'll suggest some broad answers to these questions (with a special focus on the last one). I'll proceed as follows. In the first section, I'll introduce some general constraints for the discussion and I'll characterize perception and imagination. In the second section, I'll discuss similarities and differences between perception and imagination at the representational, phenomenological and epistemological level. In the third section, I present some general cases of imagery-perception interaction and; in the following section, I introduce my core case of this interaction, namely, *amodal completion*. I'll regard amodal completion as an instance of 'seeing by imagination' based on Nanay (2010). Finally, in the last section, I discuss a common resistance to Nanay's theory based on the idea that unconscious imagination doesn't exist.



## **Constraining Imagination**

A useful place to start is to constrain the scope of the discussion by giving some restrictions and definitions. Let me begin with three important constraints: *veridicality, imagery, and vision.* The first constraint is that when talking about 'perception' or 'perceptual experience' I'm referring to *veridical perception.* So, I'll exclude cases of illusion and hallucination unless I indicate otherwise. There will be a substantive portion of the dissertation (chapter 4) in which I discuss hallucination, disjunctivism and imagination. The second constraint is that when talking about 'imagination' I'm referring to *mental imagery.* It is uncontroversial to say that imagery is a subtype of the broad class of imaginative capacities. However, I'll use 'imagery' and 'imagination' as synonyms here. The third constraint on the discussion is that my conclusions will be limited to *the visual domain.* The main reason for this is that most of the empirical evidence and the philosophical work that I'll discuss has the same implicit scope. Nonetheless, in the last chapter, I discuss the possibility of generalization to multisensory perception. Once we have established the previous constraints it would be good to have some definitions to work with. Let's focus on the term 'perception' and 'imagery' within the visual domain. So, consider what Marr's told us at the beginning of his classic work 'Vision' (1982):

"What does it mean, to see? The plain man's answer (and Aristotle's, too) would be, to know what is where by looking. In other words, vision is the process of discovering from images what is present in the world, and where it is. Vision is therefore, first and foremost, an information-processing task, but we cannot think of it just as a process. For if we are capable of knowing what is where in the world, our brains must somehow be capable of representing this information-in all its profusion of color and form, beauty, motion, and detail. The study of vision must therefore include not only the study of how to extract from images the various aspects of the world that are useful to us, but also an inquiry into the nature of the internal representations by which we capture this information and thus make it available as a basis for decisions about our thoughts and actions. ". (p.3).

Two things are salient from Marr's characterization of vision. First, he emphasizes what we can call the 'pragmatic-epistemic role'. On this approach vision is fundamentally a source of *perceptual knowledge* and that knowledge is *action-guiding* since it makes available information about the external world for behavioral purposes like navigation or, more generally, adaptation. Second, Marr's characterization is what we can call a 'computational-representational view' since it defines vision as the use of physical stimuli for *representation*. More precisely, vision is the process of using light information for cognitive

operations like decision-making or thought. A lot of philosophers, in particular, naïve realists would disagree with the idea that perceptual experience involves representations or contents (Travis, 2004). However, the notion of 'representation' here is a placeholder, it doesn't entail the philosopher's notion of perceptual content. The concept of representation is a common coin in the vocabulary of cognitive science and is employed in classical and contemporary texts on visual perception to define it (Frisby & Stone, 2010). We can generalize the previous characterization of vision by saying that *perception is the* process of using sensory information causally obtained from physical stimuli (in the appropriate way) for epistemic purposes. This characterization emphasizes the causal nature of perception without establishing its sufficiency. In addition, it is consistent with contemporary theories that describe perception as a constructive process that is not fully stimulus-driven (Stone, 2012). But, as mentioned, the sensory input coming from the physical world seems to be at least a necessary component of it. This characterization is also neutral about the nature of knowledge since by 'epistemic purposes' I don't exclusively mean matters that involve propositional knowledge, it may also include practical knowledge and abilities such as adaptive skills (know-how). Finally, given the classical resistance of naïve realists toward the notion of 'representation' or 'content', I've excluded these concepts from my description of perception.

The concept of mental imagery is also defined along the lines of Marr's characterization of perception: *"We use the term 'mental imagery' to refer to representations and the accompanying experience of sensory information without a direct external stimulus"* (Pearson, Naselaris, Holmes, & Kosslyn, 2015, p. 590). This characterization is an accurate description of what happens in my initial example of visually imagining the colorful mountain. Nevertheless, both the mountain example and the cited characterization aren't the best way of thinking about mental imagery for our purposes. First, the mountain example is a paradigmatic instance of visual imagery, the act of deliberately visualizing a scene 'in the mind's eye'. However, mental imagery isn't always a voluntary act, sometimes people have involuntary visual flashbacks or earworms. Likewise, imagery doesn't always take place in an isolated sensory space (the mind's eye). People sometimes visualize objects within their egocentric space. Although involuntariness and egocentric imagery are consistent with the cited characterization of imagery, there are two more features that should be emphasized. On the one hand, the previous characterization said the absence of a direct stimulus is enough for mental imagery, but we may still have an imaginative state when the presence of a stimulus that is not causally related to the sensory mechanisms in the appropriate way, for example, in the case of cross-modal illusions or veridical hallucinations (Lewis,

1980). What is relevant for mental imagery is not only the absence of the external stimulus but the fact that perceptual events are not causally related in the appropriate way with the external physical events *i.e.* the correspondent sensory stimulation. On the other hand, the cited characterization of mental imagery seems to require consciousness as an essential feature since it talks about 'experience of sensory information'. Nonetheless, there is a strong empirical case for unconscious imagery. There is a neuropsychological condition called 'aphantasia' in which some people report the absence of imagery phenomenology while at the same time they are able to perform normally tasks that require mental imagery such as mental rotation (Zeman et al., 2010). Unconscious imagery may sound odd to some people; however, cannot we object the same to the concept of unconscious perception and the evidence from blindsight? Surprisingly, some of the skeptics of unconscious imagery are willing to accept the idea of unconscious perception. This is ironic since the only relevant difference between them seem to be the appropriate causal link with the external physical event and, unless the skeptics are willing to admit that causality is the reason why only perception can be unconscious, the resistance seems unjustified. So, we better remain neutral by making room for unconscious imagery in the characterization. On the rest of the thesis, I'll follow Nanay (2018a) on the concept of mental imagery: perceptual processing not triggered by the corresponding sensory stimulation in a given sense-modality.

On my reading of Nanay's definition, mental imagery is obtained if there is substantive informationprocessing/computation in the primary sensory areas of the brain ("*perceptual processing*") that isn't causally related in the appropriate way with the corresponding sensory event ("*not triggered by the corresponding sensory stimulation*") in a particular modality like vision, hearing or the like ("*in a given sensemodality*"). This characterization represents classical instances of mental imagery like visualizing and mental rotation (Shepard & Metzler, 1971; Shepard, 1978); but at the same time, is consistent with the egocentric, involuntary and unconscious imagery. In addition, the 'modality constraint' fits nicely with cross-modal phenomena. For example, in typical cases of visual imagery we have substantive processing in the primary visual cortex that is not caused by the typical sensory event that brings about vision (the light hitting the retina). In fact, in the classical examples of imagery the relevant cause is not be located at the level of sensory inputs at all. However, there are cross-modal experiences like sound-induced visual illusions in which an experience of two flashes is triggered by a single visual stimulus (one flash) paired with two sounds (two beeps) (Shams, Kamitani & Shimojo, 2000). Here the visual experience (two flashes) is not triggered by the correspondent sensory stimulation (one flash) in that modality; but is rather caused by what happened in a different modality (two sounds). Intuitively, one of the flashes was purely imaginative and this is precisely what Nanay's characterization accommodates since this would be a case of *multimodal imagery* (Spence & Deroy, 2013; Nanay, 2018a). We will return to these sorts of cases in the last chapter. After my characterizations of perception and mental imagery, I'll focus on three aspects of their relations (similarities, differences, and interactions) at three levels (representational, phenomenological and epistemological).

## Similarities and Differences between Perception and Mental Imagery

One of the most salient similarities between perception and mental imagery is to be found in their content. When I see a red apple at a certain location, I represent the world to be a certain way. When I visually imagine that red apple at the same location, it seems that I represent the world to be the same way. If the representational content of a perceptual experience just is the way the world is presented in experience, then their contents are at least similar. Likewise, if the representational content of a perceptual experience is existentially quantified (property-involving) rather than possible worlds, we can still say that both experiences represent that there is a red apple at a certain location. We can support this similarity by considering one of the motivations for the very idea of content of experience, namely, the role it plays in the explanation of behavior. For example, if we want to characterize the behavior of a subject in a perceptual task (e.g. visual search), it is useful to explain her performance in terms of something that carries information about what she is looking at, a representational content. Going back to imagery, there is strong empirical evidence that shows how eye-movements during an imaginative episode of a visual scene re-enact the eye-movement obtained in the visual perception of that scene (Brandt & Stark, 1997; Laeng & Teodorescu, 2002; Mast & Kosslyn, 2002). In addition, there is also some evidence for the so-called 'scanning hypothesis' of eyemovements during REM sleep (Herman et al, 1984; Leclair-Visonneau et al, 2010). According to this hypothesis, eye-movements during REM sleep 'scan' dream imagery showing a correspondence between the reported dream narrative and the eye-movement patterns. So, there is a significant behavioral parallel in eye-movements during perception and imagery that support the similarity in content. The parallel in content is what Nanay (2015) calls 'the similar content view' about perceptionimagery and he defends it on similar grounds.

The similarity between perception and imagery is not only to be found at the representational level but also at the phenomenological level. Having a perceptual experience as of F and having an

imaginative experience as of F seem to share an important phenomenal feature since there are substantive sensory elements in both. If the phenomenal character of a visual experience in perception and imagery just is the way things look to the subject, then their phenomenology seems to be at least similar. The phenomenological similarity can be supported on empirical grounds as well. There is evidence that under controlled experimental conditions people can mistake perceiving for visualizing (Perky, 1910). This is known as the 'Perky effect' (I'll return to this later). The opposite is also true, sometimes people mistake imagery episodes for veridical perception. A typical instance of this case is dreaming (excluding perhaps lucid dreaming). Both examples can be explained by saying that, on some occasions, the way things look to a subject is similar during visual imagery and visual perception *i.e.* the phenomenal character is similar.

The representational and phenomenological similarities in perception and imagery can be supported by well-known findings about their underlying neurobiological and cognitive basis. At the implementational level, there is similar neural activation in the primary visual cortex and other brain areas for perception and mental imagery (Kosslyn, Thompson & Alpert, 1997; Kosslyn *et al*, 1999). Furthermore, representation in the brain during perception and imagery is topographically organized with retinotopic maps in early visual areas (Kosslyn *et al*, 1995; Klein *et al*, 2004; Slotnick, Thompson & Kosslyn, 2005). At the computational level, behavioral evidence that shows how imagery selectively interferes or facilitates perceptual tasks suggests a shared representational medium for both (Farah, 1985 & 1989; Ishai & Sagi, 1995). While the systematic matching between imagery and perception in the brain implies that there is a common locus of processing; content-specific effects of imagery over perception suggest that the common locus is, in addition, representational. The neuronal and functional correspondence might also be a correlate of the phenomenological similarity.

Differences can also be located at the representational and phenomenological level. Consider, for example, the determinacy of content and the feeling of presence. While perception is generally vivid, most episodes of mental imagery are faint. We can make sense of this by saying that the way the world is presented in perceptual experience is much more determinate than the way is presented in mental imagery (Bourget, 2017). Alternatively, the content of perception (excluding phenomena like blur) is more determinate than the content imagery because properties attributed in perception are determinates (or superdeterminates) while in the case of imagery are determinables (Nanay, 2014). The determinacy of perception is related to its phenomenal presence. When something is

phenomenally present in our visual experience it makes a substantive difference in the way things look. However, there are different kinds of phenomenal presence, blur and after-images are presented in our experience as radically different from shadows and depths. The latter seems to be out there in the world as properties of objects (object-directed presence) and is in this sense that perception and imagery differ in most cases (Dorsch, 2018). Perception has a phenomenal presence that mental imagery lacks. However, as we shall see, this distinction is not so straightforward for some cases like perceptual completions, lucid dreaming and, hallucinations.

Finally, one of the most important differences between perception and mental imagery is epistemological. It is widely agreed that -skeptical concerns aside- perception is a satisfactory source to acquire knowledge of the external world. Perceptual experiences such as seeing or hearing usually provide reasons to believe what they are representing. However, some people are not disposed to say the same about imagination. When it comes to modal epistemology, imagination may provide a reliable guide to know what is possible (Yablo 1993, Chalmers, 2002). However, when discussing our knowledge of what is actual, there seems to be a crucial difference between the epistemic status of perception and imagination. There are different diagnoses about what is going on here, we might conjecture that perception is truth-tracking and imagination isn't. Nevertheless, a better way of thinking about their epistemological difference comes from a venerable tradition that explains the relation between seemings and justification. According to phenomenal conservatism (also called 'dogmatism'), if it seems to S that p, then, in the absence of defeaters, S has at least some degree of justification for believing that p (Huemer, 2007). As it stated, phenomenal conservatism is a very weak thesis, and it is plausible for perceptual seemings. For example, if it looks that the cat is on the mat, and you don't have any reasons to believe that you're hallucinating, then, you have at least some degree of justification to believe that the cat is on the mat. Nevertheless, if we talk about imaginative states then phenomenal conservatism isn't plausible at all. Unlike perceiving, imagining that p doesn't seem to provide justification for believing that p. Of course, this difference is not only about voluntary imagery but also spontaneous imaginings such as daydreaming or visual flashbacks. In other words, mental imagery seems to have less evidential force than perception since imagination 'fabricate' its content.

We can summarize the previous difference by saying that, while perception provides us knowledge about the actual world, imagination seems to provide -at best- knowledge about possible worlds. You may object that this contradicts my earlier example of how visualizing can help us to know the colors of the mountain. However, in the case of visualizing the colors of the mountain, the role imagination plays is indirect since is just the vehicle through which we evoke certain representations from memory. It is the reliability of our memory that will ultimately determine whether we know the colors of the mountain, not imagination. Having said that, I regard the epistemological difference between perception and mental imagery as, *prima facie*, the most relevant one. As we shall see in the next chapter, this issue has recently been illustrated in the debate about the cognitive penetrability of perception.

## **Imagery-Perception Interaction**

After reviewing some potential similarities and differences between perception and imagery, one may wonder how these mental states could interact. Cognitive science tells us they do. First, there is general evidence for imagery-perception interaction. Second, there is also evidence for a constitutive role that mental imagery plays in perception. In this section, I'll review these two cases.

There has been a long history of studies of imagery-perception interaction since the report of the Perky effect. This phenomenon is a classic example of how visual imagery interferes with visual perception. The experiment goes like this: subjects were looking at a fixation point, and they were asked to visualize (visually imagine) objects into the screen. Unbeknown to them, faint images of the visualized objects were projected on the screen. Although the images projected were slightly above the perceptual threshold, subjects took themselves to be imagining when they were literally perceiving (Perky, 1910). The result has been replicated several times controlling different variables (Segal & Gordon, 1969) and switching between sensory modalities (Segal & Fusella, 1970). According to one popular explanation of this phenomenon, visual imagery produces sensory interference by reducing visual sensitivity (Reeves, 1981; Craver-Lemley, & Reeves, 1992).

But imagination is not always bad for perception. Other studies have shown that imagery facilitates some perceptual tasks. For example, visual imagery can facilitate the detection of a target by increasing expectations during perceptual decisions (Farah, 1985). It also has been shown during visual masking paradigms that imagery can reduce the contrast threshold (higher-contrast-sensitivity) for Gabor patch

detection by producing an effect over short-term visual memory (Ishai & Sagi, 1995 & 1997). Finally, it was reported that imagery can produce priming effects on conscious perception during binocular rivalry (Pearson, Clifford & Tong, 2008). In this paradigm, conflicting visual stimuli are presented (one to each eye) leading to a competition for which stimuli will reach visual awareness and dominate conscious perception. This experiment shows that mental imagery biases visual competition in favor of the imagined pattern. Like the previous study, the imagery-induced priming is interpreted as the result of a short-term memory trace that makes a difference in the subsequent visual dominance.

The results presented above indicate two things. First, direct imagery-perception interaction is usually detrimental, because when they overlap imagery produces interference. Second, even when imageryinduced facilitation takes place, the interaction isn't direct since the effect of imagery is always mediated by expectations or memory. In addition, it is natural to think that perception is developmentally prior and shapes mental imagery in the following sense: if you never perceptually entertain a fair amount of sensible qualities in a given modality (e.g. color and shapes) you won't be able to imagine or recognize those properties (e.g. color and shapes). This was the subject-matter of classical empiricist discussions about sense-impressions and ideas, like Hume's missing shade of blue (visual imagery) and Molyneux's Problem (cross-modal perception). Further support for the priority of perception comes from the congenitally blind. For example, there seems to be no visual phenomenology in dreaming for those that are blind from birth (Hurovitz et al., 1999). This suggests the picture that, whereas perception can beneficial for imaginative capacities; mental imagery itself has little or nothing to offer for perceptual knowledge. The question is: Is there any chance for imagery to play a direct-positive role in perception? Hume and Kant say yes. In fact, both agree that imagery plays a role in perceptual recognition (Strawson, 1974). Although these views are very controversial, there is empirical evidence suggesting that imagination plays an important role in perception. In particular, some studies have shown that mental imagery works as a mechanism of 'perceptual filling in' for peripheral vision (Otten et al, 2017) and scotomas/blindspots (Ramachandran & Gregory, 1991). In the next section, I'll focus in the most substantial case of perceptual "filling in" by mental imagery: modal and amodal completion. This will play a major role in the rest of the dissertation.

## **Perceptual Incompleteness**

Perceptual completions in vision are processes that overcome gaps in the optic input by 'filling in' sensory information (Pessoa, 2003 & De Weerd; Komatsu, 2006). Broadly speaking, there are two kinds of perceptual completions: modal and amodal completion. Let's start with a classical example:



Figure A

*Figure A* is a classical visual illusion that triggers the salient appearance of a triangle. This is known as the 'Kanizsa triangle' and is an instance of *modal completion*. The distinction between modal and amodal completion is controversial. So, the best way to distinguish them is by examples. Consider the following picture:



Figure B

When looking at *figure B* most people perceive the occluded part of the black image as the continuation of a circle. This show a classical instance of *amodal completion* which can be defined as *the representation* 

of those parts of the perceived object from which we don't get sensory stimulation (Nanay, 2018b). In general, while modal completion shows the illusory object in the front of the perceived stimulus, amodal completion does it behind an occluder. However, not all cases of amodal completion involve occlusion, for example, think about the perception of volume in spherical objects. When we see a ball but don't receive any sensory signal from its backside, we still represent it as a spherical object.

A different way of making the distinction is in terms of phenomenal presence. For example, the modally completed triangle in *figure* A has a stronger phenomenological saliency than the amodally completed circle in *figure* B. However, a lot of cases of amodal completion have a stronger phenomenal presence than *figure* B. Consider the following:



Figure C

This case has a strong phenomenal presence since almost all normally sighted people experience *figure C* as if the claw continues behind the cylinder. Thus, the distinction between modal and amodal completion is not straightforward. Furthermore, according to a controversial conjecture (the so-called 'identity hypothesis') modal and amodal completion share the same underlying representational mechanisms (Kellman & Shipley, 1991; Shipley & Kellman, 1992). Ignoring this issue, I'll focus on amodal completion since there are two crucial features of it for the following chapters. The first one is its *ubiquity* (Nanay, 2018b). Given the physical properties of our environment, pretty much of all our perceptual experience works by amodal completion. In fact, all experiences of 3D non-transparent objects and 2D partially occluded objects are instances of amodal completion. Here is a very natural example:





Figure D

*Figure D* shows that amodal completion isn't a perceptual oddity. We are presented with occlusion in pretty much all perceived scenes and we very often fill the gaps. For example, despite the occlusion in the right image of *figure D*, we don't take the bear to be an incomplete object as suggested by the left image. In addition, amodal completion is at work in the perception of depth (stereopsis) and doesn't depend on binocular disparity (Bacon & Mamassian, 2002).

The second critical feature of amodal completion for my argument is the way it works. There are two competing explanations for amodal representation. According to the first one, amodal completion represents by belief or a similar doxastic state. According to the second one, amodal completion works by *mental imagery* (Nanay, 2010). To see which explanation is better let's look at the following example:



Figure E

On the doxastic-theory, we represent the deer of *figure E* as complete just because we believe there are occluded deer-parts behind the black rectangle. Nonetheless, as Nanay (2010) pointed out, there are several problems with the doxastic-theory. First, there is a huge amount of empirical evidence that shows amodal completion occurs at a very early stage (around ~200ms after stimulus-onset) of perceptual processing in the brain (Sekuler & Palmer, 1992; Murray, Sekuler & Bennett, 2001; Plomp et al, 2004; Chen *et al.*, 2009). Second, amodal completion seems to be insensitive to evidence and sometimes impenetrable by belief. For example, all the evidence available in *figure E* shows that the most likely object behind the occluder are two deers, but if you're like most people, it will perceptually appear to you as one long deer. Furthermore, even if you're told for sure that what is behind the occluder in *figure E* are two deers, it will look like one. Third, amodal completion has a sensory phenomenology associated with the perceptual presence that belief doesn't explain. We believe that there is something behind occluders in figures *B*-*E* because it perceptually appears as if there is something behind them, not the other way around. Even if you postulate a more basic doxastic-state without these rational constraints (alief, perhaps), this is not enough to explain the sensory phenomenology associated with amodal completion.

Importantly each of the reasons against the doxastic theory is also a reason for endorsing Nanay's imagery theory of amodal completion. First, like amodal completion, imagery is also activated at an early stage of processing (Kosslyn & Thompson, 2003). Second, as we mentioned in a previous section, imagination doesn't seem to be the subject of demanding epistemic constraints. Third, imagery has a sensory phenomenology. Finally, the very characterization of mental imagery (*perceptual processing not triggered by sensory-stimulation in a given sense-modality*) seems to subsume the concept of amodal completion (*representation of those parts of the perceived object from which we don't get sensory stimulation*). So, on the basis of the imagery theory of amodal completion (Nanay, 2010), let's propose the hypothesis of *seeing by imagination* (to abbreviate let's call it "SBI"):

## [Seeing by Imagination]: In cases of amodal completion 'perceptual filling in' is done by mental imagery.

If [SBI] is true, then mental imagery is constitutive of the perceptual experiences that are instances of amodal completion. An important remark is that the word 'seeing' behind [SBI] is not a coincidence. Although, not all instances of perceptual completions are cases of 'seeing' in the factive sense (since some of them are not veridical) in a lot of cases amodal completion produce accurate representations.

In fact, most perceptual experiences that involve amodal completion are veridical. Thus, [SBI] along with the typical veridicality of amodal completion entail that *in many cases ordinary objects have properties that are represented in perceptual experience by imaginative states*. Making a rigorous defense of [SBI] is beyond the scope of my thesis. However, given the reasons provided, I'll assume that the hypothesis is true and in the following chapters, I'll evaluate its consequences for epistemology, philosophy of mind and perception.

## Unconscious Imagination and 'Mental Schimagery'

Finally, a few words on a popular resistance against [SBI]. A lot of people usually argue that in ordinary instances of amodal completion (like the bear in *figure D*) we don't consciously visualize or imagine something behind occluders. After all, in ordinary visual experiences, we don't spend too much time in attentional engagement with each object that is occluded by something. So, if [SBI] is true, then amodal completion must work by some sort of unconscious imagery. However, unconscious imagination doesn't exist. Therefore, [SBI] is false. There are two ways to respond to this argument. I first consider reasons for the actuality of unconscious imagery and; second, I consider the falsity of the conditional that establish amodal completions entails the actuality of unconscious imagery.

I have already talked about unconscious imagery in a previous section. I said that if the notion of unconscious perception makes sense, there seem to be no specific reason to deny the *possibility* of unconscious imagery. After all, it is true that most mental processes can be unconscious. That's partly why zombies became so popular in debates about consciousness and physicalism. So, why not mental imagery? At this point, you may notice that the objection isn't just about the mere possibility of unconscious imagery but its actual role in amodal completion. However, since there is evidence for the actuality of unconscious perception, we may find reasons for the actuality of unconscious imagery as well. Before doing that, let me say that I'm happy to accept that the folk-psychological concept of perception. However, in the era of cognitive science the actuality of unconscious perception is accepted on the grounds of neural and behavioral evidence: subliminal priming in perception (Greenwald, Klinger & Schuh, 1995); neuropsychological cases like blindsight (Kentdrige, Heywood & Weiskrantz, 1999; Goodale & Milner, 2004); perceptual processing during inattentional blindness (Mack & Rock, 1998); implicit learning such as visual statistical learning (Watanabe, Nañez & Sasaki, 2001; Fiser & Aslin, 2002); and, studies with continuous flash suppression (Jiang *et al*, 2006; Jiang,

Costello & He, 2007). In all these cases, people's sensory mechanisms are causally related in the appropriate way with an external stimulus and that produces significant changes in their behavior (in the performance of a task) but at the same time, they are unable to report any perceptual experience. The parallel evidence exists for unconscious imagery.

As I already mentioned, there is a neuropsychological condition called 'aphantasia' in which people report the absence of imagery phenomenology (Zeman, Dewar & Della Sala, 2015a & 2015b). Nevertheless, these subjects can perform visuo-spatial tasks that require mental imagery such as mental rotation tasks and the Brook matrix task (Zeman *et al*, 2010); they also have no imagery-based priming during binocular rivalry (Keogh & Pearson, 2018) and show abnormal brain activations during imagery activation compared to controls (Fulford *et al*, 2018). You may object against unconscious imagery that reportability and phenomenology aren't the same thing. I agree, but the same is true about the evidence for unconscious perception and, unless we want to endorse some particular view about how phenomenal consciousness and cognitive access are related in these studies, we better remain neutral on the results.

Regarding the idea that amodal completion entails unconscious imagery, I think we can also provide some reasons for its implausibility. First, as I mentioned before, there is evidence that amodal completion occurs around ~200ms after stimulus-onset. You may think this is too fast for awareness, but this is about right given that is exactly the timing of conscious perceptual processing in vision (Sekular & Bennett, 2001; Railo, Koivisto & Revonsuo, 2011; Koivisto & Grassini, 2016). Thus, amodal completion by imagery satisfies the computational conditions for being a conscious process. But, if amodal completion can be actually conscious, why does it seem to be unconscious? There are two competing explanations here depending on your view about the relation between attention and phenomenal consciousness. One is that phenomenal consciousness is attention, and the only reason why a lot of instances of amodal completion are unconscious is that we don't pay attention to them. So, to bring about phenomenal consciousness to amodal completion we just need to direct our attention to it. The other view is that the timing of amodal completion guarantees that is phenomenally conscious, but we don't have cognitive access to it. As I also mentioned in a previous section, we don't have to favor any of these views. In any case, the imagery theory of amodal completion entails neither that we are visualizing occlusions all the time nor that amodal completion is always unconscious. Usually, we can experience amodal completion in terms of the phenomenal presence of occluded object-parts when we direct our attention during amodal completion. Indeed, the phenomenology of amodal completion should probably be conceived as the phenomenal presence of invisible objectparts in ordinary perceptual experience. Sometimes this feature of amodal completion is salient and we can appreciate it without effort (e.g. *figure C*).

In order to finish this chapter, just let me be clear about this. We shouldn't confuse visualization with mental imagery. Although paradigmatic instances of imagery involve visualizing, nothing in the characterization of imagery provided entails that all its instances have to be conscious visualizing. You might not like Nanay's characterization and prefer the term 'mental schimagery' instead. That's perfectly fine, but this would be just a verbal disagreement. The following chapters are fundamentally an analysis of [SBI] for epistemology and philosophy of perception. For my purposes, it doesn't matter if you think about [SBI] in terms of mental imagery or mental schimagery.

## Chapter 2. Seeing by Imagination: An Epistemological Dilemma

As mentioned in the previous chapter, one of the most salient differences between perception and imagination is epistemological. Prima facie, while perception provide us knowledge about the external world, imagination seems to provide at best knowledge about possible worlds. The epistemological problem of imagination has recently been illustrated in the debate about the cognitive penetrability of perception. There are different diagnoses about what is wrong with cognitive penetrability, but they can be summarized by saying that sometimes cognitive penetrability leads to a downgrade in perceptual justification. This is known as 'the downgrade thesis'. A recent explanation of the downgrade thesis involves imagination, according to it, some perceptual experiences that have been cognitively penetrated are epistemically downgraded because: (i) cognitive penetration works through a mechanism of imagery activation; and (ii) perceptual experiences influenced by imaginings lack the evidential force to justify beliefs since they 'fabricate' their content (Teng, 2016). I'll call this explanation 'iconophobia'.

In this chapter, I would like to introduce a dilemma into the debate based on the perceptual phenomenon of amodal completion and [SBI]. The chapter is divided into three sections. In the first section, I introduce two major problems associated with the cognitive penetrability of perception: the psychological and the epistemological problem. In the second section, I introduce the imagery theory of cognitive penetrability and iconophobia as answers to these problems. In the third section, I raise the epistemological dilemma.

## Seeing is Believing: Two problems about Cognitive Penetrability

Can beliefs and desires change the way we perceive the world to be? A contemporary debate in the philosophy of cognitive sciences is whether mental states like beliefs, desires, intentions or expectations can have a significant causal influence over the content of perception (Stokes, 2013). This is known as the 'cognitive penetrability of perception' (CPP). There are two ways of thinking about what is at stake in the CPP debate. The first way (which is more common within cognitive science) is to ask whether there are robust top-down effects over perceptual processing. The second way (which is more common in philosophy) is to ask whether propositional attitudes can have causal influence over the content of perceptual experiences. The first way is less controversial than the second one, but there are some people that famously reject it, at least when it comes to low-level perceptual features

(Firestone & Scholl, 2016). The main motivations for this sort of impenetrability are to endorse a particular cognitive architecture like the modularity of mind (Fodor, 1983), the independence between perception and cognition (Pylyshyn, 1999) and arguing against the theory-ladenness of scientific observation (Churchland, 1988). The second way usually entails more assumptions about the nature of perception, for example, the controversial thesis that perceptual experience has content and its content is like the content of belief. The motivations are also different. People that defend the cognitive impenetrability in the philosophical sense usually endorse foundationalism or phenomenal conservatism about epistemic justification (Tucker, 2014). There is room for skepticism about this way of framing the debate of CPP, some people even think that CPP in this sense is a philosopher's fiction. However, in this chapter, I'll focus on this latter sense and I'll assume there are some plausible candidates of CPP. We can start with a characterization of CPP provided by Siegel (2012):

**[CPP]:** A perceptual experience is cognitively penetrable if it is nomologically possible for two subjects to have perceptual experiences with different contents while perceiving and attending to the same distal stimuli under the same external conditions, as a result of differences in other cognitive states.

The first question about [CPP] is if it's empirically the case. Some examples of the philosophical literature are certainly philosopher's fiction. Consider Siegel's famous example in which Jill believes that Jack is angry at her. Thus, when she sees Jack, her belief makes him look angry to her. This case shows what is wrong with the philosopher's toy examples of [CPP]. In general, cases of [CPP] can be explained away in two ways: (i) Claiming that there are no differences in perceptual experiences but rather in our judgments about perceptual experiences. (ii) Claiming that the differences in perceptual experiences are not obtained in virtue of the relevant cognitive states but rather other psychological processes (e.g. the allocation of attention, perceptual learning, etc.). These two ways of explaining away cases of [CPP] exclude the toy examples. However, there is some behavioral evidence from psychophysics that is hard to explain away in this sort of way. Consider the following case:

[Blue bananas]: We give a task to a group of participants. They must desaturate an image of a yellow banana against a gray background until the fruit looks achromatic (the observers' gray point). If you go beyond this point, you get the opposite in the color space (blue). Subjects perform the task as follows. When they reach the gray point, they continue desaturating the image marginally deviating from the target until it got a slightly bluish hue. However, when they do the same task with random patches the performance is significantly different.

This is an experimental result from a color-adjustment task by Hansen and colleagues (2006). One of the best explanations of the performance is that high-level visual memory of familiar-natural objects modulates color appearances in perception. Given their memory about how bananas look, when they reached the gray point, they expect the banana to be yellow and that causes them the experience as of a yellowish object that still needs to be chromatically adjusted (desaturated). Thus, the level of accuracy in the behavior of the participants is explained by their perceptual experiences which is affected by cognitive states (memories and expectations about the color of familiar objects). We may even say that prior beliefs about the color of familiar objects affects visual perception in the way that Bayesian theories suggests. Although, there are some attempts to explain away cases like [Blue Bananas] in terms of perceptual learning (Arstila, 2015), I'll assume that this is a genuine instance of [CPP].

If we assume that there are genuine instances of [CPP] like [Blue Bananas], there are still two fundamental issues with [CPP]. First, the *psychological problem*: What is the psychological mechanism behind [CPP]? Second, the *epistemological problem*: Why is [CPP] epistemically bad for perceptual justification? The psychological problem departs from the fact that if [Blue bananas] is an instance of [CPP], it is not obvious at all how memories or expectations could interact with perceptual states. The epistemological problem departs from the intuition that in [Blue Bananas] there is something epistemically wrong about the belief-formation process and perceptual justification: participants started with the belief that the banana is yellow, then when [CPP] takes place they have a perceptual experience as of a yellowish banana in virtue of the initial belief. Perceptual experiences usually provide justification for beliefs, but can the cognitively penetrated experience provide justification for the belief that the banana they are looking is yellow? It doesn't seem so. As we will see, some philosophers claim that [CPP] produce perceptual experiences that are less apt for justification. In any case, to solve those problems, people usually make a naturalistic assumption, namely, that the psychological mechanism of [CPP] can shed light on why there is something epistemically wrong about it. This is how we can link the problems about [CPP]. I will proceed in a similar fashion.

## **Imagination Under Attack**

One immediate question about [Blue bananas] is how memory or expectation of color can change the content of our color experience (the psychological problem). Here is a two-stage mechanism for

cognitive penetration of color experiences proposed by MacPherson (2012). According to her, [CPP] cannot produce a direct influence over experience. It rather works in such a way that the cognitive states trigger a non-perceptual state with a phenomenal character sufficiently similar to the phenomenal character of perception. This perception-like state causally interacts with the stimulus-driven sensory information bringing about the penetrated perceptual experience. The key ingredient here is that the best candidate for a perceptual-like state is mental imagery. Thus, according to MacPherson, [CPP] works by a mechanism of imagery-activation. Applying this to the case of [Blue bananas] we obtain the following. First, when participants look at the grey banana during the task their expectations about how bananas look triggers an imaginative state as of a yellow banana. Second, the imaginative state with the sensory-like content interacts with the stimulus-driven information and brings about a single experience of the participants by the activation of an imaginative state.

The evidence for the mental imagery theory of [CPP] is based on examples of imagery activation by cognition (first-stage) and cases of imagery-perception interaction (second-stage). Examples of imagery activation by cognition are easy to find: voluntary visualizing, dreaming, daydreaming, etc. Cases imagery-perception interaction are a bit more difficult. But as mentioned in the previous chapter, such evidence exists: confusions of perception with imagery and confusion of imagery with perception. Regarding the first type of confusion, the most popular case is the so-called 'Perky-effect' (Perky, 1910). Regarding the second type of confusion, the typical cases are dreaming and hallucination. A lot of the evidence from psychopathology support the idea that a hallucination is a form of vivid and involuntary mental imagery (Slade & Bentall, 1988). This mechanism provides an answer to the psychological problem of [CPP] since it explains why the best way of producing a top-down effect over perceptual experience is through mental imagery. However, MacPherson theory by itself doesn't provide a solution to the *epistemological problem*.

There are different diagnoses about what might be epistemically wrong with [CPP]. According to Siegel (2012), the problem is about epistemic circularity. The problem is that in some cases of [CPP], one should predict that an unjustified belief that influenced a perceptual experience, is *elevated* in terms of justification by the perceptual experience which was influenced by the very same belief. This is bad because the etiology of an experience seems to have an epistemic impact on its status. Of course, one crucial assumption here is that beliefs and perceptual experiences can share the same content. If we grant that, we have the following structure:



There are some troubles with this diagnosis as noticed by Lyons (2011). First, is not obvious that what the arrows represent lead to circularity. While the top-down arrow represents causality, the bottomup arrow is about justification. Second, not every instance of [CPP] is circular because a different type of attitude might influence the perceptual experience. Thus, we might obtain the following structure:



The situation is not epistemically circular, but it looks even worse because wishful thinking is doing the [CPP]. Another important issue is that no at all cases of cognitive penetration are bad, sometimes having knowledge and expertise in some domain can produce an instance of [CPP] in which one starts with a justified belief that changes the perceptual experience in a beneficial way. For these reasons, Lyons has a different diagnosis, he thinks that what is at issue is not circularity but reliability (high ratio of true beliefs). This means that bad cases of [CPP] decrease reliability *i.e.* make the agent more prone to the acquisition of false beliefs. The main problem for Lyons is that his explanation in terms of reliability is incomplete. We want a full story that integrates the psychological and the epistemological problem of [CPP].

Although both diagnoses aren't satisfactory, they suggest something important, that is, whatever is wrong with [CPP] can be framed in degrees. This is particularly obvious when Siegel talks about the 'elevation' prediction of justification. She is not talking about all or nothing justification but rather an upgrade/downgrade of justification. Similarly, when Lyons talk about reducing reliability he is talking about certain levels. In any case, it is usually assumed that whatever is wrong with [CPP], we can frame it in terms of a Downgrade Thesis (DT). Following Teng (2016):

**[DT]:** For some cases of [CPP], if the perceptual experiences are cognitively penetrated to represent that P, then they are epistemically downgraded with respect to believing that P i.e. they provide less justification for believing that P than perceptual experiences that are not under [CPP].

Some things to note about [DT]. First, the objects of the downgrade are perceptual experiences, not beliefs. Second, the domain of beliefs in question are perceptual beliefs, here understood as beliefs about the external world caused by experiences. Third, [DT] somehow implies that experiences can be objects of epistemic evaluation (Siegel, 2013). Finally, [DT] offers no satisfactory explanation of why sometimes [CPP] is problematic, it just says that it produces a downgrade. But the downgrade is not an explanation of the epistemic problem, is rather what ought to be explained. Thus, the question we should really ask is why does [CPP] lead to the [DT]?

An elegant explanation of the [DT] developed by Teng (2016) involves imagination and relies on our previous solution to the psychological problem of [CPP]. Teng uses MacPherson's theory of cognitive penetration according to which [CPP] works by a mechanism of imagery activation (MacPherson, 2012). Teng says the epistemological problem has to do with the imaginative etiology of experiences in [CPP]. According to her: (i) having an appropriate etiology is a necessary condition for perceptual justification and (ii) experiences provide justification for perceptual beliefs only when we do not 'fabricate' them for ourselves. If [CPP] causally works by imagination, then, in these cases, the etiology of perceptual experiences is imaginative, and considering that imaginative states represent without sensory stimulation, they 'fabricate' their content. Thus, in cases of [CPP], the content of perceptual experiences in [CPP] are epistemically downgraded *i.e* they don't have the same evidential force as normal perceptual experiences given their imaginative origin.

Assuming that we have an intuitive grasp of the 'fabrication' relation, I find this argument convincing. Further support to its main insight is given by what we already mentioned about the epistemic status of imagination. To close this section, I'll summarize the main claim of Teng's 'imagining argument' borrowing Dennett's terminology (1981): **[Iconophobia]:** Any perceptual experience E that is driven by an imaginative state I is epistemically downgraded if the content of E is partly fabricated by I.

Under the assumption that [CPP] works through imagination, [Iconophobia] give us an explanation of [DT] and, therefore, an explanation of why there is something epistemically bad about [CPP]. In contrast, 'iconophiles' say [Iconophobia] is false.

## The Epistemological Dilemma

In this section, I'll introduce a dilemma to the debate around [CPP] and [Iconophobia] based on [SBI]. But before doing so, let me remind you of the perceptual phenomenon that will play a role in my argument:



Figure F

Most people perceptually experience the animal in *figure F* as completed even though there is occlusion. The above is possible given a process called 'amodal completion' which is the representation of those parts of the perceived object from which we don't get sensory stimulation. There are two crucial features of amodal completion for my argument. The first one is its *ubiquity* (Nanay, 2018b). Given the physical properties of our environment, pretty much of all our perceptual experience works by amodal completion (with the exception of 3D transparent objects and 2D non-occluded objects). The second one is that amodal completion *represents by imagery* (Nanay, 2010) as stated by [SBI] in the previous chapter. If amodal completion is ubiquitous and amodal completion works by imagery, then our ordinary perceptual experience is driven by imaginative states. Now we are in a position to formulate an argument that leads to our dilemma:

- P1) If the content of a perceptual experience is partly fabricated by an imaginative state then that perceptual experience is epistemically downgraded. [Iconophobia]
- P2) If a perceptual experience is obtained by amodal completion then its content is partly fabricated by an imaginative state.
- P3) If a perceptual experience is obtained by amodal completion then that perceptual experience is epistemically downgraded. [From P1 & P2]
- P4) Ordinary perceptual experiences are obtained by amodal completion.

\_\_\_\_\_

C) Ordinary perceptual experiences are epistemically downgraded.

The conclusion of this argument is that the downgrade thesis [DT] generalizes to all our ordinary perceptual experiences. Someone might take this to be highly undesirable since it implies that we are in an epistemically defective situation most of the time. This might also introduce skeptical worries. How could we justify our beliefs about the external world if our ordinary perceptual experience is epistemically downgraded? How could we know anything about the external world under these circumstances? The argument is valid, thus, if we want to avoid the conclusion we should look at the premises. P1 is the iconophobic claim. P2 is an empirical claim based on Nanay's imagery theory of amodal completion, we already gave evidence for this. P3 just follows from P1 and P2. Lastly, P4 is another empirical claim, it states the ubiquity of amodal completion in everyday life. By 'ordinary perceptual experiences' I mean most of our perceptual experiences, which is arguably, the set of perceptual experiences that are obtained in virtue of objects that don't provide us sensory stimulation from all their parts (e.g., partially occluded objects, non-transparent 3D-objects). I don't think we should deny neither P2 nor P4 as we already assume their truth in the previous chapter. Thus, it looks that P1 is our candidate. The dilemma can be schematized as follows:

**True:** Ordinary perceptual experiences are epistemically downgraded.

[Iconophobia]

False: Some perceptual experiences whose content is partly fabricated by imagination don't provide less justification than the correspondent experiences whose content isn't fabricated. Let's start with the first horn. You may bite the bullet an accept that our ordinary perceptual experience is epistemically downgraded and say that this is still good enough to reach perceptual knowledge. On this view, there is a downgrade but is not enough to generate significant troubles for perceptual justification. The problem with this response is that [Iconophobia] was introduced as an explanation of the epistemological problem of [CPP], namely, an explanation of what is *epistemically bad* about [CPP] for perceptual justification. Accepting the first horn immediately undermines [Iconophobia] as an explanation for the epistemic problem in bad cases of [CPP] like [Blue bananas]. This is a genuine problem for Teng (2016) since; by parity reasoning, if there is something epistemically wrong with [CPP] as stated by [Iconophobia], it follows that there should be something equally wrong with ordinary perceptual experience. But if ordinary experience is epistemically acceptable, then we can no longer explain why [CPP] is epistemically bad given that both are driven by imaginative states.

Let's evaluate the second horn. This just amounts to say that [Iconophobia] is false *i.e.* some perceptual experiences whose content is partly fabricated by an imaginative state are not epistemically downgraded (Iconophilia). Since the iconophobe threated ordinary perceptual experience by arguing that is partly fabricated by imaginative states (from P2 and P4), iconophilia rather looks like a nice alternative to the challenge. Why is accepting iconophilia problematic? The reason is that iconophilia says that for some perceptual experiences, the downgrade doesn't take place despite the fact those experiences are partly fabricated by imagination. This totally dismisses the epistemic impact of the etiology of an experience. Intuitively, the nature of the process in virtue of which an experience is obtained should play some role in its rational assessment (Siegel, 2013 & 2017) and imaginative fabrication doesn't look like the best way of obtaining an experience that will play a role in perceptual justification. Furthermore, as established by [DT], the epistemic downgrade is comparative. So, to say the downgrade doesn't apply to an experience E (which content was fabricated by an imaginative state) means that E doesn't provide less justification for believing that P than the correspondent token  $E^*$  whose content isn't fabricated. This is counterintuitive. However, there are two ways of defending iconophilia. The first way is to say the downgrade doesn't apply in some cases of imaginative fabrication because imagination is epistemically neutral, *i.e* the fabrication doesn't undermine the status of the experiences in perceptual justification since the stimulus-driven component is enough to reach a reasonable degree of justification. The problem with this option is that according to the best scientific theories, perception is highly constructive in nature. This means that fabrication and top-down effects take place all the time, but it is hard to believe that they don't play any role in perceptual justification.

The second way is to say the downgrade doesn't apply because in some cases (e.g. amodal completion) mental imagery does play a positive role in perceptual justification. The problem with this option is that is not obvious how!

Here is one conjecture for the idea that imagery might play a role in perceptual justification. Perhaps, as many cognitive scientists believe, visual perception is Bayesian. According to Bayesian approaches -roughly speaking- we should model perceptual processing as probabilistic inference because, at any time, sensory inputs are noisy and there is a wide range of possible world-states consistent with each input. So, any percept should be the result of a probabilistic inference that considers both, the available sensory information (the evidence) and some prior knowledge (the hypothesis). This is the statistically optimal way to deal with sensory uncertainty (Ernst & Banks, 2002; Weiss, Simoncelli & Adelson, 2002; Kording & Wolpert, 2004; Fiser et al., 2010). We may suggest that if perception is Bayesian, then computational processes involved in amodal completion should consider both sensory information and prior non-stimulus driven representations (e.g. mental imagery). In particular, this hypothesis says that during amodal completion, mental imagery works as a prior in Bayesian inference for object-perception. This is epistemically significant because, if mental imagery works as a prior for object-perception, then imagery is a necessary condition to have a statistically optimal representation for object-recognition. If such priors are formed on the basis of reliable perceptual learning (which is generally low-level recurrent processing within the sensory stream), the Bayesian inference will give rise to experiences that are good enough for perceptual justification.

The problem with the idea that imagination may play a role in perceptual justification is that, as Helton and Nanay (2018) have pointed out, beliefs grounded in amodal completion is neither sensitive nor safe. As an example, consider the traditional formulations of sensitivity  $(\neg p \Box \rightarrow \neg Bp)$  and safety  $(Bp \Box \rightarrow p)$ ; and the belief in the proposition expressed by the sentence 'this is a spherical object'. To evaluate sensitivity, suppose you're seeing something that looks spherical, but you don't get sensory information from its back. By amodal completion, you still form the belief that this is a spherical object and it turns out to be true. However, in the nearby worlds in which the object is not spherical, you receive the same sensory information and by amodal completion, you still believe it is spherical. Thus, your belief isn't sensitive. Now let's look at the safety principle. There are some nearby worlds in which the object is not spherical, *in the majority of those* worlds you believe that it is spherical anyway. But for your belief to be safe, *in all* the nearby worlds in which you believe that *p*, it should be the case that *p*. Thus, your belief isn't safe either. Someone might try to accommodate the latter case by using a weaker version of safety, according to which your belief should be true in *most but not all* the nearby worlds. The problem with the weaker safety principle is the famous lottery paradox. Both sensitivity and safety are very important modal conditions for knowledge. So, the fact that beliefs formed by amodal completion are insensitive and unsafe is not something desirable and cast doubt on the idea that imagery might play an active role in perceptual justification.

To sum up, neither the first horn nor the second are easy to take. By having [SBI] as a background assumption we obtain the following. If you accept [Iconophobia] as an answer to the epistemological problem of [CPP], you should bite the bullet an accept that our ordinary perceptual experience is epistemically downgraded. This either introduces skeptical worries or undermines the explanation of the epistemological problem since, by parity reasoning, anything epistemically wrong with [CPP] will be equally wrong with ordinary perceptual experience; and if ordinary experience is epistemically acceptable, then the same goes for [CPP]. Nevertheless, if you deny [Iconophobia] then you obtain iconophilia, which is also a problem since it ignores the epistemic impact of the imaginative fabrication. To make sense of iconophilia, we should have a theory of perceptual justification that gives a fair role to imagination and it is not obvious how. Even is such theory exist, the result seems to imply that perceptual beliefs based on amodal completion are neither sensitive nor safe. This dilemma shows we have a real puzzle about perception and imagination.

#### Chapter 3. A Metacognitive Theory of the Penetrability of Perception

The epistemological dilemma introduced in the previous chapter was the result of [Iconophobia] which was Teng's solution to the problems of [CPP]. In particular, it is an answer to the *epistemological* problem of [CPP] that relies on Macpherson's answer to the psychological problem of [CPP]. Should we abandon Macpherson's imagery theory of [CPP]? I don't think that's necessary. But, at the same time, the previous dilemma is strong. So, the real question is if we can avoid the epistemological dilemma while at the same time maintain our answer to the psychological problem of [CPP]. I think we can. In this short chapter, I'll sketch such solution. The strategy is as follows. First, we need a theory of [CPP] that is consistent with Macpherson's imagery theory (the psychological problem). Second, the theory needs to provide the basis to analyze the issues of [CPP] with perceptual justification (the epistemological problem). Third, unlike Teng's theory, our solution should avoid the dilemma. Whether or not [Iconophobia] is true, the real issue is that it doesn't distinguish bad cases of [CPP] from ordinary cases of amodal completion. So, any theory of [CPP] that wants to avoid the dilemma should be able to account for the relevant differences between them. Note that my main concern here isn't to produce a straightforward case, it is rather to show that an empirically plausible solution is available. In particular, it is possible to sketch a theory of [CPP] that avoids the previous epistemological dilemma but at the same time preserve the psychological role of imagination.

## A Sketch of a Solution

Let's start with a brief reminder of MacPherson's theory of [CPP] (MacPherson, 2012). The fundamental idea is that [CPP] works by a two-stage mechanism. The first stage of the mechanism involves imagery-activation. The cognitive state (e.g. the belief with the content P) triggers an imaginative state (an imagining with the content P). The second stage involves the causal interaction between the imaginative state and the stimulus-driven perceptual state which brings about the penetrated perceptual experience with the P-like content.

I think that if MacPherson's mechanism of [CPP] is on the right track there are still some questions to answer. She says the second step of the mechanism involves interaction between the phenomenal character of imagery and perception. Thus, in [Blue bananas] participants represent the color properties of the stimulus as yellow by mental imagery and represent other aspects such as shape by stimulus-driven perceptual processing, this combination brings about the perceptual experience as of a yellowish banana. Although we are talking about only one experience (the experience as of a slightly yellow banana) the phenomenal character clearly has two sources: the imaginative state and the stimulus-driven perceptual state. There are two fundamental questions here. The first one is this: Why subjects continue desaturating a gray image that looks yellow if the 'yellowish' property comes from imagination? The most obvious answer is that they are not aware of that. In those circumstances, based on their ongoing experience, they cannot discriminate whether they are imagining or perceiving. If they were able to know that the color property in their experience comes from imagination, they simply wouldn't perform the task in the way they did. But more importantly, if they were able to know just based on their experience (not testimony) that the yellow phenomenology comes from imagery, the banana wouldn't look yellow to them. The second question is this: Why subjects are unable to know (based on their experience) that the phenomenal character of their color experience has an imaginary source?

I say the inability to discriminate between the two sources (imagination & perception) based on experience is obtained due to a metacognitive deficiency related to our reality-checking capacity. This metacognitive function comes under several names: reality-checking, reality-testing, reality monitoring or sense of reality. The core idea behind those tags is that, under normal conditions, there is a mechanism that monitors and help us to distinguish between self-generated and stimulus-driven representations (Johnson & Raye, 1981; Bentall, 1990). My claim is that this reality-checking mechanism is deficient in bad cases of [CPP]. This is consistent with an early explanation of the Perky effect based on signal detection theory, according to which mental imagery produce an internal signal, and the external sensory signal must be discriminated both from the internal and from background noise (Segal & Fusella, 1970). The metacognitive approach to [CPP] is also fully consistent with the imagery theory proposed by MacPherson' since is just a minor extension of the second stage in the mechanism. Thus, the proposed solution starts with an answer to the psychological questions that is consistent with the imagery theory of [CPP]. This satisfies the first requirement.

As we said before, the main evidence of substantive confusions of imagination with perception comes from psychopathology. In particular, cases of hallucination are taken to be vivid and involuntary forms of imagery. Furthermore, several theories claim that hallucinations are the result of a breakdown in a metacognitive function (reality-testing) involved in the discrimination of self-generated and stimulustriggered representations (Bentall, 1990; Dokic & Martin, 2012). The failure of a self-monitoring process like this is sometimes spelled out in Bayesian terms, particularly, as a failure of prediction error -due to strong priors- that is fundamental for updating representation about the external world (Fletcher & Frith, 2009; Corlett *et al.*, 2007 & 2018). The classical example of a breakdown of the mechanism is psychotic symptoms in schizophrenia (Frith, 1992; Frith, 2005). But there also mild forms of alteration of this mechanism that include non-psychotic cases. One example is derealization syndrome, in which people can discriminate between internal and external sources of representation (intact reality-testing) but the overall phenomenology is significantly altered (Simeon & Abugel, 2006; Sierra, 2009). So, it is very likely that this mechanism not only plays a role in the cognitive monitoring of internal/external events but in the overall 'sense of reality' (Aggernaes, 1972; Farkas, 2013).

## Metarepresentation and Psychopathology

Two objections might be raised against the metacognitive theory of [CPP]. Let's call it 'the psychiatric objection' and 'the metarepresentational objection'. On the one hand, according to the psychiatric objection, the metacognitive theory is wrong since it attributes something close to a psychotic malfunctioning to an ordinary case of [CPP]. Furthermore, the sample in the experiment of [Blue bananas] cannot be a psychiatric population that is hallucinating during the color-adjustment task. On the other hand, according to the metarepresentational objection, the metacognitive theory of [CPP] is wrong because metacognition entails metarepresentation and perceptual experience cannot be metarepresentational. Thus, [CPP] cannot be a metacognitive phenomenon.

To answer these objections, we should bear in mind the scope of the metacognitive theory. First, I'm not claiming that the metacognitive mechanism of reality-checking is malfunctioning, I'm saying that is deficient in bad cases of [CPP]. If you cannot do well in a cognitive task that demands you to exceed the average working memory capacity, you don't have a psychological malfunctioning, is just that your working memory is average. However, to explain the performance of this demanding task we can say that humans don't do well due to a normal memory deficiency. This is what I mean by a 'deficiency'. You might prefer a different word (e.g. metacognitive limitation) but what is important in this example is that to explain your performance, we should appeal to the limited capacity and your inability to store more items (normal memory deficiency). Likewise, in bad cases of [CPP] what is important is that, after the imagery activation takes place, what explains your performance in [Blue bananas] is your
inability to discriminate between imagining and perceiving (normal metacognitive deficiency). Thus, to answer the psychiatric objection we can deny the attribution of malfunction in the explanation of [CPP]. There is nothing psychopathological about this metacognitive deficiency. Another example of a normal metacognitive deficiency is dreaming. Usually our reality-checking mechanism is deficient during dreaming states (Hobson, 1999), however, there is nothing psychopathological about it. Furthermore, like [CPP] dreaming may also involve a problematic epistemology (McGinn, 2006).

Similarly, to answer the metarepresentational objection we should remember the scope of the metacognitive theory. I'm not claiming that the reality-checking mechanism (that may or may not be metapreresentational) is involved in [CPP]. It is precisely the lack of involvement of that mechanism (metacognitive deficiency) what explains the inability to discriminate between imagination and perception. What makes true that the problem is metacognitive is that the following counterfactual is true: if the reality-checking had been present, then (on the basis of their experience) subjects would have been able to discriminate between imagery and perception. Nevertheless, even if you want to claim that there is a robust metacognitive engagement in [CPP], it is not obvious that [CPP] should entail metarepresentation. There are several reasons to support that metacognition and metarepresentation are rather two separate functions (Proust, 2007: Proust, 2013). Finally, even if we accept that metacognition entails metarepresentation, it is not obvious that experience cannot involve higher-order representations. After all, this is the main insight behind higher-order theories of consciousness (Rosenthal, 2000). Thus, neither the psychiatric nor the metarepresentational objection succeed.

# Imagination, Metacognition and Perceptual Justification

Given that I've already presented my metacognitive theory, we are in a position to say something about the epistemological problem of [CPP]. Let's evaluate [Blue bananas]. In the [Blue bananas] case, subjects have to perform a color adjustment task. They started with a prior belief about how bananas look like (yellow) but during the task, they are forced to update that belief based on the incoming sensory evidence. However, given that [CPP] takes place, their belief activates an imaginative state that represents the stimulus to be yellow in such a way that, when they reach the gray point, the banana still looks slightly yellow to them. This perceptual experience as of a yellowish banana was caused by the prior belief about how bananas looks, and so, is epistemically downgraded. Why this is so? We have already said that blaming imagination cannot be the answer since it led to a difficult dilemma.

The epistemological story that I offer about [CPP] is simple. We have accepted that in the first stage of [CPP] there is imagery-activation, but we have also said that on the second stage the mechanism involves a metacognitive deficiency. A mechanism with a metacognitive deficiency affects the reliability of judgments in bad cases of [CPP] since the agent is not able to discriminate between self-generated and stimulus-driven representations, and therefore, she is more likely to predicate properties that external objects are not instantiating (falsidicality). Alternatively, you may say the metacognitive deficiency in bad cases of [CPP] affects the reliability of the agent making her more prone to confusions between imagination and perception and to form false perceptual beliefs. This is true of the [Blue bananas] case. Subjects predicate yellowness of a gray object because they cannot track the imaginative source of the color experience and that makes them less reliable (as shown by the behavior of adjusting the color of the banana to blue). So, the metacognitive theory also satisfies the second requirement.

The metacognitive theory also has the advantage that doesn't entail the massive downgrade of our ordinary perceptual experience in cases of amodal completion. This is so because, considering that amodal completion is just perceptual filling-in, it involves neither confusion of imagination with perception nor any metacognitive deficiency of reality-checking. Furthermore, if amodal completion is based on reliable perceptual learning, there shouldn't be the same epistemic worry as cases of [CPP]. Perceptual learning is based on low-level recurrent processing within the sensory stream, it is not an instance of [CPP] (Connolly, 2019). So, unlike Teng's theory, the metacognitive approach satisfies the third requirement and can explain why there is something wrong with [CPP] and not with amodal completion despite the fact that both processes may depend on mental imagery.

To sum up, my theory can provide an answer to the *epistemological problem* of [CPP] by appealing to a metacognitive deficiency that produces a reduction of reliability; but at the same time, it is consistent with the previous answer to the *psychological problem* of [CPP] (Macpherson's theory) and avoid the dilemma by distinguishing bad cases of [CPP] from ordinary cases of amodal completion.

### Chapter 4. Disjunctivism and Mental Imagery

Disjunctivism is probably the best strategy available to deal with the argument from hallucination against naïve realism. According to it, phenomenal indistinguishability is not sufficient to determine the sameness of experiences. Furthermore, there isn't a relevant common factor between veridical perception and hallucination. Although this strategy is enough to reject the conclusion of the argument, it leaves open important questions about the nature of veridical perceptual experience and hallucination. One recent proposal to provide a positive account of hallucination is to appeal to mental imagery (Allen, 2015). In this chapter, I'll argue that this strategy fails based on previous ideas about amodal completion and mental imagery. The chapter will be divided into four sections. In the first section, I introduced the argument from hallucination and mental imagery. In the third section, I'll present my argument against disjunctivism based on [SBI]. Finally, in the last section, I discuss some possible replies to my argument.

### Appearances, Reality and Disjunctivism

An intuitive picture that describes how the mind is related to the world is that in perception the objects of awareness are mind-independent entities. The classical defense of this claim comes from a theory called 'naïve realism'. According to the naïve realist, perceptual experience fundamentally involves a direct relation to worldly objects in such a way that its phenomenal character is determined by the properties of those mind-independent entities. Moreover, on this view perceptual experience is *constituted* by them (Brewer, 2011; Campbell, 2002). However, the realist picture has traditionally been challenged by the idea that the same kind of mental state can be brought about just by manipulating the adequate proximate internal causes, for example, inducing a hallucination by manipulating brain-states. Thus, perceptual experience may not involve a relation to mind-independent objects after all (Robinson, 1994). This puzzle shows the tension between two ideas. First, the intuition that perceptual appearance can be obtained without the objects from the external world. Consider the following argument:

### The Argument from Hallucination

Pi) In perception the object of awareness is a mind-independent entity.
Pii) In hallucination the object of awareness is not a mind-independent entity.
Piii) If two experiences can be phenomenally indistinguishable, they are the same kind of experience.
Piv) If two experiences are of the same kind, they have the same kind of object of awareness.
Pv) Perception and hallucination can be phenomenally indistinguishable.

*C'*) In perception the object of awareness is not a mind-independent entity [Contradiction]

*Pi* (direct realism) and *C*' are inconsistent, thus, something has gone wrong with our assumptions. *Pii* and *Pv* are uncontroversial unless someone wants to insist that perfect hallucinations are impossible, or hallucination is not defined by the absence of external objects (Lewis, 1980). *Piv* is usually rejected by representationalists (see the next chapter) and *Piii* (known as 'the common factor premise') is rejected by naïve realists. However, there are different ways of rejecting *Piii*. One way is to say that phenomenal indistinguishability is not transitive (the phenomenal sorites argument) and since identity entails transitivity, phenomenal indistinguishability is not sufficient to determine the sameness of experiences (Graff, 2001). Although this response is plausible, the naïve realist usually appeals to a different sort of strategy.

The most popular strategy to vindicate naïve realism from the argument of hallucination is to reject *Piii* by endorsing *disjunctivism* (Soteriou, 2016). According to disjunctivism, *there is no substantive common factor between perception and hallucination,* in the sense that sentences of the form  $\lceil x \rceil$  looks F to  $S \rceil$  that can be true in cases of veridical perception and hallucination, don't obtain their truth-value in virtue of the same kind of mental state. The only relevant state that makes true the previous sentence in cases of perception-hallucination is the one expressed by the following disjunction: *either S is seeing an x that looks F or S is hallucinating an x that looks F* (Hinton, 1967). Again, the main motivation of disjunctivism is to introduce a plausible response to the argument from hallucination, so, pretty much any reason to endorse it has to do with the benefits of accepting naïve realism.

One natural question for this view is this one: what kind of mental state is a hallucination if is fundamentally different from perception? The classical answer is that hallucination should only be characterized negatively, a hallucination is a kind of mental state that is *not* phenomenally distinguishable from perception. As it is stated the definition heavily depends on the notion of 'indistinguishability'. One of the most famous conceptions of hallucination that relies on this notion comes from the work of M.G.F Martin (2004 & 2006) and can be characterized as follows:

[The Negative Epistemic Account]: A hallucination as of F is a mental state that is phenomenally indistinguishable from the perceptual experience as of F, i.e the subject cannot know based on her experience whether she is perceiving F or not.

This account of hallucination is negative because it doesn't tell us what the true nature of hallucination is (if any), it rather characterizes it in terms of what is not. It is epistemic because the core property is phenomenal indistinguishability, *i.e.* inability to know based on experience (or introspection). One of the limitations of the negative epistemic account is that it doesn't provide an answer to what I call '*the key question-1*': how could two experiences that are fundamentally different (perception and hallucination) be phenomenally indistinguishable for the subject? More dramatically: How does the disjunctivist explain that a mental state that is phenomenally indistinguishable from perception can have a different phenomenal character? Key question-1 is really difficult for disjunctivism and any plausible answer probably requires a positive account of the nature of hallucinations.

### Either Hallucination or Imagination

A reasonable place to look for clues about the nature of hallucination is psychopathology. The definition of 'hallucination' provided by the 5<sup>th</sup> edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) is the following: "*perception-like experiences that occur without an external stimulus*" (p. 87, 2013). There is a striking resemblance between the previous definition of hallucination and the definition of mental imagery: *perceptual processing not triggered by sensory-stimulation in a given sense-modality* (Nanay, 2018a). So, the idea that hallucination is very close to imagination shouldn't be surprising at all. In fact, a lot of the evidence in psychopathology support the idea that a hallucination is a form of vivid and involuntary mental imagery (Slade & Bentall, 1988; Bentall, 1990). Outside the psychiatric domain, hallucination as mental imagery has also been endorsed by representationalists like Bence Nanay (2016) and by naïve realists like Keith Allen (2015). According to Allen, the theory of hallucination as imagery provides us with a positive account that is more explanatory than Martin's negative epistemic account (Allen, 2015):

[The Imagery Account]: A hallucination as of F is an imaginative state that is phenomenally indistinguishable from the perceptual experience as of F, i.e the subject cannot know based on her experience whether she is perceiving F or imagining F.

The imagery account is a positive theory about hallucination since it tells us what its real nature is: an imaginative state. Furthermore, it is also an epistemic theory because appeals to phenomenal indistinguishability. A critical issue for the imagery account is this one: Are there good reasons to think that people can confuse imagination with perception? The answer is yes, there is empirical evidence that shows how under controlled circumstances people can confuse perceptual states with imaginative states (the 'Perky effect').

One of the major advantages of the imagery account of hallucination is that provides a nice answer to the question of how something that is not perception can be phenomenally indistinguishable from it (key question-1). We have evidence that sometimes people do confuse perception with imagery (Perky effect) as suggested by the imagery account; and if perception and imagination are different kinds of mental states, this becomes evidence for phenomenal indistinguishability between different kinds of mental states. Thus, in cases of perfect hallucinations, we don't have a perceptual state, but something phenomenally indistinguishable from it (perfect imaginative states). However, one important question remains, let's call it "*the key question-2*': How can imagery and perception be different kinds of mental states if they are phenomenally similar?

Martin doesn't identify hallucinations with imaginings, nonetheless, he has a theory of why perception and sensory imagination are two different kinds of mental states (key question-2). According to his account, the content of mental imagery is the representation of perceptual experience. This is called "the dependency thesis" (Martin, 2002):

### [The Dependency Thesis]: To have an experience of visual imagery is to imagine a visual perception.

On this account mental imagery is a representation of a perceptual state. This is a straightforward way of distinguishing between perception and imagination. While perception is essentially *relational*, imagery is essentially *representational*. So, combining Allen's account of hallucination and Martin's account of sensory imagination, we can say that perfect hallucinations just are perfect imaginative episodes in which people involuntarily represent vivid perceptual experiences. The conjunction of the imagery account and the dependency thesis form a powerful combination for disjunctivism because it explains: (i) the difference between hallucination and perception despite their phenomenal indistinguishability *(key question-1)* and (ii) the difference between perception and imagination despite their phenomenal similarity *(key question-2)*.

# **Against Disjunctivism**

The main concern for the version of disjunctivism I presented is that, as we said in the previous chapters, there is a lot of evidence suggesting that the perceptual phenomenon of amodal completion works by mental imagery (Nanay, 2010):



Figure G

If this is true then mental imagery is *constitutive* of the perceptual experiences that are instances of amodal completion, which is pretty much all our ordinary perceptual experience. In *figure G*, we can appreciate an ordinary instance of amodal completion based on local cues (T-junctions) which is widespread. Moreover, it would be fair to use the label 'ordinary perception' to refer to veridical perceptual experiences of 2D partially occluded objects or non-transparent 3D objects. Thus, generalizing [SBI] we can state the following idea associated with perceptual completions:

[Completion by Imagery]: Mental imagery is constitutive of ordinary perception (veridical perceptual experiences of 2D partially occluded objects and non-transparent 3D objects).

If [Completion by Imagery] is true, we put forward the following argument against disjunctivism:

P1\*) A hallucination as of F is an imaginative state that is phenomenally indistinguishable from perceptual experience.

P2\*) An ordinary and veridical perceptual experience as of F is constituted by an imaginative state.

C\*) There is an underlying mental property in common between hallucination and ordinary perception.

P1\* just is the [Imagery account] of hallucination and P2\* is the theory of [Completion by Imagery] based on [SBI]. C\* seems to suffice for rejecting disjunctivism, since if x is F and y is constituted by F, then there is something substantive in common between x and y, namely, being related to F. In the next section, I'll assess some ways of rejecting the conclusion against disjunctivism.

### Neither Disjunctivism nor Naïve Realism

I see only three ways of defending disjunctivism from my argument. The first one is to reject P1\*, the second is to reject P2\* and the third one is to say that regardless of P1 and P2, C\* is still consistent with disjunctivism. Let's analyze each.

The first natural response is to deny the [Imagery account] of hallucination. A disjunctivist may object that the nature of the real psychological phenomenon of hallucination isn't an issue since we are just talking about a mere possibility. Even if we take this point, the natural question is: what would the qualitatively indistinguishable mental state be if it were to exist? Martin has no answer to that. Contra Martin, we can illuminate the nature of this possibility by exploring the suggestion that comes from psychopathology. There might be other stories about hallucination, for example, Fish (2008) or Johnston (2004), but these are also very problematic for reasons that are beyond the scope of this chapter (Dunn, 2008; Siegel, 2008).

The second reply is to deny P2\*. There two ways of doing this. The first way is to deny that imagery is involved in amodal completion and say that 'perceptual filling in' works with a different kind of mental state. The main problem with this option is that is an empirical claim without substantive evidence. The classical alternative to imagery in amodal completion is belief (Nanay, 2010), however, we have already shown in the first chapter that the belief-theory of completion cannot account for the early perceptual processing, the insensitivity to evidence and the sensory phenomenology of completion. The second way is to accept that imagery is involved in amodal completion but deny its role in ordinary perception. Moreover, you may say my notion of ordinary perception is completely *ad hoc* since what I've called 'ordinary perception' is precisely the set of cases of amodal completion. I

see this is as a verbal disagreement. However, the reason why I did the analytic equivalence between 'ordinary perception' and 'perceptual instances of amodal completion' is that there is almost a perfect overlap between them. Both include the perception of 3D non-transparent objects and 2D partially occluded objects. If you don't trust me just look around and try to find a single case of fully stimulus-driven perception.

Finally, the last objection is to accept C\* but say is consistent with disjunctivism. I see three ways of achieving this. First, you may say the conclusion only establish the common factor between hallucination and what I've called 'ordinary perception'. However, disjunctivism is not just a theory of ordinary perception but perception in general. My reply is that the only kind of perception that isn't obtained by amodal completion is the perception of 2D non-occluded objects and 3D transparent object. Given that the main motivation for disjunctivism is naïve realism, this reply is only plausible for a disjunctivist that is only concerned with a very limited set of instances of our perceptual experience. If the main project behind naïve realism is to vindicate the phenomenology of ordinary perception, disjunctivism cannot be a strategy with such a limited scope.

The second way of accepting the conclusion is like the previous one. One might insist that, although in ordinary perception we confront cases of amodal completion, the disjunctivist strategy is only relevant for the object-parts we see, not for the occluded object-parts. So, you may accept that in amodal completion imagery is doing the 'filling in', but you're not seeing those parts, you're imagining them. Thus, you can maintain that there is no common factor between hallucination and perception, since visual perception (unlike what I called 'ordinary perception) is about what we see (in the factive sense) not about what we complete by imagery. You may even appeal to the Moorean discussion on sense-data and the perception of surfaces about whether we can see an object directly in virtue of seeing only its surface (Martin, 2017). My response to this objection is that our perceptual phenomenology is not only about what we see (in the factive sense) but about what we perceptually experience, which include things that are not visible, but we experience as present (phenomenal presence). Therefore, the phenomenal character of a veridical experience is not only determined by what we see, but it also concerns invisible properties as long they contribute to the way things appear. Both naïve realism and disjunctivism share this concern for the phenomenology of vision, thus, the debate not only concern visible properties. The Moorean discussion about surfaces and sense-data is about 'seeing' or 'seeing directly'. As I said, the discussion in amodal completion isn't about 'seeing' in the factive sense, is about visually experiencing. My claim is fully consistent with the idea that you can see

an object directly just by seeing one of its proper parts. For example, by seeing a proper part of a partially occluded object *O* you might see *O*, but clearly, you don't see the invisible parts of *O* (that's the meaning of 'invisible'). Nonetheless, by amodal completion, you can *visually experience* some invisible parts of *O* as present *without seeing them*.

The last way of endorsing the conclusion as consistent with disjunctivism is more serious. According to this objection, amodal completion by imagery is present in both hallucination and ordinary perception but isn't relevant because the role imagery plays occurs at the level of perceptual processing, not phenomenology. In fact, we are not visualizing occluded object-parts all the time in ordinary visual experience. On this view, the imagery theory of amodal completion is a theory of the subpersonal mechanisms behind ordinary perception and this is irrelevant for disjunctivism. I have two things to say to this objection. The first is that I agree that the imagery theory of completion isn't primarily a phenomenological theory. However, what is relevant for the debate is that it explains how imagery can make a difference in the way things look, especially, in how we can be aware of invisible object-parts and experience them as present in the overall phenomenal state. Thus, the imagery theory provides an account of the problem of phenomenal presence. Second, as I mentioned in the first chapter, there is evidence that the timing of amodal completion matches the timing of conscious perceptual processing in vision (Sekuler & Palmer, 1992; Koivisto & Grassini, 2016). Therefore, the theory doesn't entail that completion by imagery is always unconscious. If we direct our attention during amodal completion, we can experience the phenomenal presence of invisible object-parts.

In sum, I have presented a case against a plausible version of disjunctivism based on the perceptual phenomenon of amodal completion. I believe this isn't the whole story that we can tell against naïve realism based on imagery. If the [Dependency Thesis] is true, then mental imagery is a representation of perception, but as we said, imagery can also be constitutive of ordinary perception. This shows against certain versions of naïve realism, that perceptual phenomenology cannot be purely relational, there might be a substantive representational element embedded in perceptual experience. Precisely, in the next chapter, I'll discuss representationalism.

### Chapter 5. Representationalism and Mental Imagery

One of the most popular responses to the problem of perception is representationalism. According to this theory -roughly- the phenomenal character of perceptual experience is determined by its content. Several arguments have been advanced against representationalism based on thought experiments (e.g. inverted earth) and empirical facts about perception (e.g. covert attention), but in some way or other, defenders of this theory have managed to avoid them by appealing to what I call 'the representation strategy'. On this chapter, I'll add one more counterexample to the list. Mine is, unsurprisingly, based on the previous ideas about amodal completion by mental imagery and it is directed to a paradigmatic version of representationalism. I'll argue that if we take my counterexample seriously and accept certain plausible assumptions, the representation strategy ultimately fails, and therefore, at least some important varieties of representationalism are false. The chapter is divided into four sections. In the first section, I introduce representationalism and I'll narrow down different versions to my target. In the second section, I'll discuss the notion of perceptual content and what I've called 'the representation strategy'. In the third section, I present my counterexample based on [SBI]. Finally, in the last section, I discuss some possible replies to my case against representationalism.

#### Representationalism, Consciousness and The Problem of Perception

The problem of perception shows the tension between two ideas. On the one hand, the idea that perception involves a relation to the external world; and on the other hand, the idea that the same kind of perceptual experiences seems to be obtainable without the objects from the external world. By adding some equally intuitive premises it is possible to argue that we cannot be aware of mind-independent objects (the argument from illusion/hallucination). Some philosophers are happy to endorse this conclusion and say that we are only acquainted with sense-data (Robinson, 1994), but most people are not.

A popular solution to the puzzle is known as 'representationalism' and it roughly says that the phenomenal character of a perceptual experience is determined by its representational content. On the one hand, the phenomenal character of a perceptual experience is what it is like to have that experience (in the case of vision, we are referring to the way things look). On the other hand, the representational content of an experience is, or at least determines, the accuracy conditions of that

experience. Representationalism highlights the intentional nature of perception by explaining the phenomenal character in terms of the representational content. This offers two major advantages. First, it allows us to say that we are directly aware of mind-independent objects (direct-realism); and second, it explains -without appealing to sense-data or qualia- why the same kind of perceptual experience can be obtained in the absence of mind-independent objects if the representational content is the same in the non-veridical case. On this view hallucination just is perceptual misrepresentation.

I would say that nowadays representationalism is to the problem of perception, what non-reductive physicalism is to the mind-body problem (Bourget & Chalmers, 2014). Furthermore, given how the phenomenology of perception is explained in terms of intentionality, the relation between the philosophy of perception and philosophy of mind becomes somewhat arbitrary here. The representationalist solution to the problem of perception can be generalized as a major theory that is not constrained to perceptual experiences but can account for conscious experiences in general. On this view, representationalism is a general theory about the relationship between consciousness and intentionality and is usually defined in terms of supervenience. We can define supervenience representationalism (SR) as follows:

**[SR]:** Necessarily, for any pair of experiences E and  $E^*$ , if E and  $E^*$  differ in their phenomenal character, they differ in their representational content.

[SR] is defended by a number of philosophers (Harman, 1990; Shoemaker, 1994; Dretske, 1995; Tye, 1995; & Byrne, 2001). But some people think that it is too strong and underspecified. The most radical explanation of [SR] is spelled out in term of identity between phenomenal and representational properties (strong representationalism), but like in the case of physicalism, most people only want to endorse the supervenience claim (weak representationalism). Nevertheless, 'weak representationalism' just seems to be a different label for [SR]. So, to narrow down the options and increase the plausibility, we can constrain [SR] to perceptual experiences (local representationalism) and restrict it to perceptual experiences within the same sensory modality (intra-modal representationalism). So, we obtain the following version:

**[SRLI]:** Necessarily, for any pair of perceptual experiences E and  $E^*$  within the same sensory modality, if E and  $E^*$  differ in their phenomenal character, they differ in their representational content.

[SR] entails [SRLI], but the latter is weaker and, arguably, more plausible. Nonetheless, there are some philosophers that identify themselves as representationalists but wouldn't accept it. For example,

Lycan (1998) considers functional properties in addition to the representational contents, and, Crane (2009) claims that we need the entire intentional nature (mode and, content) to account for the phenomenology of perception. Regardless of these versions, my claim will concern [SRLI] since by showing that is false it follows that [SR] is false as well.

# Perceptual Content & The Representation Strategy

Several arguments have been advanced against representationalism, I classify them in three generations. The first generation of arguments is composed of classical thought experiments like inverted spectrum or inverted earth (Shoemaker, 1982; Block, 1990). The second generation is constituted by perceptual oddities directed against the transparency thesis, for example, blur, after-images, and double-vision (Tye, 2002). The third generation is a set of more detailed empirical phenomena such as covert attention (Block, 2010; Speaks, 2010) spatial perception (Masrour, 2017), ambiguous figures (MacPherson, 2006) and perceptual organization (Nickel, 2007). Following Block (2010), let's focus on the third generation by taking the example of attentional phenomena:



[Attention]: You're attending to a fixation point between two Gabor patches that have the same contrast, but you're looking at the whole scene. Without moving your eyes, you shift your attention from the fixation point to the right patch and then to the left patch. With each attentional shift, the patches look different in terms of contrast. Thus, your visual experience of looking at the right patch and attending the fixation point is phenomenally different from your experience of looking at the right patch and attending the right patch.

Since you were looking at the same distal stimulus from the same spatial perspective without moving your eyes, it seems fair to say that the representational content of your experience is the same in each case (it has the same accuracy conditions). But [Attention] shows that you visually experienced different contrast-levels. Therefore, we have a pair of visual experiences with the same content but different phenomenal character. This is a putative counterexample to [SRLI] and the case is not a fiction, there is experimental evidence that shows how covert attention enhances contrast-sensitivity (Carrasco *et al.*, 2004). How to defend [SRLI] from [Attention]?

The key assumption behind the counterexample is that [Attention] doesn't entail differences in perceptual content. A typical representationalist response would be to question the assumption and say, for example, that perceptual content is the sum of properties attributed to the perceived scene including the enhanced contrast-levels by attention (Nanay, 2010b). So, to avoid problems with [Attention] we just need to enrich the notion of perceptual content by incorporating the alleged purely phenomenal property and 'representationalize it' in such a way that the content becomes more fine-grained and includes it. Something along these lines is endorsed by Chalmers (2004) regarding representational properties when talking about counterexamples to representationalism: "there is a natural strategy for dealing with them: one can add more specificity to the manner of representation" (p.347).

The previous strategy can be generalized as follows: A representationalist theory is any theory R that satisfies [SRLI]. R can always be combined with a theory of perceptual content C in such a way that we can characterize any particular representationalist theory as the conjunction R & C. If A is a counterexample to R, then to 'representationalize' A, we just need to enrich C in such a way that it becomes fine-grained enough such that R & C is consistent with A. I'll call this move 'the representation strategy'. Something similar is done by consequentialists in ethics when it comes to disagreements about rightness/wrongness of actions and maximizing the good. They just need to 'consequentialize' the counterexample into their theory of the good (Brown, 2011). However, as suggested by Brown, if we think about 'the good' as a theoretical term we see that we cannot build anything we want into its referent. I think alike regarding 'perceptual content'. It is a theoretical term that has explanatory limits, and this is not a bad thing. If we build anything into the notion of content, it might become trivial. There are different views about the nature of perceptual content. Some people think about it as accuracy conditions (Siegel, 2010) or the way the world appears to the subject (Byrne, 2009), but I take the following as a desideratum for what the content of a perceptual experience should be: (a) it determines a set of accuracy conditions, (b) it should be fine-grained enough to play a role in

the explanation of relevant behaviors, but (c) it should be coarse-grained enough to preserve a sharp distinction between intentional mode and content.

A notion of content that satisfies my desiderata is the Russellian theory (King, 2007). According to the theory, perceptual content is a complex structure constituted by objects and properties. Russellian content is more fine-grained than possible-world content (set of possible worlds) but more coarsegrained than Fregean content (ways/modes of presentation of objects and properties). However, in the Fregean notion, the distinction between mode and content becomes blurry. It is not a coincidence that people that are sympathetic with the representation strategy -like Chalmers- also defend a Fregean notion of phenomenal content (Chalmers, 2006). Thus, when arguing against [SRLI], I'll think of representational content to be Russellian in nature. Finally, you may think that if we take the notion of perceptual content to be Russellian, then the representation strategy is acceptable for cases like [Attention]. However, in the next section, I'll present a counterexample to [SRLI] that cannot be explained by using the representation strategy.

# Against Representationalism

Like in the previous chapters, let's have a look to another instance of amodal completion. The following picture has a particular phenomenal saliency:



Figure H

Most people experience *figure* H as if the cat continues behind the cylinder. It perceptually appears/look as if there is something behind the cylinder. So, let's represent the content of the experience of *figure* H as follows: <cat, continuum>. This means that our experience represents that

cat as continuing behind the cylinder. If the mental imagery theory of amodal completion is true, then imagery is playing a constitutive role in the perceptual experience of *figure H* (Nanay, 2010). Given what we have already assumed about the imaginative nature of amodal completion, we can add more information by specifying the sources of representation (the intentional mode) of each constituent as follows ('SP+MI' means *stimulus-driven perception plus mental imagery*): <cat, continuum><sup>SP+MI</sup>. Is there any alternative to the imagery theory? Yes, the doxastic theory. According to this theory, the representation of occluded object-parts in amodal completion works by belief. As we also said in the first chapter, one of the main problems for the doxastic theory is to account for cases like the following:



#### Figure I

*Figure I* shows evidence of a clear pattern of completion for the figure behind the circle. However, most people amodally complete the figure as a square despite all the evidence provided. If belief were doing the representation in amodal completion it would be expected something consistent with the exhibited pattern (belief is sensitive to evidence). Another problem for the doxastic theory is that amodal completion takes place at a very early stage of perceptual processing in the brain, which also explains why we automatically 'fill' the sensory gaps in a way that is insensitive to the evidence.

However, even if the imagery theory is true, is only *contingently true*. Nanay's arguments for the theory are based on contingent truths about imagery and perceptual processing in the brain. This means it is possible that in nearby worlds, in cases of amodal completion other representational states do the work of 'filling-in the object'. I would say the best candidate as an alternative is precisely belief. So, we can think of a scenario in which someone experiences *figure H* but she amodally represents *figure H* by

belief. We can characterize her experience as follows (where 'B' stands for belief): <cat, continuum><sup>SP+B</sup>.

As shown by the previous tuples, the Russellian content of the experience of figure H in the actual worlds is identical to the content of what happens in the counterfactual case. The key question for my argument against [SRLI] is whether there is any phenomenal difference between the experiences <cat, continuum><sup>SP+MI</sup> and <cat, continuum><sup>SP+B</sup>. I say there is a difference if we accept that imagery and belief have different phenomenal imports to the overall perceptual experiences. Arguably, if Nanay's theory of amodal completion is true, we can defend the phenomenal import of imagery by saying that it has a significant influence on the feeling of presence of invisible object-parts. Does belief also have a phenomenal import? There are three options: (i) there is no phenomenology of belief at all involved in the experience of *figure H*. (ii) there is a phenomenology of belief but is different from the phenomenology of imagery in figure H. (iii) there is a phenomenology of belief and it is exactly the same as the phenomenology of imagery in *figure H*. The only way of defending [SRLI] from my argument is to endorse (iii). But I take this option to be implausible, there is no a priori reason or empirical evidence to think that the phenomenology of belief (if any) is remotely similar to the phenomenology of imagery. Another option to defend [SRLI] will be to apply the representation strategy and build the modes of representation SP+MI/B into the representational content. However, this violates the proposed desiderata. So, given that there is a phenomenal difference within the same sensory-modality between <cat, continuum><sup>SP+MI</sup> and <cat, continuum><sup>SP+B</sup> but they have identical contents, then [SRLI] is false and so is [SR].

# **Resisting Phenomenal Completeness**

We can summarize my previous argument as follows:

(P1°) If representationalism is true, then, necessarily, for any pair of perceptual experiences E and  $E^*$  (within the same sensory modality), if E and  $E^*$  differ in their phenomenal character, they differ in their representational content.

(P2°) The pair of experiences within the visual modality <cat, continuum><sup>SP+MI</sup> and <cat, continuum><sup>SP+B</sup> are representationally identical, i.e. they have the same perceptual content.

(P3°) If representationalism is true then the pair of experiences <cat, continuum><sup>SP+MI</sup> and <cat, continuum><sup>SP+B</sup> are phenomenally identical, i.e. they have the same phenomenal character.

(P4°) The pair of experiences <cat, continuum><sup>SP+MI</sup> and <cat, continuum><sup>SP+B</sup> aren't phenomenally identical.

-----

C°: Representationalism is false.

P1° is just my characterization of representationalism (SRLI) and P3° follows from P1° and P2°. So, you might resist my conclusion against representationalism by question other premises and hidden assumptions. Let's make a short list of the most salient: amodal completion by imagery and its contingency, conscious representation during amodal completion, the sameness of perceptual content (P2°); and finally, the heterogenous phenomenal import of imagery and belief (P4°).

The first objection is against the empirical theory of amodal completion by imagery. One may say it is false. My response is that one of the classical motivations for representationalism is a naturalistic attitude in which there is a continuum between cognitive sciences and philosophy. A natural way of being consistent with this attitude is to accept the best empirical evidence available and, there is evidence at the cognitive, behavioral and neurophysiological level for the imagery theory. But suppose Nanay's theory is false and the belief theory is true. Here my argument equally works if we just turn things upside down and say that in the actual world the experience of *figure H* is <cat, continuum><sup>SP+B</sup> and in the counterfactual case, the experience is rather <cat, continuum><sup>SP+MI</sup>.

The second objection is against the assumption that amodal completion involves a distinctive conscious experience. So, on this objection, we may represent occluded parts by imagery but that is not reflected in the phenomenology of perception *i.e.* there is no conscious representation. I've already responded to this objection in the previous chapter by saying that the core phenomenal element in amodal completion is usually the *feeling of presence* of invisible object-parts, and I intentionally picked a phenomenally salient case of amodal completion like *figure* H for that matter. But even if you're not convinced by *figure* H, we can appeal to the so-called 'identity hypothesis' (Kellman & Shipley, 1991), according to which the representational process that occurs during *amodal completion* is the same at work during *modal completion* (e.g. Kanizsa triangle). The Kanizsa triangle and modal completions in general have a very straightforward phenomenology. Thus, if the identity hypothesis is true, then the Kanizsa triangle would be a clear case of conscious representation by imagery during perceptual completion.

The third objection is directed toward the idea that experiences <cat, continuum><sup>SP+MI</sup> and <cat, continuum><sup>SP+B</sup> are representationally identical, *i.e.* they have the same content. One way to deny the conclusion against representationalism is to say that those experiences have different contents (against P2°). For example, you can endorse a Fregean theory in which perceptual content is more fine-grained and is not just the complex structure of objects and properties but the way/mode those objects and properties are presented. Thus, you may apply the representation strategy and build the intentional

mode as part of the perceptual content as follows: <cat, continuum, SP+MI> and <cat, continuum, SP+B>. On this approach, the content of the token experiences is not given by the cat and the predicated property but rather by the way/mode those are presented. However, unlike the Russellian content, the application of the representation strategy to *figure H* violates the proposed desiderata since it neglects the distinction between mode (SP+MI/B) and content (cat & continuum). Furthermore, unlike the earlier case of [Attention] there isn't an analogue property to 'representationalize' (e.g, enhanced contrast) since in both cases the same property is attributed to the perceived scene, the core difference between <cat, continuum><sup>SP+MI</sup> and <cat, continuum><sup>SP+B</sup> is the feeling of presence of occluded parts.

The last objection concerns my claim that there is a heterogenous phenomenology in belief versus imagery (P4°). It is controversial to say that belief has a phenomenology at all. So, if you deny the possibility of cognitive phenomenology my claim that <cat, continuum><sup>SP+MI</sup> and <cat, continuum><sup>SP+B</sup> are different, is still true. If, on the other hand, you accept cognitive phenomenology, to resist my conclusion the only way out is to say that the phenomenal import of belief is identical to the phenomenal import of imagery. However, I don't see a reason to defend that claim. There is no evidence that what it is like to believe something is similar to imagining or perceiving. But, when it comes to imagery, there is evidence that the phenomenology of imagery is similar to perceptual experience (Perky effect).

In sum, none of the traditional responses work for [SRLI] under the assumptions I made. Nonetheless, there is still hope for the representationalist. She can abandon the representation strategy, recognize the explanatory limits of perceptual content; and instead, defend the idea that what determines phenomenology is the total intentional nature of the perceptual experience (mode & content). This view is defended by Crane (2000, 2003 & 2009). Although, this form of representationalism is inconsistent both with [SRLI] and [SR], is still fully harmonious with the leitmotiv of Brentano's thesis, the idea that intentionality is the mark of the mental. This is all we need to face the problem of perception and perhaps, the problem of consciousness as well.

### Chapter 6. Behind the Doors of Perception

In the previous chapters, I have explored the consequences of the hypothesis of "seeing by imagination" [SBI] based on the role mental imagery plays in amodal completion (Nanay, 2010). This hypothesis reveals that in typical cases ordinary objects have properties that we represent in perceptual experience by imaginative states. I have explored the consequences of [SBI] for epistemology (perceptual justification), cognitive sciences (the cognitive penetrability debate) and for the philosophy of perception and mind (disjunctivism and representationalism). In this last chapter, I'll assess some concerns about [SBI], I'll suggest a few questions for future research and draw some general conclusions.

### **Beyond Vision**

One potential concern about my arguments might be that I have relied too much on [SBI] which is a very particular theory about the role of mental imagery in amodal completion. Furthermore, I have only provided examples of [SBI] within one modality, vision. This may work for my case against representationalism considering that one counterexample suffices, but to raise the epistemological dilemma and the argument against disjunctivism, I have said the role imagery plays in ordinary perceptual experience is pervasive. So, what if imagination is not constitutive of vision? Well, one may argue that it is true for other modalities (e.g. hearing and touch). But even when there is evidence for amodal completion in other modalities, ordinary perception doesn't present a fragmented phenomenology for different senses, it's rather a rich blending of multisensory experiences. Maybe this multisensory blending is the most important factor in our ordinary phenomenology and not imagery. Indeed, the human brain has evolved to integrate information from different modalities in the computationally optimal way (Driver & Spence, 2000; Ernst & Bülthoff, 2004; Ghazanfar & Schroeder, 2006; Stein & Stanford, 2008) and sensory integration/feature binding seem to be an important fact to explain the unity of consciousness (Zmigrod & Hommel, 2011 & 2013; Bayne, 2014). Thus, if stimulus-driven perception from a single modality isn't enough to explain our ordinary conscious experience, perhaps the integration of sensory information from different modalities can account for our rich phenomenology without appealing to [SBI] or mental imagery. If by 'multisensory experience' here we just mean experience that involves information coming from different senses, then ordinary

perceptual experience is multisensory (Shimojo & Shams, 2001; O' Callaghan, 2015). For example, watching-listening someone playing music, seeing-hearing someone talking, tasting-smelling while eating, etc. But, if multisensory experience can be explained without mental imagery, then it might not be required to account for ordinary perceptual experience. This would be a huge problem for some of my arguments. Let's call this the 'multisensory challenge'.

### Multimodal Mental Imagery

Fortunately, pretty much all my previous arguments can be generalized to meet the multisensory challenge. To illustrate my point, let me begin with an old problem. Suppose a congenitally blind man can tell by touch the difference between a sphere and a cube. One day he recovers his sight. Can he immediately distinguish just based on his visual experience which is the sphere, and which is the cube? This is the famous Molyneux problem formulated to Locke. He believed that ideas were formed on the basis of specific senses, so, his answer was negative. Contemporary neuroscience seems to vindicate his answer (Held *et al*, 2011). But why is "no" the right answer? The basic idea is that Molyneux case involves fast perceptual recognition in virtue of cross modal-mapping from haptic to visual information and this turn out to be computationally very complex for the congenitally blind.

Suppose the congenitally blind were able to use touch information to form the appropriate visual representations without "seeing". If that were the case, then she probably would recognize the objects immediately after recovering her sight. The capacity of forming perceptual representations of one modality triggered by the sensory-stimulation from different modality is what is known as 'multimodal mental imagery' (Nanay, 2018a) or 'cross-modal mental imagery' (Spence & Deroy, 2013). Is this really mental imagery? Well, it is perfectly consistent with the characterization provided in chapter 1: *perceptual processing that is not triggered by corresponding sensory stimulation in a given sense modality*. So, if this is imagery, we may ask if there are genuine instances besides the hypothetical superblind. There are, indeed. Let's begin with some dramatic cases.

One classic instance of multimodal imagery are cross-modal illusions (Macpherson, 2011a). Perhaps one of the most famous are sound-induced flash illusions. In the classical case, two visual experiences are triggered by one visual stimulus (one flash) when is paired with two sounds (two beeps) at the same time (Shams, Kamitani & Shimojo, 2000). Other popular illusions include cases of somatosensory integration combining visual and tactile stimulation such as the Rubber-Hand Illusion (Botvinick & Cohen, 1998) and experimentally induced "Out-of-Body" experiences (Ehrsson, 2007; Petkova & Ehrsson, 2008). In addition, there is strong evidence that mental imagery can be combined with perceptual stimuli to induce multisensory integration in the brain (Berger & Ehrsson, 2014). In fact, classical illusions like ventriloquism or the McGurk effect can be obtained combining visual imagery with auditory stimuli and auditory imagery with visual stimuli (Berger & Ehrsson, 2013). Another instance might be synaesthesia. This involves the perceptual experience typically associated with the sensory modality X when there is stimulation in the sensory modality Y (where X is not Y) (Hubbard, 2007). The usual combinations of modalities in synaesthesia are: visual and haptic (mirrortouch synaesthesia), visual and auditory (color-sound/chromesthesia); and, more specific properties like grapheme-color synaesthesia (Cytowic, 2002; Cytowic & Eagleman, 2009). Another interesting case is sensory substitution, which occurs when people use a prosthetic device that transforms physical stimuli from one modality (e.g. visual) to sensory stimulation in a different modality (e.g. tactile). Blind people with this sort of prosthetic 'vision' tend to report visual phenomenology. Whether this is merely a metaphoric report, or they are literally seeing is a complicated issue (Macpherson, 2011b). But one way to avoid this problem of sense-individuation is to say sensory substitution is neither vision nor touch, is rather an instance of multimodal imagery (Nanay, 2017). Finally, people under the effect of psychedelic drugs usually report hallucinations with a rich multisensory phenomenology that is not triggered by sensory stimulation (Carhart-Harris et al., 2016; Terhune et al., 2016).

One may accept the previous cross-modal phenomena as cases of multimodal imagery, but all of these are very odd perceptual experiences. If instances of multimodal imagery are cases of sensory substitution or psychedelic hallucinations, then this is no help for the multisensory challenge because this is a problem about ordinary perception. However, as Nanay (2018a) pointed out, there is evidence that ordinary multisensory experience involves the activation of perceptual processing in modality X triggered by sensory stimulation in modality Y. Just to mention a few examples: the activation of the primary auditory cortex by visual speech (Pekkola *et al*, 2005), the activation of the visual cortex in response to tactile stimuli (Zangaladze *et al*, 1999), visual perception of motion induced by sound (Sekuler, Sekuler and Lau, 1997), etc. If this is true, then we can replace [SBI] as follows:

# [SBI\*]: In most cases of multisensory perception there is significant involvement of mental imagery.

Again, I don't plan to defend [SBI\*]. I just want to point out that it is enough to respond to the multisensory challenge and also give further support to my previous arguments. Just to show one

example. We can formulate again the epistemological dilemma introduced in chapter 2 by saying that the alleged problem of imagination for [CPP] also affect ordinary perceptual experience, since most of it is multisensory and it has a multimodal imaginative etiology. If [SBI\*] is true, then the same problem arises for [Iconophobia].

# All Power to the Imagination: Consciousness and Cognition

In this section, I would like to draw some conclusions based on the discussion in the previous chapters. As I have shown, if we assume that mental imagery plays a role in veridical perceptual experience [SBI] then some important philosophical consequences are obtained. First, from chapter 1 we can at least grant that there are good reasons to believe that mental imagery plays a constitutive role in veridical perception. Second, from chapter 2 we can conclude that blaming imagination for the epistemological problems of the cognitive penetrability leads to a very unfortunate dilemma. Third, from chapter 3 we can conclude that there is a solution to the problem of cognitive penetrability that is consistent with an imagery theory but, at the same time, can avoid the dilemma. Fourth, from chapter 4 we can conclude that disjunctivist theories that provide a positive account of hallucination in terms of mental imagery are implausible. Fifth, from chapter 5 we can conclude that traditional versions of representationalism have problems with the contingent role that mental imagery plays in perceptual experience. Finally, from chapter 6 we can conclude that we can generalize the previous ideas beyond vision and give further support to them on the basis of multisensory perception. Here is the same in a list-format:

- 1. There are good reasons to believe that mental imagery plays a role in veridical perception.
- 2. Blaming imagination for epistemic problems of cognitive penetration leads to a dilemma about perceptual justification.
- Imagery theories of cognitive penetrability of perception can account for the epistemological problem and avoid the dilemma.
- 4. Disjunctivist theories that give a positive account of hallucination in terms of mental imagery cannot explain cases of amodal completion.
- 5. Classical versions of representationalism have troubles to explain the contingent role mental imagery plays in cases of amodal completion.
- 6. Multisensory perception provides further support for the previous cases.

The previous list doesn't exhaust the potential that mental imagery has as a source of inquiry for the philosophy of mind, philosophy of perception, epistemology and cognition. Consider the following ideas. To begin with, there are important empirical questions about the role imagination plays in cognition beyond the realm of perception; for example, spatial navigation (Guariglia & Pizzamiglio, 2007), spatial memory (Byrne, Becker & Burgess, 2007), episodic memory (Fletcher et al, 1995), episodic counterfactual thinking (Schacter, Addis, & Buckner, 2007; Moulton & Kosslyn, 2009; De Brigard & Parikh, 2018), pretense (Nichols & Stich, 2000), mindreading (Nichols & Stich, 2003); dream imagery in learning and memory (Fosse et al, 2003; Wamsley et al, 2010; Wamsley & Sitckgold, 2010); and even its function in the brain's default mode network (Mason et al, 2007) Like in the case of perception, the psychology of imagery may have important epistemological consequences. Take the example of episodic memory. There is a lot of evidence in favor of the constructive nature of memory (Schacter, Norman & Koutsaal, 1998; Schacter & Addis, 2007). This means that representations stored in episodic memory are not only obtained from stimulus-driven perception, but from other cognitive sources as well; for instance, imagination. If this is true, then we may have an epistemological problem similar to the cognitive penetrability of perception. Does the role of imagination downgrade memory representations? How to justify our remembering if imagination fills the gaps in episodic memory? What is the mechanism behind 'episodic completion'? All these are important questions for epistemology and cognitive sciences.

Classical discussions in the philosophy of mind can also be benefited from the research on mental imagery. For example, concepts like intentionality, content, and mental representation have been traditionally discussed in debates about belief and perception. Nonetheless, in my experience, when someone introduces these concepts to non-philosophers, the first thing that comes to their mind is the idea of 'picturing' something in the head, *i.e.* imagining. This shows that at least our ordinary concept of representation is very related to our imaginative capacities. Although, the nature of mental representation was at the heart of the so-called 'imagery debate' (Pylyshyn, 1973, 1981 & 2002; Kosslyn & Pomerantz, 1977; Kosslyn *et al*, 1979 Kosslyn, 1981) perception wasn't a crucial part of the agenda. Now, some people think that perceptual content is propositional but regard imagistic representations as picture-like. However, if imagery plays a role in amodal completion, then the content of perception becomes an interesting combination of representations in different formats. This is something that needs to be addressed if we want a full theory of the intentionality of perception. Similarly, we haven't examined the rich phenomenology behind the most striking cases of multimodal imagery like

synaesthesia, psychedelic hallucinations, dreaming, cross-modal illusions, sensory-substitution, etc. It would be very reasonable to think that these cases are relevant for consciousness studies since they reveal one of the most neglected issues in philosophy of mind, namely, consciousness diversity.

As you may see, my inquiry about the role of mental imagery is far from complete. You may even argue that is wrong. However, as I said at the beginning of this work, my aim here was to analyze some consequences behind the idea that imagination is a constitutive part of our most primitive relation to the external world *i.e.* perception. By doing so, I expect, at least, to have shown that neglecting imagination from discussions in analytic philosophy has been something very unfortunate. In fact, if my analysis was correct, what lies behind the doors of perception might just be mental imagery. Therefore, what most people told us about perception and imagination was wrong. Seeing is not believing, - it is imagining.

### References

- Aggernaes, A. (1972). The Experienced Reality of Hallucinations and other Psychological Phenomena. Acta Psychiatrica Scandinavica, 48, 220 – 238.
- Allen, K. (2015). Hallucination and Imagination. Australasian Journal of Philosophy, 93 (2), 287-302.
- Arstila, V. (2015). Perceptual Learning Explains Two Candidates for Cognitive Penetration. *Erkenntnis*, 81 (6), 1151–1172.
- American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders (5th edition)*. Arlington, VA: American Psychiatric Association.
- Bacon, B & Mamassian, P. (2002). Amodal Completion and the Perception of Depth without Binocular Correspondence. *Perception*, 31 (9), 1037-1045.
- Bayne, T. (2014). The Multisensory Nature of Perceptual Consciousness. In, D. Bennett & C. Hill (Eds.). Sensory Integration and the Unity of Consciousness. Cambridge, MA: MIT Press.
- Bentall, R.P (1990). The Illusion of Reality: A Review and Integration of Psychological Research on Hallucinations. *Psychological Bulletin*, 107 (1), 82-95.
- Berger, C & Ehrsson, H. (2013). Mental Imagery Changes Multisensory Perception. Current Biology, 23 (14), 1367-1372.
- Berger, C & Ehrsson, H. (2014). The Fusion of Mental Imagery and Sensation in the Temporal Association Cortex. *The Journal of Neuroscience*, 34 (41),13684–13692.
- Block, N. (1990). Inverted Earth. Philosophical Perspectives, 4, 53-79.

Block, N. (2010). Attention and Mental Paint. Philosophical Issues 20: 23-63.

Botvinick, M & Cohen, J. (1998). Rubber hands 'feel' touch that eyes see. Nature, 391(6669), 756.

- Bourget, D & Chalmers, D. (2014). What do Philosopher Believe? *Philosophical Studies*, 170 (3), 465-500.
- Bourget, D. (2017). Why Are Some Phenomenal Experiences 'Vivid' and Others 'Faint'? Representationalism, Imagery, and Cognitive Phenomenology. *Australasian Journal of Philosophy*, 95, 4, 673-687.
- Brandt, S. & Stark, L. (1997). Spontaneous Eye Movements During Visual Imagery Reflect the Content of the Visual Scene. *Journal of Cognitive Neuroscience*, 9 (1), 27-38.
- Brewer, B. (2011). Perception and Its Objects. Oxford: Oxford University Press.

Byrne, A. (2001). Intentionalism Defended. Philosophical Review, 110 (2), 199-240.

Brown, C. (2011). Consequentialize this. *Ethics*, 121 (4), 749-771.

- Byrne, A. (2009). Experience and Content. The Philosophical Quarterly, 59 (236), 429-451.
- Byrne, P., Becker, S & Burgess, N. (2007). Remembering the Past and Imagining the Future: A Neural Model of Spatial Memory and Imagery. *Psychological Review*, 114 (2), 340-375.
- Campbell, J. (2002). Reference and Consciousness. Oxford: Oxford University Press.
- Carhart-Harris, RL., Muthukumaraswamy, S., Roseman, L., Kaelen, M., Droog, W., Murphy, K., et al (2016). Neural correlates of the LSD experience revealed by multimodal neuroimaging. *Proceedings of the National Academy of Sciences*, 113 (17), 4853–4858.
- Carrasco, M., Ling, S., & Read, S. (2004). Attention alters appearance. *Nature Neuroscience*, 7 (3), 308–313.
- Chalmers, D. (2002). Does Conceivability entail Possibility?. In T. S. Gendler and J. Hawthorne (eds.), *Conceivability and Possibility*. Oxford: Oxford University Press.
- Chalmers, D. (2004). The Representational Character of Experience. In, Leiter, B (ed.). *The Future for Philosophy*. Oxford: Oxford University Press.
- Chalmers, D. (2006). Perception and the Fall from Eden. In T. S. Gendler and J. Hawthorne (eds.), *Perceptual Experience*. Oxford: Oxford University Press.
- Chen, J., Liu, B., Chen, B., & Fang, F. (2009). Time course of amodal completion in face perception. *Vision Research*, 49 (7), 752–758.
- Churchland, P.M. (1988). Perceptual Plasticity and Theoretical Neutrality: A Reply to Jerry Fodor. *Philosophy of Science*, 55 (2), 167-187.
- Connolly, K. (2019). Perceptual Learning: The Flexibility of the Senses. Oxford: Oxford University Press.
- Corlett, P. R., Murray, G. K., Honey, G. D., Aitken, M. R. F., Shanks, D. R., Robbins, T. W., Bullmore, E. T., Dickinson, A., & Fletcher, P. C. (2007). Disrupted prediction-error signal in psychosis: evidence for an associative account of delusions. *Brain*, 130(9), 2387-2400.
- Corlett, P.R, Horga, G., Fletcher, P., Alderson-Day, B., Schmak, K & Powers, A. (2018). Hallucinations and Strong Priors. *Trends in Cognitive Sciences*, 23 (2), 114-127.
- Crane, T. (1992). The Non-conceptual Content of Experience. In T. Crane (ed.), *The Contents of Experience*. Cambridge: Cambridge University Press.
- Crane, T. (2000). Introspection, Intentionality, and the Transparency of Experience. *Philosophical Topics*, 28 (2), 49-67.
- Crane, T. (2003). The Intentional Structure of Consciousness. In Q. Smith & A. Jokic (Eds.). Consciousness: New Philosophical Perspectives. Oxford: Oxford University Press.
- Crane, T. (2009). Intentionalism. In A. Beckermann & B. McLaughlin (Eds.), Oxford Handbook to the *Philosophy of Mind*. Oxford: Oxford University Press.
- Craver-Lemley, C & Reeves, A. (1992). How visual imagery interferes with vision. *Psychological Review*, 99 (4), 633-649.

- Cytowic, R. (2002). Synesthesia: A Union of the Senses. Cambridge, MA: MIT Press.
- Cytowic, R. & Eagleman, D. (2009). Wednesday is Indigo Blue. Cambridge, MA: MIT Press.
- De Brigard, F. & Parikh, N. (2018). Episodic Counterfactual Thinking. *Psychological Science*, 28 (1) 59–66.
- Dennett, D. (1981). Two approaches to Mental Images. In D. Dennett. Brainstorms: Philosophical Essays on Mind and Psychology. Cambridge, MA: MIT Press.
- Dretske, F. (1995). Naturalizing the Mind. Cambridge, MA: MIT Press.
- Driver, J. & Spence, C. (2000). Multisensory Perception: Beyond modularity and convergence. *Current Biology*, 10 (20), R731-735.
- Dokic, J & Martin, J. R. (2012). Disjunctivism, hallucinations, and metacognition. WIREs Cognitive Science, 3, 533-543.
- Dorsch, F. (2018). Phenomenal Presence. In F. Dorsch and F. MacPherson (eds.). *Phenomenal Presence*. Oxford: Oxford University Press.
- Dunn, J. (2008). The Obscure Act of Perception. Philosophical Studies, 139 (3), 367-393.
- Ehrsson, H. (2007). The Experimental Induction of Out-of-Body Experiences. Science, 317 (5841), 1048.
- Ernst, M. & Banks, M. (2002) Humans integrate visual and haptic information in a statistically optimal fashion. *Nature*, 415, 429–433.
- Ernst, M. & Bülthoff, H. (2004). Merging the senses into a robust percept. *Trends in Cognitive Sciences*, 8 (4), 162-169.
- Farah, M. (1985). Psychophysical Evidence for a Shared Representational Medium for Mental Images and Percepts. *Journal of Experimental Psychology*, 114 (1), 91–103.
- Farah, M. (1989). Mechanisms of Imagery-Perception Interaction. *Journal of Experimental Psychology: Human Perception and Performance*, 15 (2), 203-211.
- Farkas, K. (2013). A Sense of Reality. In Fiona MacPherson & Dimitris Platchias (eds.), Hallucinations. MIT Press.
- Firestone, C & Scholl, B. (2016). Cognition does not affect Perception: Evaluating the evidence for "top-down" effects. *Behavioral and Brain Sciences*, e229, 1–19.
- Fiser, J & Aslin, R. (2002). Statistical learning of new visual feature combinations by infants. *Proceedings* of the National Academy of Sciences, 99 (24) 15822-15826.
- Fiser, J., Berkes, P., Orban, G & Lengyel, M. (2010). Statistically Optimal Perception and Learning: from behavior to neural representations. *Trends in Cognitive Sciences*, 14 (3), 119-30.

- Fish, W. (2008) Disjunctivism, Indistinguishability and the Nature of Hallucination. In A. Haddock and F. MacPherson (eds.). *Disjunctivism: Perception, Action, and Knowledge*. Oxford: Oxford University Press.
- Fletcher, P.C, Frith, C., Baker, S., Shallice, T., Frackowiak, R & Dolan, R. (1995). The Mind's Eye-precuneus activation in memory-related imagery. *Neuroimage*, 2 (3), 195-200.
- Fletcher, P. C., & Frith, C. D. (2009). Perceiving is believing: a Bayesian approach to explaining the positive symptoms of schizophrenia. *Nature reviews. Neuroscience*, 10 (1), 48-58.
- Fodor, J. (1983). The Modularity of Mind. An Essay on Faculty Psychology. Cambridge: MIT Press.
- Fosse, M., Fosse, R., Hobson, A & Stickgold, R. (2003). Dreaming and Episodic Memory: A Functional Dissociation? *Journal of Cognitive Neuroscience*, 15 (1), 1–9.
- Frith, C. D. (1992). The Cognitive Neuropsychology of Schizophrenia. Hillsdale: Erlbaum.
- Frith, C. D. (2005). The Self in Action: Lessons from delusions of control. *Consciousness and Cognition*, 14, 752–770.
- Frisby, J. & Stone, J. (2010). Seeing: The Computational Approach to Biological Vision. Cambridge, MA: MIT Press.
- Fulford, J., Milton, F., Salas, D., Smith, A., Simler, A., Winlove, C., & Zeman, A. (2018). The neural correlates of visual imagery vividness—An fMRI study and literature review. *Cortex*, 105, 26-40.
- Ghazanfar, A & Schroeder, C. (2006). Is Neocortex Essentially Multisensory? *Trends in Cognitive Sciences*, 10 (6), 278-285.
- Graff, D. (2001). Phenomenal Continua and the Sorites. Mind, 110 (440), 905-935.
- Greenwald, A. G., Klinger, M. R., & Schuh, E. S. (1995). Activation by marginally perceptible ("subliminal") stimuli: Dissociation of unconscious from conscious cognition. *Journal of Experimental Psychology: General*, 124 (1), 22-42.
- Goodale, M. & Milner, D. (2004). Sight Unseen: An Exploration of Conscious and Unconscious Vision. New York: Oxford University Press.
- Guariglia, C. & Pizzamiglio, L. (2007). The Role of Imagery in Navigation: Neuropsychological Evidence. In F. Mast & L. Jancke. *Spatial Processing in Navigation, Imagery and Perception*. Heidelberg: Springer.
- Hansen, T., Olkkonen, M., Walter, S & Gegenfurtner. (2006). Memory modulates color appearance. *Nature Neuroscience*, 9 (11), 1367–1368.
- Harman, G. (1990). The Intrinsic Quality of Experience. Philosophical Perspectives, 4, 31-52.
- Held, R., Ostrovsky, Y., de Gelder, B., Gandhi, T., Ganesh, S., Mathur, U & Sinha, P. (2011). The newly sighted fail to match seen with felt. *Nature Neuroscience*, 14 (5), 551–553.

Helton, G & Nanay, B. (2018). Amodal completion and Knowledge. Analysis.

- Herman, J., Erman, M., Boys, R., Peiser, L., Talyor, M.E & Roffwarg, H. (1984). Evidence for a Directional Correspondence Between Eye Movements and Dream Imagery in REM Sleep. *Sleep*, 7 (1), 52-63.
- Hinton, J. M. (1967). Visual Experiences. Mind, 76 (32), 217-27.
- Hobson, A. (1999). Dreaming as Delirium: How the Brain Goes Out of Its Mind. Cambridge, MA: MIT Press.
- Hubbard, E. (2007). Neurophysiology of Synesthesia. Current Psychiatry Reports, 9 (3), 193-9.
- Huemer, M. (2007). Compassionate Phenomenal Conservatism. *Philosophy and Phenomenological Research*, 74(1): 30–55.
- Hurovitz, C. S., Dunn, S., Domhoff, G. W., & Fiss, H. (1999). The Dreams of Blind Men and Women: A replication and extension of previous findings. *Dreaming*, 9 (2-3), 183-193.
- Ishai, A., & Sagi, D. (1995). Common Mechanisms of Visual Imagery and Perception. Science, 268 1772-74.
- Ishai, A., & Sagi, D. (1997). Visual Imagery Facilitates Visual Perception: Psychophysical Evidence. Journal of Cognitive Neuroscience, 9 (4), 476-489.
- Jiang, Y., Costello, P., Fang, F., Huang, M & He, S. (2006). A Gender- and Sexual Orientation Dependent Spatial Attentional Effect of Invisible Images. *Proceedings of the National Academy of Sciences*, 103 (45), 17048–17052.
- Jiang, Y., Costello, P & He, S. (2017). Processing of Invisible Stimuli: Advantage of Upright Faces and Recognizable Words in Overcoming Interocular Suppression. *Psychological Science*, 18 (4), 349-355.
- Johnston, M. (2004). The Obscure Object of Hallucination. Philosophical Studies, 120 (1-3), 113-83.
- Johnson, M & Raye, C. (1981). Reality Monitoring. Psychological Review, 88 (1), 67-85.
- Kellman, P. J., & Shipley, T. F. (1991). A Theory of Visual Interpolation in Object Perception. *Cognitive Psychology*, 23 (2), 141-221.
- Shipley, T. F., & Kellman, P. J. (1992). Perception of partly occluded objects and illusory figures: Evidence for an Identity Hypothesis. *Journal of Experimental Psychology: Human Perception and Performance*, 18 (1), 106-120.
- Kentridge, R.W., Heywood, C.A & Weiskrantz, L. (1999). Attention without Awareness in Blindsight. *Proceedings of the Royal Society of London B*, 266 (1430), 1805–1811.
- Keogh, R. & Pearson, J. (2018). The Blind Mind: No Sensory Visual Imagery in Aphantasia. *Cortex*, 105, 53-60.
- King, J. (2007). The Nature and Structure of Content. Oxford: Oxford University Press.
- Klein, I., Dubois, J., Mangin, J-F., Kherif, F., Flandin, G., Poline, J-B., Denis, M., Kosslyn, M & Le Bihan, D. (2004). Retinotopic organization of visual mental images as revealed by functional magnetic resonance imaging. *Cognitive Brain Research*, 22 (1), 26-31.

- Koivisto, M & Grassini, S. (2016). Neural processing around 200ms after stimulus-onset correlates with subjective visual awareness. *Neuropsychologia*, 84, 235-243.
- Komatsu, H. (2006). The Neural Mechanisms of Perceptual Filling-in. *Nature Review Neuroscience*, 7 (3), 220–231.
- Kording, K & Wolpert, D. (2004). Bayesian integration in sensorimotor learning. *Nature*, 427, 244–247.
- Kosslyn, S. & Pomerantz, J. (1977). Imagery, Propositions, and the form of Internal Representations. *Cognitive Psychology*, 9 (1), 52-76.
- Kosslyn, S., Pinker, S., Smith, G & Shwartz, S. (1979). On the Demystification of Mental Imagery. Behavioral and Brain Sciences, 2 (4), 535-581.
- Kosslyn, S. (1981). The Medium and the Message in Mental Imagery: A theory. *Psychological Review*, 88(1), 46-66.
- Kosslyn, S., Thompson, W. L., Kim, I & Alpert, N. (1995). Topographical representations of mental images in primary visual cortex. *Nature*, 378, 496-8.
- Kosslyn, S., Thompson, W. L & Alpert, N. (1997). Neural Systems Shared by Visual Imagery and Visual Perception: A Positron Emission Tomography Study. *Neuroimage*, 6 (4), 320–334.
- Kosslyn, S., Pascual-Leone, A., Felician, O., Camposano, S., Keenan, J.P., Thompson, W.L., Ganis, G., Sukel, K & Alpert, N. (2000). The Role of Area 17 in Visual Imagery: Convergent Evidence from PET and rTMS. *Science*, 284 (5411), 167-70.
- Kosslyn, S. & Thompson, W. L. (2003). When is early visual cortex activated during visual mental imagery? *Psychological Bulletin*, 129 (5), 723-746.
- Laeng, B & Teodorescu, DF. (2002). Eye scanpaths during visual imagery reenact those of perception of the same visual scene. *Cognitive Science*, 26 (2), 207-231.
- Leclair-Visonneau, L., Oudiette, D., Gaymard, B., Leu-Semenescu, S & Arnulf, I. (2010). Do the eyes scan dream images during rapid eye movement sleep? Evidence from the rapid eye movement sleep behaviour disorder model. *Brain*, 133, 1737–1746.
- Lewis, D. (1980). Veridical hallucination and prosthetic vision. *Australasian Journal of Philosophy*, 58 (3), 239-249.
- Lycan, W. (1998). In Defense of the Representational Theory of Qualia (replies to Neander, Rey, and Tye). *Philosophical Perspectives*, 12, 479–87.
- Lyons, J. (2011). Circularity, Reliability, and the Cognitive Penetrability of Perception. *Philosophical Issues*, 21 (1), 289–311.
- Mack, A., & Rock, I. (1998). Inattentional Blindness. Cambridge, MA: MIT Press.

MacPherson, F. (2006). Ambiguous Figures and the Content of Experience. Nous, 40 (1): 82-117.

- MacPherson, F. (2011a). Cross-Modal Experiences. Proceedings of the Aristotelian Society, 111 (3), 429-468.
- MacPherson, F. (2011b). Taxonomising the senses. Philosophical Studies, 153 (1), 123-142.
- MacPherson, F. (2012). Cognitive Penetration of Color Experience: Rethinking the issue in light of an indirect mechanism. *Philosophy and Phenomenological Research*, 84, (1), 24-62.
- Mast, F & Kosslyn, S. (2002). Eye Movements During Visual Mental Imagery. *Trends in Cognitive Sciences*, 6 (7), 271-272.
- Martin, M.G.F. (2002). The Transparency of Experience. Mind & Language, 17 (4), 376-425.
- Martin, M.G.F. (2004). The Limits of Self-Awareness. Philosophical Studies, 120 (1), 37-89.
- Martin, M.G.F. (2006). On Being Alienated. In T. S. Gendler and J. Hawthorne (eds.), *Perceptual Experience*, Oxford: Oxford University Press.
- Martin, M.G.F. (2017). Elusive Objects. Topoi, 36 (2), 247-271.
- Marr, D. (1982). Vision: A Computational Investigation into the Human Representation and Processing of Visual Information. San Francisco: W. H. Freeman.
- Mason, M., Norton, M., Van Horn, J., Wegner, D., Grafton, S & Macrae, N. (2007). Wandering Minds: the default network and stimulus-independent thought. *Science*, 315 (5810), 393-395.
- Masrour, F. (2017). Space Perception, Visual Dissonance and the Fate of Standard Representationalism. *Nous*, 51 (3), 565-593.
- McGinn, C. (2006). Mindsight: Image, Dream, Meaning. MA: Harvard University Press.
- Moulton, S. & Kosslyn, S. (2009). Imagining Predictions: Mental imagery as mental emulation. *Philosophical Transactions of the Royal Society B*, 364, 1273–1280.
- Murray, R., Sekuler, A & Bennett, P. (2001). Time course of amodal completion revealed by a shape discrimination task. *Psychonomic Bulletin & Review*, 8 (4), 713-720.
- Nanay, B. (2010). Perception and Imagination: amodal perception as mental imagery. *Philosophical Studies*, 150 (2), 239–54.
- Nanay, B. (2010b). Attention and Perceptual Content. Analysis, 70 (2), 263-70.
- Nanay, B. (2014). Blur and Perceptual Content. Analysis, 78 (2), 254-260.
- Nanay, B. (2015). Perceptual content and the content of mental imagery. *Philosophical Studies*, 172 (7), 1723–1736.
- Nanay, B. (2016). Hallucination as Mental Imagery. Journal of Consciousness Studies, 23 (7), 65-81.
- Nanay, B. (2017). Sensory Substitution and Multimodal Mental Imagery. Perception, 46 (9), 1014-1026.
- Nanay, B. (2018a). Multimodal Mental Imagery. Cortex, 105, 125–134.

- Nanay, B. (2018b). The importance of amodal completion in everyday perception. *i-Perception*, 9 (4), 1–16.
- Nichols, S & Stich, S. (2000). A Cognitive Theory of Pretense. Cognition, 74 (2), 115-47.
- Nichols, S & Stich, S. (2003). Mindreading. An Integrated Account of Pretence, Self-Awareness, and Understanding Other Minds. Oxford: Oxford University Press.
- Nickel, B. (2007). Against intentionalism. Philosophical Studies, 136 (3), 279-304.
- O' Callaghan, C. (2015). The Multisensory Character of Perception. *The Journal of Philosophy*, 112 (10), 551-569.
- Otten, M., Pinto, Y., Paffen, C.L., Seth, A & Kanai, R. (2017). The Uniformity Illusion: Central Stimuli Can Determine Peripheral Perception. *Psychological Science*, 28 (1), 56-68.
- Pearson, J., Naselaris, T., Holmes, E. A., & Kosslyn, S. (2015). Mental imagery: Functional Mechanisms and Clinical applications. *Trends in Cognitive Sciences*, 19 (10), 590–602.
- Peason, J., Clifford., C & Tong, F. (2008). The Functional Impact of Mental Imagery on Conscious Perception. *Current Biology*, 18 (13), 982-986.
- Pekkola, J., Ojanen, V., Autti, T., Jaaskelainen, I. P., Mottonen, R., Tarkiainen, A & Sams, M. (2005). Primary auditory cortex activation by visual speech: An fMRI study at 3 T. *NeuroReport*, 16 (2), 125-128.
- Petkova, V & Ehrsson, H. (2008). If I Were You: Perceptual Illusion of Body Swapping. *PLoS ONE*, 3 (12), e3832.
- Perky, C. W. (1910). An Experimental Study of Imagination. *American Journal of Psychology*, 21 (3), 422–52.
- Pessoa, L., & De Weerd, P. (2003). Filling-in: From Perceptual Completion to Cortical Reorganization. New York: Oxford University Press.
- Plomp, G., Nakatani, C., Bonnarde, V., & van Leeuwen, C. (2004). Amodal completion as reflected by gaze durations. *Perception*, 33 (10), 1185–1200.
- Proust, J. (2007). Metacognition and Metarepresentation: Is A Self-Directed Theory of Mind a Precondition for Metacognition? *Synthese*, 159 (2), 271–95.
- Proust, J. (2013). The Philosophy of Metacognition Mental Agency and Self-Awareness. Oxford: Oxford University Press.
- Pylyshyn, Z. (1973). What the Mind's Eye Tells the Mind's Brain: A Critique of Mental Imagery. *Psychological Bulletin*, 80 (1), 1-24.
- Pylyshyn, Z. (1981). The Imagery Debate: Analogue Media Versus Tacit Knowledge. *Psychological Review*, 88(1), 16-45.
- Pylyshyn, Z. (2002). Mental imagery: In search of a theory. Behavioral and Brain Sciences, 25(2), 157-182.

- Pylyshyn, Z. (1999). Is Vision Continuous with Cognition? The case for cognitive impenetrability of visual perception. *Behavioral and Brain Sciences*, 22 (3), 341-365.
- Railo, H., Koivisto, M & Revonsuo, A. (2011). Tracking the processes behind conscious perception: a review of event-related potential correlates of visual consciousness. *Consciousness and Cognition*, 20 (3), 972-983.
- Ramachandran, V. S., & Gregory, R. L. (1991). Perceptual filling in of artificially induced scotomas in human vision. *Nature*, 350, 699-702.
- Reeves, A. (1981). Visual imagery lowers sensitivity to hue-varying, but not to luminance-varying, visual stimuli. *Perception & Psychophysics*, 29 (3), 247-250.
- Robinson, H. (1994). Perception. London: Routledge.
- Rosenthal, D. (2000). Consciousness, Content, and Metacognitive Judgments. *Consciousness and Cognition*, 9 (2), 203-214.
- Schacter, D., Norman, K & W. Koutsaal. (1998). The Cognitive Neuroscience of Constructive Memory. *Annual Review of Psychology*, 49, 289-318.
- Schacter, D & Addis, D. (2007). The cognitive neuroscience of constructive memory: remembering the past and imagining the future. *Philosophical Transactions of the Royal Society B*, 362 (1481), 773– 786.
- Schacter, D., Addis, D & Buckner, R. (2007). Remembering the past to imagine the future: the prospective brain. *Nature Reviews Neuroscience*, 8 (9), 657-61.
- Segal, S & Fusella, V. (1971). Influence of imaged pictures and sounds on detection of visual and auditory signals. *Journal of Experimental Psychology*, 83 (3), 458-464.
- Segal, S. & Gordon, P-E. (1969). The Perky Effect Revisited: blocking of visual signals by imagery. *Perceptual and Motor Skills*, 28 (3), 791-797.
- Sekuler, A. B., & Palmer, S. E. (1992). Perception of partly occluded objects: A microgenetic analysis. Journal of Experimental Psychology General, 121, 95–111.
- Sekuler, R., Sekuler, A. B., & Lau, R. (1997). Sound alters visual motion perception. Nature, 285, 308.
- Shepard, R. N., & Metzler, J. (1971). Mental rotation of three-dimensional objects. *Science*, 171 (3972), 701-703.
- Shepard, R. N. (1978). The Mental Image. American Psychologist, 33 (2), 125-137.
- Simeon, D & Abugel, J. (2006). Feeling Unreal: Depersonalization Disorder and the Loss of the Self. Oxford: Oxford University Press.
- Shams, L., Kamitani, Y & Shimojo, S. (2000). What you see is what you hear. Nature, 408 (6814), 788.
- Shimojo, S & Shams, L. (2001). Sensory modalities are not separate modalities: plasticity and interactions. *Current Opinion in Neurobiology*, 11 (4), 505–509.

Shoemaker, S. (1982): The Inverted Spectrum. The Journal of Philosophy, 79 (7), 357-381.

Shoemaker, S. (1994). Phenomenal Character. Nous, 28 (1), 21-38.

- Siegel, S. (2008) The Epistemic Conception of Hallucination. in A. Haddock and F. MacPherson (eds.). *Disjunctivism: Perception, Action, and Knowledge*. Oxford: Oxford University Press.
- Siegel, S. (2010). The Contents of Visual Experience. New York: Oxford University Press.
- Siegel, S. (2012). Cognitive Penetrability and Perceptual Justification. Noûs, 46 (2), 201-222.
- Siegel, S. (2013). The Epistemic Impact of the Etiology of Experience. *Philosophical Studies*, 162 (3), 697-722.
- Siegel, S. (2017). How Is Wishful Seeing Like Wishful Thinking? *Philosophy and Phenomenological Research*, 95 (2), 408-435.
- Sierra, M. (2009). Depersonalisation: a New look at a Neglected Syndrome. Cambridge: Cambridge University Press.
- Slade, P. & Bentall, R. (1988). Sensory Deception: A Scientific Analysis of Hallucination. Baltimore, MD: Johns Hopkins University Press.
- Slotnick, S., Thompson, W.L & Kosslyn, S.(2005). Visual Mental Imagery Induces Retinotopically Organized Activation of Early Visual Areas. *Cebrebral Cortex*, 15 (10), 1570-83.

Soteriou, M. (2016). Disjunctivism. London: Routledge.

Speaks, J. (2010). Attention and Intentionalism. Philosophical Quarterly, 60 (239), 325-42.

- Spence, C. & Deroy, O. (2013). Crossmodal Mental Imagery. In S. Lacey & R. Lawson. (Eds.). *Multisensory Imagery*. Heidelberg: Springer.
- Stein, B. & Stanford, T. (2008). Multisensory integration: current issues from the perspective of the single neuron. *Nature Reviews Neuroscience*, 9 (4), 255-66.
- Stokes, D. (2013). Cognitive Penetrability of Perception. Philosophy Compass, 8 (7), 646-663.
- Stone, J. (2012). Vision and Brain: How We Perceive the World. Cambridge MA: MIT Press.
- Strawson, P. F. (1974). Imagination and perception. In P. F. Strawson (Ed.), *Freedom and Resentment*. London: Methuen.
- Teng, L. (2016). Cognitive Penetration, Imagining, and the Downgrade Thesis. *Philosophical Topics*, 44 (2), 405-426.
- Terhune, DB., Luke, DP., Kaelen, M., Bolstridge, M., Feilding, A., Nutt, D., et al (2016). A placebocontrolled investigation of synaesthesia-like experiences under LSD. *Neuropsychologia*, 88: 28– 34.
- Travis, C. (2004). The Silence of the Senses. Mind, 113 (449), 57-94.
- Tucker, C. (2014). If Dogmatists Have a Problem with Cognitive Penetration, You Do Too. *Dialectica*, 68 (1), 35-62.

- Tye, M. (1995). Ten Problems of Consciousness: A Representational Theory of the Phenomenal Mind. Cambridge, MA: MIT Press
- Tye, M. (2002). Representationalism and the Transparency of Experience. Nous, 36 (1), 137–151.
- Wamsley, E., Tucker, M., Payne, J., Benavides, J & Sitckgold, R. (2010). Dreaming of a learning task is associated with enhanced sleep-dependent memory consolidation. *Current Biology*, 20 (9), 850-855.
- Wamsley, E & Sitckgold, R. (2010). Dreaming and offline memory processing. *Current Biology*, 20 (23), R1010–R1013.
- Watanabe, T., Nañez, J & Sasaki, Y. (2001). Perceptual Learning without Perception. *Nature*, 413, 844-848.
- Weiss, Y., Simoncelli, E & Adelson, E. (2002). Motion illusions as optimal percepts. *Nature Neuroscience*, 5 (6), 598-604.
- Yablo, S. (1993). Is Conceivability a Guide to Possibility? *Philosophy and Phenomenological Research*, 53 (1), 1-42.
- Zangaladze, A., Weisser, V. D., Stilla, E., Prather, S. C., & Sathian, K. (1999). Involvement of visual cortex in tactile discrimination of orientation. *Nature*, 401, 587-590.
- Zeman, A., Della Sala, S., Torrens, L. A., Gountouna, V.-E., McGonigle, D. J., & Logie, R. H. (2010). Loss of imagery phenomenology with intact visuo-spatial task performance: A case of 'blind imagination'. *Neuropsychologia*, 48, 145-155.
- Zeman, A., Dewar, M., & Della Sala, S. (2015a). Lives without imagery: Congenital aphasia. *Cortex*, 73, 378-380.
- Zeman, A., Dewar, M., & Della Sala, S. (2015b). Reflections on Aphantasia. Cortex, 74, 336-337.
- Zmigrod, S & Hommel, B (2011). Feature Integration across Multimodal Perception and Action: A Review. *Multisensory Research*, 26, 143–157.
- Zmigrod, S & Hommel, B (2013). The relationship between feature binding and consciousness: Evidence from asynchronous multi-modal stimuli. *Consciousness and Cognition*, 20, 586-593.