

---

CLOTILDE CALABI

Università degli Studi di Milano

clotilde.calabi@unimi.it

---

# AMODAL COMPLETION, PERCEPTION AND VISUAL IMAGERY

## *abstract*

---

*Amodal completion typically occurs when we look at an object that is partially behind another object. Theorists often say that in such cases we are aware not only of the visible parts, but also, in some sense, of the occluded parts, because otherwise we could not have a perceptual experience of the object as continuing behind its occluder. Since no sense modality carries information about the occluded parts, this information is provided by other means. Amodal completion raises two questions. First, what is the mechanism involved? Second, what kind of experience do we have of the occluded parts? According to Nanay, the so-called Imagery Theory answers both questions. For this theory, information about the occluded parts is the product of a low level, vision specific, neural mechanism that takes place in the early vision processing areas of the brain. This mechanism provides a representation of the occluded parts and, as a result, the observer enjoys a quasi-sensory or quasi-perceptual conscious experience that is phenomenally similar to seeing those parts (as purportedly Perky has proved). In this paper I criticize Nanay's answer to the second question.*

## *keywords*

---

*Occlusion, amodal completion, visualization, mental imagery*

## 1. Amodal Completion and the Role of Perky's Experiment

Bence Nanay has recently brought back to our attention a famous experiment by Cheve West Perky, in which she tried to prove that perceiving and visualizing are phenomenally similar.<sup>1</sup> The experiment consisted in the following. Subjects were asked to fix a point on a white wall while visualizing an object, such as a banana, for example. Unbeknownst to them, an image of that object was projected on the wall from behind. The visual imagery experience they reported reflected the object perceived. According to Perky, the subjects took themselves to be visualizing, though in fact they were perceiving. If we can mistake perceiving for visualizing, there is phenomenal resemblance between them. Nanay claims that this conclusion helps to address the puzzle of amodal completion.

Amodal completion typically occurs when we look at an object that is partially behind another object. Theorists often say that in such cases we are aware not only of the visible parts, but also, in some sense, of the occluded parts, because otherwise we could not have a perceptual experience of the object as continuing behind its occluder. Since no sense modality carries information about the occluded parts, this information is provided by other means.

The phenomenon of amodal completion raises two questions. First, what is the mechanism involved? Second, what kind of experience do we have of the occluded parts? According to Nanay, the so-called Imagery Theory answers both questions. For this theory, information about the occluded parts is the product of a low level, vision specific, neural mechanism that takes place in the early vision processing areas of the brain. This mechanism provides a representation of the occluded parts and, as a result, the observer enjoys a quasi-sensory or quasi-perceptual conscious experience that is phenomenally similar to seeing those parts (as purportedly Perky has proved). As Nanay puts it, the occluded parts are thus phenomenally present to the observer, despite their perceptual absence. In this paper I criticize Nanay's argument supporting the Imagery Theory.<sup>2</sup>

1 I would like to thank for their helpful comments Robert Briscoe, Louise Moody, Paul Nordhoof, Marco Santambrogio and Barry Smith on a previous version of this essay.

2 Nanay defends this theory after rejecting three other theories, namely the perception theory, the belief theory and the access theory. He describes them as follows. According to the perception theory, in perceiving 3-D objects, we perceive we perceive also the occluded parts that do not project on the retina, thanks to certain perceptual cues. For the belief theory that representation of the occluded parts is the result of an inference based on information about the visible features of the objects we see, and background beliefs. For the access theory the claim is that we have perceptual access to the occluded parts of objects and in this sense they are present to us, despite the fact that we do not represent them.

## 2. Nanay's Argument

Before addressing the argument, let me just say that people interested in mental representations are generally divided into two groups: as Daniel Dennett puts it, there are the iconophiles and the iconophobes. The iconophiles think that mental representations have visual properties, like pictures; the iconophobes think that they are more like sentences. In the discussion on amodal completion, typically mental imagery theorists take the side of the iconophiles and belief theorists take the side of the iconophobes. Since the nature of mental representations is still a matter of debate, if Nanay succeeds in defending the visual imagery account of amodal completion, then he strikes a blow for the iconophiles brigade. Here is what he says.

Suppose that I am looking at a cat behind the picket fence. The cat's tail is not visible to me, because it is occluded by one of the pickets. My visual imagery mechanism completes the missing detail by representing it and, as a result, I have visual imagery of, or visualize *the cat's tail*. Perky's experiment comes into play at this point. Given the phenomenal similarity between visualizing/having visual imagery experiences and perceiving that the experiment demonstrates, when the missing part is represented, according to Nanay it is *as if I were perceiving it*. In his own words,

*If what it is like to have visual imagery is similar to what it is like to perceive and being aware of occluded parts of perceived objects is having visual imagery, then, putting these two claims together, we get that what it is like to be aware of the occluded parts of perceived objects is similar to what it is like to perceive those parts that are not occluded. (Nanay, 2010, p. 252).*

Fleshing out Nanay's argument, we obtain the following:

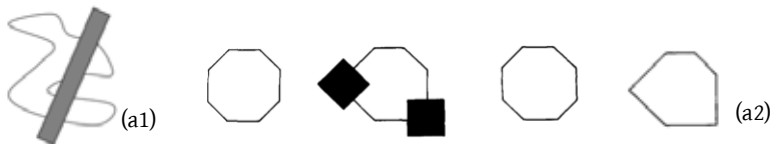
1. We are aware of occluded parts of perceived objects.
2. Being aware of occluded parts of perceived objects is having visual imagery of those parts.
3. What it is like to have visual imagery of an F is similar to what it is like to perceive an F.
4. What it is like to be aware of the occluded parts of perceived objects is similar to what it would be like to perceive those parts (if they were not occluded). (from 2-3).

Premise (1) is not negotiable: indeed, we are aware of the cat as continuing behind the picket fence. Premise (2) says that the awareness we have of the

occluded features is *nothing but visual imagery of those features*. Premise (3) is a general statement about the experience of having visual imagery: it says that to have visual imagery is like to perceiving. Evidence for it comes from Perky's experiment. (4) answers the question of what kind of experience we have of the occluded parts of perceived objects: to be aware of these parts is similar to seeing them. But is it? The argument seems valid: if (2) and (3) are true, (4) is true: our experience of the occluded features of the objects we perceive is some kind of visualization. Hence, in some sense we imagine the unity of such objects. But there is nothing visual in our awareness of the occluded parts. Thus, in what respect is being aware of them similar to seeing? The conclusion of the argument is at least doubtful and this makes us wary of its premises.

3. **Briscoe's Objection** Briscoe (2011) rejects (2). According to him the imagery-based account provides only a *partial explanation of amodal perception* (amodal perception is the perception of objects that are partially occluded by other objects). More precisely, he argues that visual imagery is not necessary for amodal perception. Of course, if visual imagery is not a necessary condition for amodal perception, then (2) is false.

Briscoe points out that there are two types of amodal completion, one stimulus driven and not depending on background knowledge and the other depending on stored information about the kind of object we are perceiving and/or its individual properties. Typically, the former occurs in cases such as these:



And the latter in the cat behind the fence example and many other cases, such as the following:



There are some significant differences between the (a) cases and the (b) cases, as Nanay rightly acknowledges. But according to Nanay the imagery theory applies to them all. Briscoe disagrees. He claims that the (b) cases, that is, those that involve cognitive amodal completion, “give rise not only to mental imagery, but also to beliefs”. Instead, “an empirically and phenomenologically compelling case can be made” for the view that the (a) cases, namely those involving amodal non-cognitive completion are “a properly *perceptual* phenomenon subserved by representations of occluded object features in early visual processing areas”. (159, my emphasis).

Let me focus, then, on the (a) cases. If Briscoe demonstrates that the (a) cases do not involve visual imagery, then (2) is false. He starts with the observation that the absence of sensory stimulation does not always mean absence of visual information. Following Gibson, he stresses that the informational basis for the perception of a surface is not limited to the surface’s optical projection in the retinal image. There are many other sources of visual information for occlusion, such as the wiping of surface textures according to perspective information, binocular disparity and T-junctions. Most importantly this kind of information contributes to the segmentation of the 3-D visual scene into discrete objects that we perceive in certain spatial relations with each other, given our observation point. In fact, our visual system exploits this information and constructs perceptual representations of occluded object features that contribute to the content and phenomenology of our perceptual experiences. Thus, according to Briscoe, “non-cognitive amodal completed contours and surfaces are *not* non-perceptual addenda to what we ‘strictly speaking’ see [my emphasis]”. As a result, we experience the visible parts of the object as connected to their invisible parts – that is, we perceive one surface as continuing behind another surface.

I do not think that Nanay would have anything to object up to this point. He would happily accept that there are perceptual cues that allow us to perceive 3-D objects as arranged in a particular visual scene and hence make us aware of some of their not-visible parts. But the presence of perceptual cues is not a reason for rejecting the claim that our awareness is an experience of imagery.

Briscoe has one more blow to strike. He claims that there is an asymmetry between phenomena of amodal completion and visual images. Visual images

1. have a conscious quasi-visual phenomenology

2. are not stable
3. are not stimulus driven
4. are not obligatory

Instead, our awareness of the occluded parts of partially hidden object is not quasi-visual, it is stable, is stimulus driven and obligatory.

On these grounds, Briscoe concludes that Nanay's idea that "we use mental imagery to represent the occluded features of the objects we perceive" should be rejected. If he is right, (2) is false.

Interestingly enough, Briscoe points out that nothing he says militates against the view that mental imagery is sufficient for amodal perception. Now, sufficient conditions are notoriously difficult to pin down. But here is what he says.

If amodal perception is defined as representing a perceived object's non-visible features, and if mental images are representational, then forming mental images of a perceived object's occluded features suffices for amodal perception. This modest thesis is empirically well motivated. In particular, there is neuropsychological evidence that feedback connections may enable high-level visual areas in the brain sometimes to 'augment' degraded perceptual inputs or, in the case of partial occlusion (superposition) incomplete perceptual inputs with stored, object specific information [...] There is good empirical motivation for the claim that we sometimes represent occluded object features by superimposing mental images of the relevant region of the visually experienced scene. (Briscoe 2012, pp. 166-167)

In fact, according to him, this is precisely what happens in the (b) cases. In these cases superimposition of mental images is sufficient for amodal perception, other necessary conditions being satisfied. In particular, we become visually aware of the hidden part of the objects that we see in virtue of certain necessary perceptual cues. But it is the (a) cases that are under scrutiny, not the (b) cases.

Are we at the end of the game? No. Nanay could rejoin that the visual images that Briscoe has in mind are of a peculiar type, namely intentional visualizing. This is the experience that we have, for example, when we try to figure out how a round table would look in the dining room. This kind

of visual imagery is not stimulus driven; it is not obligatory and unstable. However, there are other phenomena, involving picture-like representations that contribute to the content of a visual experience, and are stimulus driven, obligatory and stable (like perception). Which are they? The popping up of camouflaged objects, the Kanizsa triangle and all the other examples of modal completion are cases in point: their experience is visual, stable, stimulus driven and obligatory. But we can find examples that are even more suited to our case: phenomena of amodal completion too, have these same features. And of course, it would not do to say that they do not have a visual phenomenology. For this is precisely Nanay's contention: they *do* have some kind of visual phenomenology.

As Nanay acknowledges, there are some obvious differences in the phenomenology of modal and amodal completion. In amodal completion, objects are represented behind an occluder, whereas in modal completion they are represented in front of inducers (for the Kanizsa triangle, the inducers are the three black circles and the triangle is represented in front of them). In the Kanizsa case,

*[given that the boundaries of the triangle do not project any contrast], they have no corresponding features in the image and thus the nearer object is effectively invisible. Under these circumstances, the visual system must actively "hallucinate" the invisible structures (Fleming and Anderson 2004, p. 1288).*

Experiments tell us that the visual system also "hallucinates" the invisible parts of a partially occluded object. At this point Nanay concludes that, given that the visual imagery mechanism for modal completion generates an experience of visualizing that is phenomenally indistinguishable from the experience of seeing, for amodal completion, too, we have an experience of visualizing, which is phenomenally indistinguishable from the experience of seeing.

We cannot reject this implication simply by saying that phenomena of amodal completion do not enjoy visual phenomenology. However, there are at least two ways in which we can reject it. One consists in rejecting the claim that the mechanism determines one and only one phenomenology. If we adopt this line we fall into the muddy waters of the mind-body problem. The other line, which I follow, amounts to the claim that awareness of the oc-

cluded parts, whatever it is, cannot be similar to seeing. Thus, either awareness of the occluded parts is not visualizing, or visualizing is importantly different from seeing. In following this line, I attack (3).

4. **Points of View** If visualizing is phenomenally similar to seeing, as (3) asserts, then it should share seeing's essential property, which is the following: we cannot have two different point of views on the same scene at the same time. Thus, for example, we cannot have a visual experience of the inner parts and of the outer parts of an object (unless this object is transparent) at the same time and we cannot have at a visual experience of the front and of the back surface of an object (unless there is a mirror) the same time. Accordingly, Nanay remarks that phenomenal resemblance between seeing and visualizing suggests that we visualize the occluded parts of perceived objects as occupying a particular location in our egocentric space:

*When we represent the occluded parts of perceived objects, we use mental imagery in this latter sense: in a way that would allow us to localize the imagined object in our egocentric space. When I represent the cat's occluded tail, I represent it as having a specific spatial location in my egocentric space. (Nanay 2010, p. 250).*

Consider now the following example. I look at a tree in front of a house and I see the front surface of the tree and the front façade of the house that is not occluded by the tree. Given that by hypothesis, I am aware of the occluded part of the front façade, I should visualize it. But the surface of the tree that I see also occludes some parts of the tree itself, namely its rear. Similarly, the region of the house façade that I see occludes the rear façade. The theory predicts that I also visualize these parts. Given my viewpoint, the rear part of the tree is in front of the occluded part of the house and it occludes parts of the front façade and parts of the rear façade. The prediction of the theory is that I have at the same time a quasi-sensory experience of the rear part of the tree, of the front part of the façade that is occluded by it and of the rear façade. However, if visualizing things involves projecting them in one's egocentric space, I should visualize the rear part of the tree as in front of the occluded part of the house and that part as in front of the rear façade. But it is not obvious at all in what sense these spatial relations, given the uniqueness of the point of view, can be preserved.

More generally, the objection is that if we are perceptually aware of the oc-



cluded parts of some three-dimensional objects arranged in a scene, we must at the same time have different points of view on the same scene. But, if visualizing is like seeing, we do not visualize the occluded parts of those objects.

A possible rejoinder could be the following: my experience of the rear part of the tree is similar to the one I would have if I were moving around the tree and looking at it from the back, *and* my experience of the invisible parts of the house is similar to the one I would have if I were moving around the tree and looking at the house. In other words, I visualize (at  $t$ ) that if at  $t$  I were in place  $l$  and looking at the tree, I would see such and such a scene and if at  $t$  I were in place  $l^*$  ( $l^*$  can be identical to  $l$ ) and looking at the house, I would see such and such a scene.

But here we have a problem. The content of awareness in such a case is captured by a conditional sentence or a conjunction of conditional sentences. But can a conditional sentence capture the content of a visualization? That is, can we visualize conditional states of affairs? I do not think that we can. Thus, if we are aware of the occluded parts of the objects we see, our awareness is not a case of visualizing.

I conclude now with a possible objection, a reply and a final suggestion. The objection is that I focus on anomalous examples of occlusions and amodal completion. When we talk about occlusions, we have in mind objects that are partially hidden from our view by other objects, for example we have that the front façade of the house is partially hidden from our view by the tree. For such cases, Nanay will happily say that we see the tree and the not-occluded part of the façade and, at the same time we have visual imagery of the occluded part of the façade, as if it were a semi-transparent picture superimposed on the tree.<sup>3</sup> No change in point of view would be required here. However, we do not generally say that the front side of the tree occludes its rear side, nor do we say that the near side of the moon occludes its far side. But these cases are crucial for my argument against the visual imagery theory, for it is precisely the assumption that the front side of a 3-D object occludes its rear side that allows me to argue that the observer has different points of view on the same scene.

My examples are *not* anomalous. When we perceive 3-D objects, we generally perceive them as having a rear side. This means that we see them as

<sup>3</sup> Briscoe (2012), footnote 3, makes a similar point.

continuing beyond the surface that we immediately see. For example, if I see a cube, I see it as continuing beyond its square front side. Is it possible to simply superimpose a visual image of the rear side on the image of the front side, as if it were a semi-transparent picture (as for the tree in front of the house example)? Suppose that the front side of the cube is coloured and its colour shades form red to blue: at the centre it is brilliant red and at its boundaries it is blue. I will see it continuing as blue on the back, too. But if this is the case, I cannot imagine the rear side as if it were a semi-transparent picture superimposed on the front side. In fact, I should imagine it, as it would look if I turned around the cube and changed my point of view. But, once again, in order to visualize, I should have different points of view on the same scene at the same time. This is impossible for me.

I draw the suggestion from Dennett (1992). His argument against the filling-in analyses of the blind spot phenomenon suggests that there are two ways in which one can deal with occlusions, depending on whether we take the visual system as *excluding* an absence, that is, representing the absent part as if it were present or as *ignoring* an absence. In the visual imagery account, the visual system *excludes the absence* of the (missing) parts, by representing those parts as present. In other words, the visual system *excludes that the missing parts are missing* (it imagines them as present). I have argued that this strategy raises a serious problem. In the alternative view, the visual system ignores that some parts are absent, that is, ignores that seeing one part is *seeing one part only*. My suggestion is that we should endorse the alternative view. One way to do it is to accept the hypothesis that to see a non-detached part of a 3-D object, is simply to believe that the whole thing is there, unless we believe otherwise.

**References**

- Briscoe, R. E. (2011), "Mental Imagery and the Varieties of Amodal Perception", *Pacific Philosophical Quarterly*, 92, pp. 153-173;
- Dennett, D. (1969), "The Nature of Images and the Introspective Trap", repr. in N. Block (ed.) *Imagery*, 1982;
- Dennett, D. (1979), "Two Approaches to Mental Images", in *Brainstorms*, MIT, 176-189;
- Dennett, D. (1992) "Filling in versus Finding out. A Ubiquitous Confusion in Cognitive Science", in Pick, Van den Broek, Knill (eds) *Cognition. Conceptual and Methodological Issues*, Washington D.C., American Psychological Association;
- Hopkins, R. (2012), "What Perky did not Show", *Analysis*, 431-439;
- Nanay, B. (2010), "Perception and Imagination. Amodal Perception as Mental Imagery", *Philosophical Studies*, vol. 150, pp. 239-254;
- Nanay, B. (2012), "The Philosophical Implications of the Perky's Experiments. Reply to Hopkins", *Analysis*, pp. 439-443;
- Perky, C. W. (1910), "An Experimental Study of Imagination", *The American Journal of Psychology* 21:3 pp.432-452.