The reappearing act

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In a recent article, Roy Sorensen proposed a very interesting puzzle involving shadows – *The Disappearing Act* puzzle (2006). It was left unsolved there. Nevertheless, in his latest book he has added a new thought in guise of a solution to it (2008: 73-75). In what follows I will argue that Sorensen's solution has some shortcomings, and will offer an alternative to it.
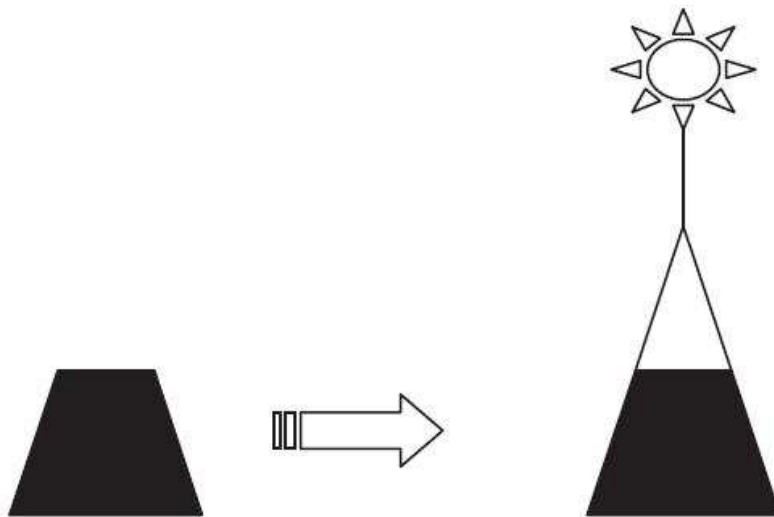
1. The puzzle

Consider figure 1.[2]:

Figure 1

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[2] The original from Sorensen 2006 and 2008.

The truncated cone on the left represents a brick whose appearance duplicates the appearance of the shadow cast by the cone illuminated by some light source on the right of the figure. When the brick is slid into the exact spot of the shadow, there is no discernible difference. The question is: what do we see under the illuminated cone once the brick is parked in the spot previously occupied by the shadow?

We seem to only have three options, and none of them appears to be acceptable. The first option is the shadow. Against this answer we should observe that a shadow cannot exist wholly within an opaque object; that is why we don't take a brick lying on the floor, in the presence of a light source directed upon it, to cast a shadow on or through the floor. Consequently, the shadow is destroyed and replaced by the brick. Further, since the brick is supposed to exactly occupy the dark spot, we could only be left with at most an abstract shadow boundary, which does not qualify as a surface to be causally efficacious on our senses.

The second option is the brick. However, the brick is causally idle, it is completely covered by darkness, so it cannot be the thing we see. It could undergo various changes – it could grow green spots, spin, or shrink—without our ever noticing them.

Finally, one could propose a third dark thing that is neither a shadow, nor the brick. But the causal mechanism that is responsible for such a third kind of being is the same as the one responsible for the existence of a shadow, namely the process of the cone blocking some light. Furthermore, the new kind of dark thing, whatever it is, could again only have an abstract dark boundary, so fail to qualify as causally relevant for perception.

2. Sorensen's solution

Lately, Sorensen has offered the following solution to the puzzle (2008, 73-74):

"My solution to the riddle of the disappearing act is that the shadow was hollowed out, not destroyed.

(...) Material things cannot be seen by virtue of surfaces that are not material.

The criteria for seeing shadows are broader. Shadows cannot have material surfaces, so they never owe their visibility to the reflective or absorptive properties of their surfaces. The shadow prevails over the brick because the standards for seeing absences are lower than the standards for seeing objects. We thought there was a tie because we mismodeled an object-shadow competition as an object-object competition.

(...) Unlike a material thing, a shadow can be absolutely hollow.

(...) The (artist's) brick perfectly hollows out the shadow."

So according to Sorensen what we see is the completely hollow shadow via its *merely abstract* "surface". If we are to see shadows, then we do see abstract surfaces because shadows only have such surfaces by their very nature. On the other hand, material objects are seen in virtue of concrete surfaces, and since the brick's surface is completely covered by darkness, we are unable to see it.

3. The problem

As it has been pointed out above, we don't take bricks to cast any shadow on or through the exact region of the surface they are lying on. This indicates that when there is contact between an object and a surface or another object, there is no place for a shadow. A more precise formulation of this idea I offered as a condition for shadows to exist: "a nonzero volume of space, for which it is true that light would have penetrated it, had it not been blocked by an object" (Aranyosi 2007: 417).

As it happens Sorensen's completely hollow shadows violate this condition. The question is then whether it is the condition that is more plausible, or the idea of completely hollow shadows. The problem with hollow shadows is that we are supposed to see them. Sorensen subscribes to the causal theory of perception, which means that if we are to see the hollow shadows, our experience as of them has to be caused by them. But recall that according to Sorensen hollow shadows are seen in virtue of their merely abstract "surface". Seeing them, therefore, has to be in virtue of being causally acted upon by a merely abstract surface. The question is whether a merely abstract object can causally act upon our senses. It is hard to see how it could, especially in the sense required by perception[3]. Conversely, if we are caused to see a shadow, it looks as though there has to be a nonzero volume of space between the light-blocker and the brick, otherwise causation is hard to accommodate[4].

In light of these considerations, I would like to suggest an alternative interpretation of the case, according to which what the puzzle shows is yet another way of seeing *objects*, rather than another way of seeing *shadows*.

4. An alternative solution: a new way of seeing objects

What we see, I would like to suggest, is what I will call "the exactly shaded brick", rather than the completely hollow shadow. An exactly shaded object S is one that (1) has no surface in

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[3] I take being located in space as occupying space, so Sorensen is correct in talking about an abstract surface of a hollow shadow, as the hollow shadow does not *occupy* any space. My objection bears some resemblance to Benacerraf's dilemma in philosophy of mathematics; as applied to our case it could be put like this: either we see a shadow, in which case it cannot be an abstract hollow, or it is an abstract hollow, in which case it is impossible to see it.

[4] An anonymous referee asks whether a normal, "filled" rather than hollow shadow would have causal powers at all. An ordinary shadow does have spatial and temporal location, unlike abstract objects, so at least a necessary condition for causal interaction is satisfied. Further, the case of shadows, considered as absences of light, is just a particular instance of absences in general, and I take it that, though not uncontroversial, cases of causation by absence are quite frequent – for instance, it seems right to say that the absence of oxygen in the brain causes brain death. Similarly a spatially circumscribed absence of light, i.e. a shadow, causes shadow-appearances in normal perceivers.

contact with any quantity of light and (2) occupies *exactly* the region R that would satisfy my condition, with respect to an obtruder O, had S not been present. The condition, to recall, was a nonzero volume of space, for which it is true that light would have penetrated it, had it not been blocked by the obtruder O. Condition (1) is responsible for the term "shaded", while (2) is responsible for "exactly" in the phrase "an exactly shaded object".

The phrase does not commit us to the existence of any shadow. By "shaded" I mean "lacking contact with light", so a wooden box in a completely dark room counts as shaded. It satisfies condition (1), but, importantly, it does not satisfy (2). Condition (2) in effect explains in virtue of what *looking* at an exactly shaded object counts as *seeing* that object.

Sorensen explains why the brick cannot be the thing that we see in virtue of looking in its direction, by appealing to an analogy (2006, 322):

"It is also tempting to argue from the premiss that the observer is looking at the brick. If looking at x entails seeing x, the brick is seen. Certainly the observer's eyes are pointed in the right direction. Onlookers will feel no temptation to adjust his head or point elsewhere. If the brick were available for viewing, then the observer would be locked on target. The problem is that the brick is unavailable. A police officer can know that the fugitive is hiding in the shadow in front of him. Yet the best the police officer can honestly say is 'I know you are in there! Step out so that I can see you.'"

The problem is that what the police officer looks at is a shaded object, in our terminology, rather than an exactly shaded one. The wooden box in the completely dark room is, of course, not seen by a perceiver. Similarly, what the police officer's eyes are focused on is mere darkness. But what would we say if the fugitive were exactly shaded, that is, if he were shaded *and* occupying *exactly* the volume that would be occupied by the shadow cast by the obtruder in that situation? The appearance of the exactly shaded fugitive would be no

different from his *silhouette* – the police officer could easily shoot him exactly in the head or in the heart! And looking at someone's silhouette is, I think, uncontroversially a case of seeing that person.

One could argue against this reasoning by considering the exact shading of the object as one stage within the context of a series of stages of shading, with the result that the exact shading is no different from the other shading stages, from the point of view of the intuitions regarding what people would judge to be the case in terms of what is seen. The objection goes like this[5]. Start a truncated cone in large, cast by a big cone overhead. Let the cone shrink until it matches Sorensen's cone. Then at the last stage shrink the cone a bit more so that the truncated cone is now absorbing light. Ask people when they first saw the truncated cone. The intuition is that they will say the truncated cone was seen only at the last stage. The effect would probably be even stronger if the truncated cone were not black, but yellow, for instance.

I think this objection only shows that there is a certain context-dependence in ordinary judgments regarding perception. Take the reverse of the process described above. Consider a yellow half-cone seen in full light, then block the light in such a way that the half-cone is exactly shaded, and, finally, increase the size of the light-blocker, while keeping the same shape of the cast shadow. I think that people would still judge that they see the half-cone at the second stage, when it is exactly shaded: they would just say it is not seen as yellow but as covered by darkness. However, at the third stage, when the shadow gets larger, they would judge that they can't see the half-cone anymore. (Similarly, the change from the situation of seeing the half-cone in full light to the one in which it is backlit, would be judged as still seeing the half-cone, but as dark, rather than ceasing to see it completely. The case is analogous to exact shading.)

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[5] Thanks to an anonymous referee for this objection.

Another objection is that while the exactly shaded fugitive has the appearance of a person in a clear way, not the same can be said about our brick: there is no reason why an observed who just passes by would judge that what he is seeing is an exactly shaded brick rather than a shadow. On the contrary, given how rare such phenomena as the disappearing act normally are, any observer who is unaware of the fact that the brick was parked in the place of the shadow would judge that what he sees is a shadow. This is true, but we should focus, following Sorensen's own advice (2006, p. 322; 2008, pp. 38, 58, 222, 240, 245-49, 268), on the nonepistemic notion of seeing in Fred Dretske's sense (1968: 88), which commits us to no ascription of specific beliefs to the perceiver, or to ascription of false beliefs. *Seeing* is at issue here, not the epistemic notion of *seeing that* something is the case. The unaware passer-by may well not see that there is an exactly shaded brick in front of him, and actually believe that there is a shadow, but all this is compatible with him (nonepistemically) seeing the brick.

Sorensen's argument against the brick being seen is that (1) the brick's not absorbing any light implies that it is not a cause of what is seen, (2) seeing an object O implies being caused by O to have some experience, therefore, (3) the brick is not seen. But consider the following situation. Everything is like in the original scenario regarding the brick and the shadow, except that now the brick is moving, say, horizontally, then vertically, while there is an electronic motion-sensor that receives signals from the brick and sends signals to the light source and the light-blocking cone, to change their positions, in such a way as for the shadow that would be generated to exactly occupy the volume occupied by the brick at any time (the signals sent to and from the sensor are traveling with the speed of light, so there is no perceived delay between the brick's motion and that of the putative shadow). Now it seems acceptable to say that the brick causes us to see the its moving since it is in virtue of the brick's moving that the light source and the light-blocker are moving. Nevertheless there is no

time at which the brick absorbs any light. So proposition (1) in the above argument is apparently false[6].

Finally, what about Sorensen's criticism against the view that we see the brick, based on the potential changes the brick could undergo without our ever being able to notice them? Here is a quote (2006, 320):

"While parked, the brick could grow yellow spots and spin. That would not affect what you see. The brick could contract into the shape of bowling pin, wobble, and then further shrink into non-existence. Once again, what you see would not change. This low degree of functional dependence is due to the fact that the brick is causally idle. To be seen, an object must be a cause of what is seen. Therefore, the brick cannot be seen."

It is useful to distinguish two kinds of changes that are taken here as putative counterexamples to seeing the brick.

First, growing yellow spots and spinning. Why are these changes incompatible with seeing the brick? I might look at my mother from a certain distance that would make me unable to notice a sudden change of her facial expression. But what I see is nevertheless my mother. Sorensen himself mentions (pp. 61-2) the excitement recalled by arctic anthropologist Gontran de Poncins of spotting an eskimo in the distance, *seen as* a black dot on the immense white arctic surface.

Second, the brick's contraction into something smaller than it actually is would be equivalent to its becoming shaded rather than exactly shaded. And, as I have already pointed

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[6] The causal theory requires a causal connection of the right sort. An anonymous referee doubted that the causal connection in my example is of the right sort. The causal connection in this case is indeed artificial, but nevertheless it conforms to two requirements - (a) it is still visual in nature, that is, it is not a detection mechanism *simpliciter*, like one based on auditory, or tactile, or ... perception, but a visual (photically based) one, and (b) it is construed as a reliable mechanism – which I take to be sufficient to make it appropriate in the context of seeing.

out, there is no dilemma there: objects in perfectly obscure rooms are not seen. The fact that the object *as shaded* is not seen is irrelevant to the question of whether it is seen *as exactly shaded*.

Sorensen adresses the worry that what we see is not counterfactually dependent on te existence of the shadow: if the shadow disappeared, we would have the same visual appearance, but he argues, following Brian McLaughlin (1996), that that only shows that David Lewis's early counterfactual theory of causation is wrong: what is important is not what we *would* see, but the *actual* physical process that causes us to see. I agree with this diagnosis except that what seems to be relevant in the case of exactly shaded objects is Lewis's latest counterfactual theory of causation – causation as influence (Lewis 2000).

According to this theory, where C and E are distinct actual events, C influences E if and only if there is a substantial range C1, C2, ... of different not-too-distant alterations of C (including the actual alteration of C) and there is a range E1, E2, ... of alterations of E, at least some of which differ, such that if C1 had occurred, E1 would have occurred, and if C2 had occurred, E2 would have occurred, and so on (Lewis 2000: 190).

An alteration of event E is either a very fragile version of E or else a very fragile alternative event that is similar to E, but numerically different from E (Lewis 2000: 188).

It seems that once we have excluded the presence of the shadow, for reasons I have explained above, the brick appears as a paradigm case of influece: a series of alterations (in our case very small changes in size or location) of the brick would result in similar changes in our experience[7].

What the puzzle shows, if what I have said is right, is that we should revise the view that material objects are always seen in virtue of absorptive and reflective properties of their surfaces. There are circumstances, those of exact shading, in which a material object is seen

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[7] As I have pointed out in Aranyosi 2008, causation as influence also yields a different result in one of Sorensen's other puzzles, the Intersecting Eclipses Puzzle, chapters 1 and 2 in his book.

for the same reason that a shadow is normally seen, namely, its mere contrast with a light-containing environment.

5. Compatibilism?

There is an obvious alternative to the view I have sketched above: why can't we say that we see both a shadow and the brick? The phrase "exactly shaded object" suggest, quite intuitively, that the object is somehow covered by darkness, so how are we to avoid committment to there being a shadow that at least covers the brick. Furthermore, the condition of influence holds equally for the hollow shadow: a series of tiny changes in its location brings about a series counterfactually dependent tiny changes in our visual field! There are three directions from which I want to reply to this suggestion.

A. Sufficient conditions for shadowhood. As I mentioned earlier, what the phrase "exactly shaded obect" suggest is simply that the object's surface does not receive any quantity of light. In our case the reason for this is that something (the cone above) blocks it. Some quantity of light being blocked is a necessary condition for shadowhood, but whether it is sufficient is a further question. Our very example is one that can be taken as indicating that some light being blocked is not sufficient for a shadow to exist, and that we need a further condition, namely, that there be some volume of space where light would penetrate had it not been blocked. So the case itself is not sufficient to establish that something being shaded implies a shadow's existence.

B. Covering versus suffusing. Does the problem lie in the materiality of the brick that exactly occupies the dark spot under the light-blocking cone? No. Consider the case of the brick being transparent[8]. I would say that (1) there is a three-dimensional shadow because probably the sufficient conditions for shadowhood are met (the necessary condition that

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[8] I owe this idea to Roy Sorensen, personal communication.

wasn't met in the opaque brick case is now met, i.e. that there be a volume of space where light would penetrate had it not been blocked), (2) the transparent brick spatio-temporally coincides with the shadow, and (3) what we see is the two coinciding beings, the brick and the shadow.

Related to (3) I think the case is similar to the case of PET scanning, which involves visualizing some tissue by using a contrast liquid – we see the tissue as suffused with the contrast liquid and in virtue of that. So we see both, i.e. the organ and the quantity of liquid that (quasi)coincides with it. So in the case of the transparent brick I think we could say that we see the brick as *suffused* with the shadow (darkness) and in virtue of that plus the mere contrast with the light that falls outside that area.

We get more support for this diagnosis if we now compare two cases: (α) an opaque brick lying on an opaque object, and (β) an opaque brick lying on a thick transparent object, which in turn lies on another opaque object. In case (α) we would certainly refuse thinking that a shadow is cast by the brick through the opaque object it lies on, whereas in case (β) we would clearly see a three-dimensional shadow suffusing a determinate region of the transparent object, and "stopping" in the form of a two-dimensional cast shadow on the surface of the lowermost, opaque object. What I want to suggest is that cases of suffusion are much clearer, more decidable regarding the existence of shadows than cases of alleged abstract covering that Sorensen's solution requires[9].

C. Prior ontological commitment. Finally, there is a question of prior ontological commitment when addressing the objection that the hollow shadow satisfies the condition of influence just like the brick does. Previously (Aranyosi 2008) I argued, in connection with

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[9] I expect at this point that Sorensen identifies in my talk of suffusion what he calls the "fallacy of reification" (2008: 53). I would like to make clear that what I mean by a transparent object being suffused with the darkness of a shadow is that for each region *R* of the transparent object it is true that a particular quantity of light Q is such that Q is at-R*-rather-than-at-R, where R* is a region toward which the blocked light is reflected. This negative and contrastive reference to shadow-locations is a way to make it more precise that a shadow is a region of missing light, so suffused or constituted by regions of missing light. For more on this account and an alternative one, see Aranyosi 2007, section 2.

another puzzle proposed by Sorensen, that of intersecting eclipses (Sorensen 2008, chapters 1 and 2), for a compatibilist solution. The puzzle is the following. Suppose the Earth has two moons, one that is smaller but closer to us, Near, and one that is larger but farther from us, Far. The two moons could line up between us and the Sun in such a way that we see a solar eclipse. Further suppose that the ring of light of the eclipse would appear exactly the same to us if either of the moons were destroyed while keeping the other in its place. The question is whether we see Far or Near when looking at the eclipse. Sorensen argued, based on the causal theory of perception, for Far as the thing we see, because Near is causally idle. I argued for Far + Near (Aranyosi 2008: 513-4):

> "I agree that we do see Far in spite of the counterfactual theory, but I think a good case can be made for the view that what we see is both Far and Near, that is, the scattered object Far + Near. Consider making huge perforations into both moons until they become rings, so that the silhouette we see is a ring, and such that it is true that we would still have the same experience, were either of the moons destroyed while keeping the other one in its place. Isn't it intuitive to think that Near-ring has to satisfy certain very precise conditions regarding its shape, location, and dimensions in order for us to actually see a dark ring of a certain location and certain dimensions? Even if Near-ring is covered by Far-ring's shadow, we can take Near-ring's idleness, that is, its *not interfering* with the light that is *not reflected or absorbed* by Far-ring, as quite important in order for us to see the silhouette exactly as we see it. This brings us to Lewis's *latest* counterfactual theory of causation—causation as influence."

The puzzle of intersecting eclipses is, of course, relevantly similar to our puzzle, nevertheless there is an important difference: in the former case there is no question about whether Far or Near exist or not; we already know they do, so the only question is which one do we see. As opposed to this, in our case there is no prior ontological commitment to anything but the brick[10]. It is precisely part of the puzzle that it is naturally questionable whether a shadow also exists, besides the brick existing.

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[10] An anonymous referee asks whether in a modified disappearing act scenario, one in which (a) the surface which the half-cone brick is lying on is transparent and (b) the observer is under that surface, I would say that when the brick is slid under the light-blocking cone, the observer sees both the brick and the (silhouette of the) cone, and whether the brick qualifies as exactly shaded. To reply to the second question, it is pretty clear that the brick does not qualify as exactly shaded, because there is a shadow proper between the eyes of the observer and the lower extremity of the brick: to use my earlier metaphor the transparent surface the brick is lying on is

To conclude, I think both the case for seeing a hollow shadow and the case for compatibilism, that is, for seeing both the shadow and the brick, is weaker than the one for seeing the brick alone. What the puzzle shows is yet another way of seeing dark things - by way of being causally connected to exactly shaded objects[11].

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suffused with darkness. Regarding the first question it is worth observing that this modified scenario is a version of the puzzle of the intersecting eclipses, so I would judge that, indeed, we see both the brick and the cone, as both of them are causally relevant, if causation is understood as influence.

There is a further argument for this last claim. The case is interesting in that it combines elements from three distinct puzzles involving shadows: the disappearing act (because it follows that case closely), the intersecting eclipses (because the observer, the brick, and the cone are lined up in a straight line), and the Yale shadow puzzle. A version of the Yale shadow puzzle is a case in which we have a larger object - a wall, for instance- which casts a shadow on a surface, and another object, smaller than the first - a box, for instance - lying within the three dimensional shadow of the wall. There is clearly a shadow between the box and the surface, and it seems plausible that every shadow is a shadow of something. The question is then: whose shadow is it? Apparently, it can't be the shadow of the box, as the box does not block any light (because it is already shaded, i.e. does not have contact with light). It can't be a shadow of the wall either, as a shadow cannot be cast through an opaque object. My own answer should be apparent by now: the shadow is the shadow of the sum of the box and the wall, because it is only by considering *Box+Wall* as a replacement for *x* that the following proposition is true of the region behind the box: light would be there were it not blocked by x. The wall alone, or the box alone would simply not do! If what I say about the Yale shadow puzzle is right, then since the observer in the modified disappearing act puzzle is positioned in the shadow of something, he has to be considered as positioned in the shadow of *Box+Wall*, so what he sees is (the silhouette) of the sum of the box and the wall. There fore he sees both the box and the wall.

The Yale shadow puzzle is due to Samuel Todes and Charles Daniels (1975), also discussed by Bas Van Fraassen (1989).

[11] For useful feedback I would like to thank an anonymous referee for *Acta Analytica* and Roy Sorensen.

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