A TESTABLE MODEL OF VISUAL AWARENESS

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In this paper, I propose a novel model of visual awareness capable of generating perceptions, hallucinations, and illusions. This model satisfies the following constraints: it is (1) world involving, and (2) energy efficient. I discuss where my model fits within the traditional discussion philosophers have had concerning the nature of perception. In particular, I argue that the proposed model is direct realist. Unlike competing direct realist views, this model might turn out to be supported by empirical considerations and it is more efficient than a salient alternative.
To all my friends that have helped me, in some way or another, during these two years. Especially, to Sylvie Ramirez and Daniel Kokotajlo. You are two of the most generous human beings I have ever met. Thank you.
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Introduction

In this paper, I propose a novel model of visual awareness capable of generating perceptions, hallucinations, and illusions. This model satisfies the following constraints: it is (1) world involving, and (2) energy efficient. These constraints will be explained in full in later sections of the paper. It is important to note that throughout this exercise, I am not claiming that my system actually models human visual awareness. To show that, a lot more empirical research would be needed. Here, I’m only interested in modeling how human perception could work.

In the first section, I present the system and explain how it generates the three different kinds of visual awareness. In the second section, I explain how constraints (1) and (2) might make the system more attractive than a salient alternative that does not satisfy these constraints. In section three, I present and respond to two functional challenges that the system faces. In the fourth section, I argue that while I’m not attempting to model human visual awareness, it is not unreasonable to think that humans may utilize an analogous system. Finally, in section five, I discuss where my model fits within the traditional discussion philosophers have had concerning the nature of perception. In particular, I argue that the proposed model is direct realist. Unlike competing direct realist views, this model might turn out to be supported by empirical considerations.
1.0 The Cognitive Model

Let us say that a *veridical perception* occurs whenever: (1) a subject S is visually aware as of a physical object O having property F, (2) O exists, (3) S and O are perceptually related in the right kind of way, and (4) O indeed has F. For example, if there is a big red apple on the table, and the subject is visually aware of the apple as red, and the subject and the apple are perceptually related in the right kind of way, then the subject is having a veridical perception. Let us think of *hallucinations* and *illusions* as failures of veridical perception. A subject S has a hallucination as of O having F, whenever conditions (2), (3) and (4) are not met. For example, a subject with a high fever may be visually aware as of a spider that is slowly approaching her bed when no spider is actually there. A subject S has an illusion as of O having F, whenever condition (4) is not met because even though O exists and the subject is perceptually related to it in the right kind of way, O is not F. For example, refraction of light may make a subject visually aware of a broken straw in a glass of water, even though the straw is not broken. The subject’s visual awareness of a broken straw is an illusion.

In what follows, I describe a system of *visual awareness* whose parts are organized and coordinated so as to bring about veridical perceptions, hallucinations and illusions.
1.1 Veridical Perceptions

To begin with, assume the system is in a world populated by physical, mind-independent things or objects. If the system is to bring about veridical perceptions of these objects, then it needs a device that allows it to access them. I call this device *the receptor*.

In cases of veridical perception, the receptor *passively* receives information that comes from objects outside of the system. Once the system acquires this information, it sends it to the system’s *processor* which processes the information and delivers it, in the right format, to other parts of the system. The information the processor receives indicates the presence of an object outside the system. This information triggers the processor to create a command to find that object in a particular location of the world. The processor sends this command back to the receptor which changes its state from passive to active. This time, the receptor *actively* looks for the object in the world, putting the subject in the right state to have a veridical perception. When the receptor finds the object, the system has *satisfied the command* and the subject has a veridical perception of that object in virtue of being in the right relation to the object.¹

The following diagram illustrates how the system brings about veridical perceptions. The colored parts correspond to the parts of the system I have mentioned, and the numbers indicate the sequence in which the information flows.

¹ Later on, it will be important to notice that the system is built to comply with this kind of command; once the processor generates a command, the system will try, by all means, to satisfy it.
To recapitulate, in veridical perception, the system carries out the following processes:

1. The receptor *passively* receives information from an external object.
2. After interpreting this information, the processor generates a command to find a particular object outside of the system.
3. The processor sends the command to the receptor.
4. The receptor puts itself into the active mode.
5. In a system’s attempt to satisfy the command, the receptor actively looks for the object in the world, and the subject who has the system enters in the right state to have a veridical perception.
6. Once the receptor finds the object, *the subject* becomes aware *of it* and the command is satisfied.
7. It is only at this point that the subject has a veridical perception.
Note that the awareness relation is between the subject and the object, and not between the subject and a representation of the object. That is not to say, however, that this system is not able to generate representations available to the subject’s awareness. Both of these points will be relevant in my discussion below.

1.2 Subsidiary processes

The system can generate accurate representations of external objects and it does so every time it brings about veridical perceptions. However, it is important to notice that these representations don’t play any role in bringing about veridical perceptions. On the contrary, veridical perceptions are prior to the representations; it is only after the receptor finds an external object and the subject becomes aware of it that the system’s processor generates a representation of the object. Note that, if the subject hadn’t become aware of an external object, the system would not have created a representation of it.

Diagram 2 below illustrates the moment after a veridical perception has occurred; when the processor generates representations of the object.

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Note: There may be different kinds of representations that serve different purposes. It could also be that visual representations are of a particular kind and therefore have a characteristic format—for example, pictorial. But I am not going to go over such details and clarifications because what I have to say holds regardless of this. In what follows, I discuss visual representations without specifying their format.
After the processor has created a representation of an external object, it sends it to the system’s short-term storage unit. I will henceforth call this unit the short-term memory. This unit allows the system to briefly hold information (in case it needs it again in the next few moments for some purpose—including simply deciding what to do with that information). Diagram 3 illustrates the processor sending a representation of an object to the system’s short-term memory.

At some point, the system determines whether the representations in its short-term memory are important. If it determines that they are, it sends them to its information storage unit.
or, as I will call it, its *long-term memory*. This unit allows the system to keep important information for an indefinite amount of time to be used whenever it is needed. Diagram 4 illustrates the short-term memory sending important representations to the system’s long-term memory.

In summary, I have described a set of processes subordinated to veridical perception. They are not part of what the system needs to bring about veridical perceptions; rather, they take place only after veridical perceptions have occurred:

1. The system’s processor generates a representation of an object.
2. After the processor has created this representation, it sends it to the system’s short-term memory.
3. If the system recognizes this representation as important, it sends it to its *long-term memory*.

Note that these processes explain how the system acquires and holds on to representations of external objects. Again, the system doesn’t use these representations to produce veridical
perceptions, but instead acquires them as a result of the subject’s awareness of external objects. In
other words, I am not saying that a subject with such a system becomes aware of external objects
through representations, but rather that she becomes aware of objects directly—no intermediary
needed—and that only afterwards does the system generates a representation of those object.

1.3 Hallucinations

The system is also able to bring about hallucinations, i.e., cases of visual awareness as of
objects that are not in the world at all. The system does this in two stages: the reaching failure stage
and the hallucinatory stage. Let us first describe the reaching failure stage. As illustrated below, in
Diagram 5, the system receives informational noise—broadly speaking, defective information—and
sends this information to the processor. The processor interprets this information as indicating the
presence of an object with specific features outside of the system. This kind of interpretations
triggers the processor to create a command to find that object in the world. The processor sends
this command to the receptor and starts the receptor’s active mode. Then, to satisfy the command,
the receptor actively looks for the object in the world and the subject enters in the right state to
have a veridical perception. But the receptor cannot find the object because there is no such object
in the world and so the subject does not have a veridical perception of it.

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3 The same kind of defective processing can occur even if the received information is not defective but the system is
not working properly.
The system is designed to satisfy the processor’s command, so it uses all its resources to do so. Since the object is not found in the external world, the system searches its stored representations and select one that satisfies the features of the object. Then, the system sends this representation to a device that allows the subject to become aware of the information that is in it. I will call this device the *internal board of awareness*. The subject cannot become aware of information stored in the system unless that information is put in her internal board. In Diagram 6, we can see that, in the case of a hallucination, a representation of an object in the long-term memory is selected as most appropriate and sent to the internal board of awareness. At this point, the subject has a hallucination.
Just to recapitulate, in the case of hallucination, the system undergoes the following processes:

1. The system receives informational noise—broadly speaking, defective information—that is interpreted as indicating the presence of an object with certain properties outside of the system.

2. With this interpretation, the system generates a command to find a particular object outside of the system.

3. The system attempts to satisfy the command by receiving and actively looking for the specified object in the world.

4. However, this object is not found in the world.

5. In a further attempt to satisfy the command, the system looks for it in its long-term memory and, if found, sends a representation of the object from its long-term memory to the internal board of awareness so that the subject can become aware of it.

6. At this point, the subject is aware as of an object in the world, but, given that there is no such object outside, she has a hallucination.
Note that in this case, unlike in the veridical case, the subject is aware as of an object by deploying a representation of the object that is in the internal board of awareness.

1.4 Illusions

The system is also able to bring about illusions—visual awareness of actual things in the world with properties they don’t have. Illusions are intermediate cases between veridical perceptions and hallucinations. When a subject who has this system has an illusion, she is aware both of an object in the world and of a representation of a property that is in the internal board of awareness. Let us describe how the system brings about illusions in more detail.

First, just as in the case of veridical perception, the system receives information from an external object. At the same time, just as in the case of hallucination, the system also receives informational noise. The processor interprets this information, and generates a command to find an object with several properties, including \( \varphi \). The information that the object has the property \( \varphi \) is a distortion of the received information caused by the presence of informational noise; in reality, the object doesn’t have it. When the receptor tries to satisfy the command and actively looks for the specified object, it finds one that has all of the required properties except \( \varphi \). As a result, the processor’s attempt to satisfy the command fails. This is what I will call the inaccurate reaching stage, which is illustrated in the following Diagram 7.
But since the system is designed to satisfy the command it will reach out to its long-term memory to find a representation of \( \varphi \)—the missing feature of the object—and then send it to its internal board of awareness. The subject will then become aware of the blend between the object and \( \varphi \); the subject has an illusion because she is aware of an object \( O \) that is out there in the world, but she is aware of it as of having the property \( \varphi \). I call this last stage of illusion the \textit{multiple board of awareness stage} because in this kind of case the subject has access to things that are within two different “boards of consciousness”: the internal one and, metaphorically, the external world. Diagram 8 below illustrates this stage.
Note that in illusions, unlike in veridical perceptions, representations play an important role in the subject’s awareness. Without representations, the subject wouldn’t be able to have illusions.
2.0 Advantages of the system

The system I have described is hybrid: it provides us with one kind of explanation for veridical perceptions and another kind for illusions and hallucinations. On the one hand, if a subject with such a system has a veridical perception, then she is visually aware only of things that are in the external world. On the other hand, if she has an illusion or a hallucination, then she is visually aware either both of things in the external world and of representations in the system’s internal board of awareness or only of representations in the internal board.

To appreciate some important virtues of this system, let’s compare it with a different kind of system that, at first sight, might look more appealing. This alternative system is a non-hybrid one; it is a system that provides us with only one general account of how veridical perceptions, hallucinations and illusions are brought about. Briefly, a subject with such system has veridical perceptions, hallucinations and illusions by deploying representations in the system’s internal board of awareness. Let us describe, in more detail, this alternative system.

2.1 The alternative system

2.1.1 Veridical Perceptions

As we will see in Diagram 9, the alternative system first receives information from an external object. The processor of this system interprets this information as an indication of the presence of an object outside of the system. With this interpretation, the processor generates a command to create an accurate representation of that object so that the subject who has this system
can become aware of it. This system is also built to satisfy this kind of command, and to do so the processor generates a representation of it and sends it to the system’s internal board of awareness. It is only at this point that the system has satisfied the command; it has successfully generated an accurate representation of an external object and, through it, the subject has become aware of that external object.

Note that, unlike the system I proposed, a subject who has this alternative system has a veridical perception of an external object in virtue of having a representation of it in the internal board of awareness.

2.1.2 Hallucinations

The case of hallucination is very similar to that of veridical perceptions. The only difference is that the information the receptor receives is defective. It is interpreted as indicating the presence of an object in the world when there is no such object. As in the veridical case, the alternative system generates a command to create an accurate representation of the reported object so that the subject can become aware of it. The processor generates this representation and further
sends it to the system’s internal board of awareness. The subject becomes aware of that representation so that the system has satisfied the command. However, unlike her awareness in the veridical case, the subject’s awareness in this case is as of an object that is not in the world, and so the subject has a hallucination. This process is illustrated in the following diagram:

Note that, in this case, the subject is aware as of an object in virtue of having a representation that doesn’t represent any object which is actually outside of the system. However, just as in the veridical case, the subject’s awareness in this case is only possible because a representation is in the internal board of awareness.

2.1.3 Illusions

The illusion case is a mixture between the veridical and the hallucination case. As shown in Diagram 11, the system receives both reliable information about an actual object in the world and defective information that affects how the processor interprets that object. The processor interprets this information as indicating that an object with some features, including $\varphi$, is outside. As in the cases of veridical perception and hallucination, this alternative system generates a command to
create a representation of the reported object. The processor generates it and sends it to the system’s internal board of awareness. In this way, the subject’s awareness is of an actual object in the world that satisfies all the specified features in the command except $\varphi$ as of having it. In such a case, the subject with this system has an illusion.

![Diagram 11. Illusions (Alternative System)](image)

In the three cases of visual awareness, this alternative system uses representations of objects and deploys them in its internal board of awareness. Note that these representations are not of something of which the subject using this system is already aware of; rather, they are representations that, when placed in the internal board, make the subject visually aware for the first time.

### 2.2 Advantages of the proposed system

In all cases of visual awareness, neither the alternative system’s short-term memory nor its long-term memory are used. It might be tempting to think that this system doesn’t have these two devices, but that seems implausible. This alternative system, just like the system I proposed, is able to receive a large amount of information, and it is likely that it would need to process some of that
information again; hence, it seems plausible that this system will need a short-term memory. In the same vein, it also seems plausible that this system will need a long-term memory to keep important information. Therefore, it is reasonable to think that this system will also have these two devices, though they will not play a role in the system’s production of visual awareness.¹

2.2.1 Direct contact with the world

If we were comparing the proposed system to this alternative (in what follows “the alternative”), we might think that the latter is more appealing. After all, the alternative is simpler and elegant; it is able to produce any kind of visual awareness by carrying out the same process. Furthermore, given that the alternative system provides us with one unified account for all types of visual awareness, it is a more “economical” system than hybrid models, like the one I propose, that require one explanation for veridical perceptions and another for hallucinations and illusions. However, I think that even though the system I propose is less simple in this sense, it is a preferable system overall.

The simplicity and elegance of this alternative system comes at a price: it cannot put the subject that uses it in direct contact with the object she perceives. To fully appreciate why this is an important cost for this system, recall how the system I propose brings about veridical perceptions: it is only when the system actively finds a particular object in the world that the system’s subject becomes aware of that very object in the external world. In other words, when bringing about veridical perceptions, the system itself extends all the way to the relevant external objects that are part of the subject’s visual awareness. In contrast, when the alternative system brings about a

¹ It is possible that this alternative system sometimes uses stored representations to generate visual awareness. For brevity, however, I only presented a simplified version of it.
veridical perception—or any other kind of visual awareness—the system’s subject is aware of an external object only by means of a representation of it in its internal board of awareness. This image is an accurate representation of the relevant external object; nevertheless, it is just a representation. In this sense, the alternative system becomes a mere image generator that creates images that sometimes resemble the world and other times don’t. Intuitively, we seem to be in direct contact with the world when we veridically perceive it—without any intermediary. Only one of these models nicely captures this intuition.

One way of appreciate this is by comparing an art class in which you are taught by seeing art pieces on a screen, with one in which you learn by seeing the pieces of art themselves. The second class seems better. Likewise, the system that allows you to become aware of external objects by putting you in direct contact with them seems preferable than the alternative that does it through representations.

2.2.2 Wise use of resources

The other apparent advantage of the alternative system is that it is more “economical”: it provides us with only one kind of explanation of how perceptual awareness occurs—namely, trough representation of objects deployed in the internal board of awareness. In contrast, the system I proposed provides us with one explanation for veridical perceptions and a different explanation for hallucinations and illusions. In the case of veridical perceptions, the awareness relation doesn’t go through a representation, but in the cases of hallucinations and illusions it does.

Although this feature might make the alternative system more desirable, it seems intuitive that if other system has different features that make it more efficient or powerful at the cost of becoming more complex, this is a good price to pay. I argue that the system I propose is
more complex but it uses its resources better in the sense that it either makes itself more efficient or more powerful.

We have three different reasons to believe that the first system is more efficient. The first reason is that the original system uses only two devices for veridical perceptions, while the alternative system uses three. One could argue that the system that uses more devices also uses more energy. Hence, the system I propose seems more efficient. However, it might well be that the two processes used by the (intuitively more efficient) system end up using more energy than the three used by the alternative system. So we need a better reason to believe in the greater efficiency of the system I propose.

The second reason is that, perhaps, the use of the internal board of awareness is costly. If a system can avoid using it and still be able to bring about some kind of visual awareness, then it should; not using the internal board will save it a lot of energy. The system I propose does not use its internal board when bringing about veridical perceptions, which presumably saves it a large amount of resources. In contrast, the alternative system uses its internal board all the time. Hence, the original stands as more efficient.

Still, one may wonder why is the internal board of awareness costlier? If these systems existed, this would be an empirical question, so what I want to motivate here is merely the plausibility of the intuition. Bernard Baars (1997, 2002) has proposed that humans actually have something like the internal board of awareness I’ve been talking about, which he calls “inner global workspace”. He thinks that this inner workspace is what allows all parts of the brain to become aware of the information that is in that space. Without it, the stored information wouldn’t be accessible to the system. If the internal boards of awareness of the two systems which we are
comparing function in a similar fashion, then these internal boards will use resources to inform all parts of the system that some information is available to that part at that moment. This seems like a task that requires a lot of energy. A system that can avoid (at least in some cases) the use of its internal board in its production of visual awareness seems more efficient.

A third reason comes from a concept from the cognitive sciences: cognitive offloading. Although this concept is strongly connected to things the brain tends to do, we can understand it as an energy-saving process that different kinds of cognitive systems—including the ones presented here—undergo. These systems perform cognitive tasks that consume energy; if they can make some other physical system reliably accessible to them perform those tasks, then they let that other system do them for them instead. Think about humans and how we tend to make electronic devices remember phone numbers and perform calculation that we would otherwise have to remember or calculate ourselves. It is a fact that people are becoming worse at memorizing information and calculating since they have reliable access to their smartphones. This supports the idea that cognitive systems tend to offload their tasks to other reliable sources when they can. The system I propose seems to be doing just that by veridically perceiving an object by using that object itself in the world instead of creating a representation of it. We can see this as a form of cognitive offloading. By engaging in such cognitive offloading, our system saves its energy resources. In contrast, the alternative system—which always creates the representations by virtue of which its

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3 For an introductory discussion see Evan F. Risko, and Sam J. Gilbert, (2016)

4 See Storm B. C, Stone S. M., Benjamin A. S. (2016)
bearer become visually aware—cannot engage in this cognitive offloading with the world. Between these two systems, the former seems more efficient.

We can go a step further and think about this feature of the first system not only as a resource to save energy but also as a way for the system to become more powerful. Clark and Chalmers (1998) argue that if a cognitive system heavily leans on another reliable system to perform its tasks, something more than cognitive offloading takes place between those two systems. The two systems are linked in a two-way relation that makes them one; the system that offloads its tasks enlarges itself and makes the other system a part of itself. This phenomenon is known as \textit{extended cognition}. Going back to the two systems of visual awareness which we've discussed, we can think of my proposed system as enlarging itself by taking the world as its external board of awareness. If my proposed system enlarges itself by including the world, it becomes more powerful than the alternative that doesn’t.

Note that the system I propose is more advantageous than the alternative whether or not Clark and Chalmer’s idea is right. If they are right, then my system is more powerful; if they are not it is still more efficient. Either way, my system seems preferable.
3.0 Functional Challenges

The view proposed here, might be challenged in different ways. In what follows, I'll address two such challenges to defend the plausibility of my view. This section will also further clarify how my system works.

3.1 Robust awareness

In the case of veridical perception, what does it mean for a subject who has the system I have proposed to become aware of the external world? Why doesn’t she become aware of the initially received visual information? After all, the information is telling the system that there is an object outside. Why is this not enough for the subject to be aware of the object?

Response: In a non-robust sense, the system—but not the subject—“is aware” of the initial information when it processes it. Non-robust awareness, or information sensitivity, refers to the ability of a system—or a part of it—to recognize that external stimuli contain information about objects outside of it. But visual awareness is more robust than this initial “stage of awareness”; it involves the system’s engagement with the world in an active way.

In the case of veridical perception, the received information includes information interpreted as indications of where to find a particular object. But this information is not the object itself; it is only what triggers the receptor to active search for that object so that the bearer of the system can become aware of it. She becomes aware of this object only after the receptor has actively looked for and found it.
3.2 Evolutive advantage

When I first introduced my system, I said that it is built to satisfy the processor’s commands to find for external objects. Someone might think that this feature is ill-motivated. She might wonder why the system goes out of its way to comply with the processor’s command by producing a hallucination or an illusion even after it has found that there is no object outside of it. Would not it be more preferable to avoid the illusory or hallucinatory state? Is the system meant to trick its subject?

Response: We can think of this feature of the system as providing an evolutionary advantage for the subject who has it. Some objects can put the subject in danger if she doesn’t react to them. But in order to do so, she has to become aware of them first. So it is desirable that every time some information is interpreted as indicating the presence of an object, the subject becomes aware of it or of something that helps her react to what could be a possible hazard. Imagine that a snake is outside the system and, for some reason, the subject fails to perceive it; in this case, she would not try to get away from it and would be in danger of being bitten. In this sense, it may be more advantageous to overgenerate visual awareness than to undergenerate it.
4.0 Interlude: Do Humans have such a system?

By now, you might be wondering which of the described systems, if any, best characterizes the human system. To settle this question, a more detailed and thorough investigation of the empirical literature is needed. However, at first pass, it seems plausible to claim that any of these systems might be considered as a viable model of the human system of visual awareness.

This is a good opportunity to clarify that I am not claiming that the system I have developed actually describes the system humans have. However, I haven’t dismissed this possibility either. There is no part of my system that has not been considered by important figures in the cognitive sciences. For example, short-term and long-term memory are two brain processes that are widely acknowledged in the scientific community. Likewise, as I mentioned before, something like the internal board of awareness has been considered and discussed by Baars (1997, 2002) in his “Global Workspace Theory”. But, again, this is not to say that empirical evidence supports my model over the alternative; the alternative model works with the same parts as mine, so any evidence that the human system has these parts is evidence for both models. So far, the only thing that shouldn’t be controversial is that, at least regarding its parts, the system I propose is plausible.

It is worth noticing that a superficial look at the empirical literature reveals that there is a common assumption among neuroscientists: minds indirectly become aware of the world. This assumption of indirect awareness favors the alternative system over mine. However, this

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7 See Atkinson and Shiffrin (1971)’s canonical paper on this.
8 J. J. Gibson (1950, 1961, 1967,1976,1979) is an important figure that doesn’t share this assumption.
assumption that humans perceive the world only indirectly is precisely what is at issue between the two systems. As long as this unjustified assumption about awareness remains, it will be difficult to find empirical support for or against the claim that we perceive the world directly.

Having said that, someone might wonder if my proposed view is testable. I think that, in principle, it is. If it were true that the human system had the same parts as the system I propose—in particular the internal board of awareness—and we had a way to observe its behavior, then the following two conditions would lend support to my view over the alternative:

1. During an episode of veridical perception, the subject’s internal board of awareness was empty or at least it did not have a representation of the object to be perceived, and
2. During a hallucination or illusion, the board contained an appropriate representation.

The satisfaction of both conditions would lend some support to the idea that the human system is very similar to the one I propose. But if either of the conditions failed to obtain, then my hypothesis should have to be dismissed.

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For a detailed study of the origins of this assumption see Noble (1981).
5.0 Philosophical consequences

Within the philosophical literature, there’s been a longstanding dispute between two main views on the nature of perception: direct realism and indirect realism. On the one hand, indirect realists claim that any kind of visual awareness—veridical perception, hallucination or illusion—is constituted by two components: a subject and a mental representation. In the case of veridical perception, a subject is aware of the world only through an accurate mental representation of it; the subject is indirectly aware of things in the external world. On the other hand, direct realists claim that veridical perceptions are constituted by a perceiver and the world that is perceived. In this view, a subject is directly aware of things in the external world; she does not need an intermediary to have veridical perceptions. However, for hallucinations and illusions, direct realists need to offer a different account, because no object in the external world (fully) matches the perceiver’s visual awareness. This is why direct realism is sometimes called “disjunctivism”.

The model proposed here clearly falls into the direct realist or disjunctivist realm. Its account of veridical perception is constituted only by a perceiver and the external world. Its accounts of hallucinations and illusions introduce elements of indirect realism, so that in both cases, the subject is aware of representations in the absence of the appropriate external objects. Given that this system is a version of direct realism, it is subject to the same problems that this view has faced. In what follows, I’ll present two of these problems and offer a solution for each of them.

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1) Simplicity of explanation: In general, philosophers tend to reject disjunctivist theories because of their explanatory complexity; they prefer theories that explain more with less. Why, then, should we prefer disjunctivism?

Answer: If philosophers take seriously the idea that the human brain tends to engage in different cognitive mechanisms to save energy resources\(^1\), then they should be open to a disjunctivist account of perception.

Evidence for this tendency in the human brain is found in the aforementioned cases of cognitive offloading, and also in habit formation. Duhigg (2014) argues that the brain has the ability to create habits. It will try to make into a habit any activity that it has to perform systematically. The first time that a subject engages in some activity (complex or simple), several regions of her brain are active and processing different kinds of information. However, after some repetition, the action becomes a habit, and only one region of her brain—where the basal ganglia are—becomes active when she performs it. Habit formation helps the brain to economize its energy resources. Just as it does in these examples, it is plausible that the brain economizes its resources in perception by directly using the world, in which case the disjunctivist theory would best model this economization.

2) The metaphysical queerness problem. If disjunctivism were true, then it would follow that two different kinds of visual awareness—veridical perceptions and hallucinations—would produce the exact same phenomenology in subjects\(^2\). This might strike someone as odd.

\(^1\) See Evan F. Risko, and Sam J. Gilbert (2016)

\(^2\) Different versions of this principle recently have been discussed by Martin (2004), and Crane (2005).
because two causes, if they produce the same effect, are usually of the same kind. This is a queer metaphysical consequence for disjunctivism and another reason why philosophers tend to reject it. Why then should philosophers accept the disjunctivist model I have proposed?

Answer: This would be a problem for my view—and I would need to provide additional reasons to accept its queerness—if I had been trying to capture the phenomenal aspect of consciousness. But now is a good time to clarify that I have been talking only about awareness, not consciousness. David Chalmers (1995) and Ned Block (2005) have distinguished different kinds of consciousness. They acknowledge that, in most cases, different types of consciousness are present at the same time. One kind of consciousness is phenomenal consciousness or the what is like to have an experience. In this sense, a subject is conscious of an experience if there is something that is like to be in that particular experience.

The other kind of consciousness is awareness. ‘Awareness’ refers to a cognitive functional phenomenon that occurs when a system or organism is able to access and manipulate inner states in such a way that it would be possible for it to make reports about them. For instance, Chalmers thinks that awareness can be, in principle, described and explained by neuroscience, but phenomenal consciousness cannot. In this paper, I have been talking about a system that is able to functionally bring about veridical perceptions, hallucinations and illusions. I have explained what processes and functions a system needs to undergo in order to bring about visual awareness in the non-phenomenal sense.

\*\* Some preeminent disjunctivists reject that cases of veridical perception can be phenomenally just like cases of hallucinations or illusions. See Campbell (2002), Martin (2004), and Soteriou (2013).
Once the scope of my account has been clarified, there should be nothing puzzling about two different processes bringing about two different kinds of visual awareness. It is easier to be a functionalist about awareness than about phenomenal consciousness. Awareness functionalism has to do with implementing a function, let’s call it the awareness function, regardless of the system or the process that does the implementation. Hence, the metaphysical queerness problem, for awareness, is less challenging.

Of course, the question of how to account for phenomenology of perception within this model remains open. However, that is a question I am not here addressing.
Conclusions

I have developed a model of visual awareness that satisfies two constraints: (1) in veridical perceptions, it reaches out to the world to become aware of its object, and (2) it is energy efficient. I have contrasted this model with a simpler alternative that is more explanatory elegant insofar as it explains all kinds of visual awareness in the same way. A subject who has this alternative system can only become visually aware by virtue of having representations of the external world in the system’s internal board of awareness. However, I provided reasons to think that the model I propose—by satisfying the listed constraints—has advantages that counterbalance, if not outweigh, the alternative system’s advantages. I presented and addressed two functional challenges to the system that clarified what it is for a subject to become veridically aware of an external object; *i.e.* to be in the right state caused be the system actively looking for an object, and then to be in the right relation with the external object when the system finds it.

I have also clarified that while I am not attempting to model the human system of visual awareness, it is not unreasonable to think that the model does so. To determine whether this is the case would require empirical research. Finally, I connected the model with a longstanding debate in the philosophical literature of perception: direct realism vs indirect realism. I have argued that my model is a direct realist model. If it so happens that my system does accurately model human visual awareness, then direct realism would be correct. This is not to say, however, that direct realism has already been vindicated; this model only opens a viable alternative for this contender. A decisive victory for direct realism would be provided, or not, only after empirical verification.
REFERENCES


Evan F. Risko, and Sam J. Gilbert, (2016) Cognitive Offloading, Trends in Cognitive Sciences,

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Storm B. C, Stone S. M., Benjamin A. S. (2016) Using the Internet to access information inflates future use of the Internet to access other information. *Memory*, 2016; 1 DOI: 10.1080/09658211.2016.1210171