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Accessibility and Phenomenality: Remarks on Solving Molyneux's Question Empirically

***Accesibilidad y fenomenalidad: Reflexiones acerca de una solución empírica a la pregunta de Molyneux*.**

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Abstract

In the xvii century, William Molyneux asked John Locke whether a newly-sighted person could reliably identify a cube from a sphere without aid from their touch. While this might seem an easily testable question, answering it is not so straightforward. In this paper, I illustrate this question and claim that some distinctions regarding the concept of consciousness are important for an empirical solution. First, I will describe Molyneux's question as it was proposed by Molyneux himself, and I'll briefly say something about its early debates. Second, I will go over some empirical attempts to solve this question, including recent experiments coming from neuroscience. Third, I will introduce some distinctions with regards to consciousness, and in the following section I will apply them to the Molyneux case. Finally, I will shortly consider some consequences of this approach. I conclude by suggesting researchers pay attention to different senses in which Molyneux's question might be posed for empirical purposes.

Keywords: visual perception, touch perception, modalities, phenomenology, consciousness.

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Resumen:
En el siglo XVII, William Moleyneux le pregunta a John Locke si una persona quien acaba de adquirir la visión estaría en capacidad de distinguir con certeza un cubo de una esfera sin utilizar el tacto. Aunque esta pregunta parece fácilmente comprobable, responderla no es tan sencillo. En este artículo, ilustro esta pregunta y sostengo que ciertas distinciones acerca del concepto de la conciencia son importantes para encontrar una solución empírica. Primero, describiré la pregunta de Molyneux tal como es enunciada por éste y haré unos breves comentarios acerca de los debates tempranos entorno a la cuestión. En un segundo momento, reconstruiré algunos intentos de responder la pregunta empíricamente, incluyendo algunos experimentos neurocientíficos. Tercero, introduciré algunas distinciones acerca de la conciencia y en luego las aplicaré al caso de Molyneux. Finalmente, consideraré brevemente algunas consecuencias de esta aproximación. Concluyo sugiriendo que la investigación debería estar atenta a los diferentes sentidos en los que pregunta de Molyneux podría plantearse para fines empíricos.
Palabras Clave: percepción visual, percepción táctil, modalidades, fenomenología, consciencia.

In 1688, William Molyneux sent a letter to John Locke asking a famous question that, to this day, is still a matter of discussion among those who study visual perception. Molyneux asked whether a man born blind, were he to recover vision, could immediately identify a cube from a sphere or their distance from himself using only his newly acquired vision. This question has been answered in many ways using two general approaches. On one side, philosophers including Molyneux and Locke have answered from a conceptual standpoint, looking for conceptual criteria to determine whether the concepts a blind person has are the same as those used by a sighted person, or what can be concluded about our perceptual knowledge from this experiment. On the other hand, scientists have provided empirical evidence from patients that have received surgery to recover their vision. Recently, this latter debate has met the tools that neuroscience provides, allowing for further inquiry into what we should expect in a case such as Molyneux's.

There are, however, important philosophical questions regarding an empirical solution to Molyneux's question. Some of these issues have been already discussed by Molyneux, Locke, George Berkeley and even contemporary philosophers such as Evans (1985) and Gallagher (2005). These regard the criteria for the possession of a multimodal concept or crossmodal transfer. Nonetheless, there are still other questions besides those regarding concepts, this time regarding consciousness, that can shed light on the empirical design of the experiment and its expectations. Particularly, one can inquire about the distinct ways in which Molyneux patients might be conscious of what they are seeing, in which senses are they conscious or not, and further lines of research towards our understanding of consciousness overall.

In this text, I will illustrate this question and claim that some distinctions regarding the concept of consciousness are important for an empirical solution to the question at hand. First, I will describe Molyneux's question as it was proposed by Molyneux himself, and I'll briefly say something about its early debates. Second, I will go over some empirical attempts to solve this question, including recent experiments coming from neuroscience. Third, I will introduce some distinctions with regards to consciousness, and in the following section I will apply them to the Molyneux case. Finally, I will shortly consider some consequences from this approach.

Molyneux's question

As explained above, Molyneux first wrote his question in a letter directed to John Locke. The reason for this was Locke's *An Essay on Human Understanding*, which proposed an empiricist theory of perception. This first version of the letter went as follows:

> A Man, being born blind, and having a Globe and a Cube, nigh of the same bignes, Committed into his Hands, and being taught or Told, which is Called the Globe, and which the Cube, so as easily to distinguish them by his Touch or Feeling; Then both being taken from Him, and Laid on a Table, Let us suppose his Sight Restored to Him; Whether he Could, by his Sight, and before he touch them, know which is the Globe and which the Cube? Or Whether he Could know by his Sight, before he stretchd out his Hand, whether he Could not Reach them, tho they were Removed 20 or 1000 feet from him? [sic]. (Molyneux, 1996 [1688])

In this formulation, the question is one about the abilities of Molyneux's man. Molyneux and Locke answered negatively, arguing that such a subject would lack the experiences that would allow him to associate tactile and visual information. For the latter, a corollary of such a conclusion would teach us something about how experience shapes our *judgment*. In other words, Molyneux's man failure is one of forming the appropriate judgment, failure that occurs due to the absence of experiences (see Locke, 1689).

Under this interpretation, the problem becomes one about the usage of perceptual information to form judgments. Berkeley (2008 [1709]) discussed this problem extensively based on Locke's answer, and thus followed this interpretation. Moreover, Berkeley thought that scenarios of the type Molyneux envisaged could not only teach us about judgment, but also about the ways in which we classify our experiences in general. In other words, Berkeley extended this problem to make it one about *concepts* (or in his own vocabulary, about *ideas*)[2]. For the Irish philosopher, it was natural to expect the patient who recovers vision to fail at identifying cubes and spheres, since his concepts would be radically different from those of normally sighted people[3].

Interpreting Molyneux's question as being one about concepts has become the canonical interpretation. In what follows, I will attempt to distance myself from it, although some of its points will be of vital importance for my claim. As a preamble, one might ask: is it just a matter of using perceptual information to form judgments or concepts? In other words, are judgments or concepts all there is involved in this scenario? Failure to form judgments or concepts, I will argue, does not rule out usage of perceptual information, at least in a sense. Before getting to this point, however, it is important to go over the empirical evidence and to examine what it suggests and how it has been interpreted.

Empirical evidence on Molyneux's question

There have been several experimental situations in which Molyneux's question has been tested in some version. Some of these reports have unfortunately not been rigorous enough, some due to the time in which the experiments were realized (e.g. Cheselden, 1727) , some due to their presentation (e.g. Sacks, 1995). Since these latter reports do not explicitly present the conditions and results optimally, I will not be concerned with them for the current discussion. For this reason, I will focus on three reports coming from neuroscience and psychology, which explain thoroughly their methods and present details as to the abilities of a blind man that recovers vision.

The first of these reports is the one by Fine and colleagues (2003). They reported on a man that lost one eye and was blinded in the other at age three (3.5, to be exact) after chemical and thermal damage to the cornea. For forty years, this damage prevented MM (as they called the patient)[4] from having a successful cornea

2 Broadly, one can equate the modern's notion of "idea" to current usages of "concept". On this topic, see Fodor (1998, p. 9).

3 Berkeley based his answer on a general thesis about perceptual concepts, namely, the thesis that there is no common concept to different perceptual senses (there are no common sensibles). This heterogeneity thesis, as it has been called in Berkeley's exegesis, has become an interesting point of discussion for those interested in Molyneux's case and Berkeley's philosophy, but will not be important in what follows. For other work on this topic, see Muehlmann (2008) , Wilson (1999) , and Loaiza (2017).

4 It is worth noting that this pseudonym most likely stands for "Molyneux's Man".

replacement that would give him back his visual faculties. At age 43, MM received a corneal and limbal stem-cell transplant to his right eye, allowing him to recover vision, even if only partially.

Before the procedure, as the researchers report, MM had "some light perception, but no experience of contrast or form" (Fine *et al*., 2003, p. 1). The results after the procedure, even though they showed some improvement in MM's visual abilities after 5 to 10 months were mixed. First, using psychophysical measures, the researchers report MM's contrast sensitivity function as similar to that of controls for low spatial frequencies (<1.3 c.p.d.), but dramatically lower for higher spatial frequencies (maximum value perceived was 1.3 c.p.d, compared to 30-40 c.p.d in controls) (see Fine *et al*., 2003, fig. 1). The retina was visible under ophtalmoscope, showing no apparent degeneration and suggesting that his inability was due to some neural problem.

Second, using fMRI, the researches found that BOLD responses to low-frequency gratings were half of those of control in motor selective cortex (MT+) and about a fifth for area V1 (see supplement for details regarding the researchers' definition of area V1). Moreover, these responses "fell off rapidly with increasing spatial frequency, with little or no response above 1 c.p.d." (p. 1). The researchers explain that if one takes into account that MM had a functioning visual system until age 3, where visual acuity should be at least 25 c.p.d., then it is likely that visual deprivation from early age causes a degradation of spatial resolution in the early visual cortex.

Third, regarding recognition tasks, MM showed no deficits identifying simple forms, slight changes in the orientation of a bar, and color. He could segment texture patterns based on luminance contrast, use occlusion cues, interpret shading cues (although apparently using explicit reasoning instead of automatic perceptual processes), and identify the direction of simple and complex plaid motion and the barber illusion. In contrast, he could not identify shapes in Kanizsa figures, had problems with transparency, perspective cues, common object, face gender and expression identification, and was slightly worse than controls in tasks regarding integration (see Fine *et al*., 2003, fig. 2).

Overall, the researchers conclude:

> After compensation for reduced acuity, MM's simple form, color and motion processing were essentially normal. In contrast, complex (especially 3D) form, object and face recognition were severely impaired. Why might motion processing be so robust to deprivation? Studies of subcortical projections to MT/MST suggest that they alone could not support MM's post-operative vision15. Motion processing develops early in infancy compared to form processing10 and might therefore

> have been more established, and consequently robust to deprivation, by the age of three. Alternatively, complex form processing may remain plastic after early development, and thus susceptible to deprivation, because novel objects and faces are encountered throughout life. (Fine *et al*., 2003, p. 2)

Recently, Huber and colleagues revisited MM's case to determine whether his complex form, object, and face recognition abilities have improved (2015). They tested MM using behavioral measures and fMRI, using similar tasks as Fine *et al*. (2003), but using different databases to ensure that the results were not due to familiarity to the previous experiments. They also tested further regarding three-dimensional shapes using forms adapted from photographs spanning a 360º rotation. Furthermore, for the fMRI part of the experiment, the researchers included scene stimuli, which were not present in the previous reports.

Regarding the behavioral measures, the researchers report that MM was able to discriminate images of cubes (incomplete and scrambled) beyond chance level, although with lower performance than control subjects. In the case of bi-dimensional shapes, the case was similar: higher than chance performance, but significantly worse than controls. When asked to judge rotation of three-dimensional forms at varying perspectives, MM performed at chance level, although he could correctly identify various household items. Finally, his performance was worse when asked to recognize gender and emotions in people's faces than that of controls. In general, his performance was not better as in the previous report, despite the time span between the experiments being more than ten years.

The fMRI results showed lower responses in most tasks, if any was discernible from noise at all. There was no evidence for face selectivity activation, and while there was some activation for objects compared to faces in the ventral temporal cortex, this was not significantly different from noise. MM also showed no selectivity for objects compared to scrambled images of objects, even though he performed well in bi-dimensional shape recognition tasks. The researchers explain this finding by arguing that the lateral occipital cortex responds to objects without linking them to stored representations, which would imply responses to shape without object-selectivity.

On the scene stimuli, the researchers showed blurred and unblurred stimuli both to MM and to controls. Unblurred stimuli yielded the expected response in controls, while blurred stimuli yielded no response in them (only in one of the two controls, and only in the left hemisphere). For MM, there was no response for either type of stimuli; at best, the researchers found a small area consistent with the parahippocampal place area that responded selectively to scenes in contrast to objects, but this activation was not robust enough and could not be differentiated from noise. Lastly, regarding face stimuli, MM showed selective responses "in a region consistent with the extrastriate body area within the right hemisphere" (Huber *et al*., 2015, p. 339), but no clear response in the left hemisphere.

So far, the reports on patient MM give us an overview of his capacities of using visual information and report on it. It is worth noticing that these experiments differ from Molyneux's original question in at least two ways. First of all, the experiments were done only as soon as 5 months after the intervention in MM's eyes, whereas Molyneux's problem, at least in the traditional interpretation, seems to require immediate testing. Second, and most importantly, these two reports do not tackle crossmodal transfer phenomena, that is, they do not test whether MM is using the same concepts that he learned by touch or whether he is learning completely from scratch.

There is, however, one report that does tackle crossmodal transfer in a Molyneux-type scenario and that claims to have tested subjects as little as 48 hours after surgery, although only with behavioral methods (instead of using fMRI like the previous experiments). Held and colleagues (2011) tested five subjects, four of which presented dense congenital bilateral cataracts, and the other one presented bilateral congenital corneal opacities. All of them received surgery to give them back their visual faculties. Before their interventions, none of them were able to discriminate form.

The researchers tested the subjects using "20 pairs of simple three-dimensional forms drawn from a children's shape set" (Held *et al*., 2011, p. 551), similar to those of a building block set. These pairs consisted in a haptic and a visual stimulus paired according to form. Subjects were presented either the haptic or the visual stimulus, followed by the presentation of the stimulus either haptically or visually, and a distractor. The experimenters included pairs such as object A visually (or haptically) in both in t_1 and t_2 to control for possible failures within one modality, since a central part of testing Molyneux cases is ensuring that both the haptic and visual systems are functional (p. 551; see also Gallagher, 2005). The task was then to identify which stimulus in the second presentation was the target presented first.

In the intramodal conditions, all subjects performed almost perfectly, with average performances of 98% for haptic-haptic pairs and 92% for vision-vision pairs (p. 552). In the transmodal conditions, however, they performed near chance level (mean, 58%), significantly different from the intramodal conditions ($P<0.001$ compared to the haptic-haptic condition, and $P<0.004$ for the vision-vision one). On later dates, three of the five subjects were retested. In this second experiment, there was some significant improvement compared with the first experiment ($P<0.02$), even for a subject tested five days after the first run.

Yet, since subjects needed some time to learn and improve their performance in this task, the researchers concluded: "Our results suggest that the answer to

Molyneux's question is likely negative. The newly sighted subjects did not exhibit an immediate transfer of their tactile shape knowledge to the visual domain" (Held *et al.*, 2011, p. 552). This interpretation is consistent with the findings of both Fine *et al.*'s and Huber *et al.*'s reports on patient MM, since it seems that even though subjects can use some visual information (e.g. they can identify two-dimensional shapes), they do not seem to rely on previous tactile information.

In summary, empirical evidence shows that blinded patients that recover vision do indeed have some visual processing that they can report on, at least for simple bidimensional forms, color, and motion. Reports on MM show that he could identify some cubic shapes, although he could not use transparency or perspective cues, and so his success in this identification might lie on bidimensional information (e.g. seeing a cube as a square with lines around). Finally, there seems not to be crossmodal transfer in these patients, nor robust or at least not normal activations in regions associated with the visual system, including V1, MT+, parahippocampal place area and fusiform face area.

Overall, these are quite interesting results, although there are questions to be raised regarding their interpretation. In particular, we can inquire as to the degree of consciousness these subjects have regarding visual information. In other words, it seems that they are conscious in one sense, since they have something to report on their visual field, and even do report in some cases, but in other sense they might not be conscious of the stimuli they fail to report on. In order to make this interpretation clear, we can invoke some useful distinctions regarding consciousness, namely, distinguishing between reportability and phenomenality.

Distinguishing types of consciousness

When discussing consciousness, it is important to distinguish between at last two senses in which someone might be conscious of a stimulus. Block (2002) famously named this distinction one between *phenomenal consciousness* and *access consciousness*. As I will explain later, this distinction has appeared in other works as well, such as Lamme's (2003) , although with different names. Even Block himself (2007) has renamed these categories, adopting the names of *phenomenality* and *cognitive access*, respectively. For the moment, it suffices to draw the distinction and leave aside the terminological discussion around what names should be used for these phenomena. To be sure, I will use Block's earlier names (*phenomenal*- and *access consciousness*, or *phenomenality* and *accessibility*).

In one sense, we are conscious of a stimulus if there is something it is like (following Nagel's [1974] terminology) to be in that mental state. Vaguely, this amounts to having some experience, some phenomenology for a given mental state.

In this sense, we are *phenomenally conscious*. The proper definition for phenomenal consciousness is somehow elusive; even Block (2002) claimed that he could not define it in a non-circular way. However, leaving this definitional issue aside, phenomenal consciousness covers the phenomenological and perhaps qualitative character of conscious experience. The examples later on might clarify what is meant by this.

In the other sense, we are conscious of a stimulus when we can say something about it, or more precisely, when it is available for thought (or cognition). In other words, we are conscious of something when we can think about it. In this second sense, we are *access conscious*. In contrast to phenomenal consciousness, access consciousness does have a more precise definition: "a representation is [access conscious] if it is broadcast for free use in reasoning and for direct "rational" control of action (including reporting)" (Block, 2002, p. 208).

As we can see in Block's definition, one of the most important phenomena which depend on access consciousness is reportability. It is vital not to confuse access consciousness with reportability though. Reportability might be a criterion for access consciousness, since one needs access in order to yield the report, but this does not exhaust access. For instance, a patient in vegetative state might be able to think about stimuli in his surroundings, thus having access consciousness, even though she might not be able to report on them. What is relevant for our discussion is the fact that experimental methods do rely on reportability to judge whether a state is conscious or not; in the end, experimental designs require subjects to report, even if only by a button press.

Block's illustration might clear up this distinction. On the one hand, Block invokes an everyday, common life experience in which we are phenomenally conscious but not access conscious. The example reads as follows:

> Suppose that you are engaged in intense conversation when suddenly at noon you realize that right outside your window, there is—and has been for some time—a pneumatic drill digging up the street. You were aware of the noise all along, one might say, but only at noon are you *consciously aware* of it. That is, you were [phenomenally] conscious of the noise all along, but at noon you are both [phenomenally] conscious *and* [access] conscious of it. (Block, 2002, p. 212)

In this case, there was a stimulus present all along, something there was like to be hearing the drill; but the sound was not available for thought, or more precisely, was not an object of thought, until one notices it.

This situation, although illustrative, can also be received with skepticism. After all, drawing from such cases involves pumping intuitions. Yet, this distinction can also be traced experimentally. Cases such as agnosia due to damage to the ventral stream (Goodale & Milner, 1992; Milner & Goodale, 2008) , or unconscious priming experiments (Dehaene *et al*., 1998) show situations in which patients or subjects are not phenomenally conscious of a stimulus; that is, they do not see the stimulus in a sense, but the stimulus still affects their cognitive processes and action, such as grasping an object or judging whether a number is greater than or smaller than five (respectively). Put differently, there is nothing that it is like to be in these patient's visual state, there is presumably no qualitative experience whatsoever, yet visual information seems to be somehow available for some responses such as grasping or even basic arithmetic operations.

It could be argued that in these cases, there is no consciousness at all, neither phenomenal nor access consciousness, since subjects cannot report on what the stimulus they were presented is (i.e. they cannot identify it). However, following Block, it is not the thought that the stimulus is this or that that is required for access consciousness, but the fact that the representation of the stimulus enters cognitive processing. In Block's words, it is "the state of the perceptual system that gives rise to the thought [...] that is [access] conscious without being [phenomenally] conscious" (Block, 2002, p. 211). In other words, the distinction is not one about having the capacity to identify or not, but a distinction between having information available for cognition and action (access) vs. having something it is like to be in a particular state (phenomenal).

As presented above, a similar case is defended by Victor Lamme (2003). Awareness is consciousness in a broad sense, which covers both access and phenomenal consciousness. Inside the category of awareness, there are then attended and unattended stimuli, which correspond to access and phenomenal consciousness respectively. In other words, stimuli of which a subject is aware, and to which attention is directed, are access conscious; similarly, stimuli of which a subject is aware but to which no attention is directed are only phenomenally conscious (Lamme, 2003, p. 14 and fig. 2).

With these distinctions in mind, we can now go back to Molyneux-type cases and evaluate which kinds of consciousness are present in these patients, whether the current experiments can tell these kinds apart, and whether these cases can tell us something about the mechanisms underlying consciousness.

Is Molyneux's Man conscious?

Access consciousness

Let us now turn to some questions regarding Molyneux patients and in which sense they are conscious of shapes and visual information. At first glance, the empirical results show some lack of access to three-dimensional shape and information about facial expressions, gender, and places (in contrast to objects). Recall that in the reports considered, subjects are not able to use occlusion, transparency or perspective cues to identify three-dimensional figures, and so we can interpret this as a failure in accessing three-dimensional concepts using visual information. The same goes for facial expressions, gender, and places. In this sense, Molyneux patients do not seem to be access conscious of three-dimensionality or the other stimuli when it comes to the visual domain. Even assuming that these subjects might have the same kind of phenomenal experience as sighted people have (an assumption I will reconsider in the next section), it seems that there is a difference in access consciousness as incoming visual information seems to be interpreted differently by these patients' neural systems and hence produce different behavioral outcomes.

What explains this lack or change in accessible information? On the one hand, behavioral results show impoverished performance in the mentioned identification task. On the other hand, the results coming from fMRI scans show lack of activation in otherwise related regions. For example, remember that MM showed no relevant activations when it came to identifying faces (expressions or gender) or places in contrast to objects. In other words, his brain did not respond differently with these stimuli than it did with objects (even scrambled ones), and so this lack of activation is evidence for lack of access.

Unfortunately, as stated above, neural evidence only covers the visual domain, and does not tackle issues regarding learning in small time scales (less than five months) or crossmodal transfer. The behavioral data available on these issues does seem to imply that information coming into the visual system does not access information stored from the tactile domain, and so it seems that Molyneux patients are not access conscious of the identity between visual shapes and tactile shapes. Therefore, when formulating Molyneux's original question in terms of whether the newly sighted man is conscious or not of the identity of the objects he is seeing, the answer seems negative. Yet, a possible horizon to expand on this line of inquiry would be to use imaging methods to explain what happens inside these patient's brain that prevents them from accessing tactile concepts using visual information.

A possible answer to this question comes from plasticity research in congenitally blind people. As Renier and colleagues (2013) report, for instance, plasticity phenomena in congenitally blind subjects lead to a rewiring of the early occipital cortices, leading to responses not to visual information, as in control subjects, but to responses to auditive and tactile inputs. This change in the occipital cortices might explain why Molyneux patients cannot access some of the aspects of their visual input: information about three-dimensionality and relevant information regarding faces, places, and objects might not be broadcast due to plasticity issues. This hypothesis, however, requires proper research in order to comprehend Molyneux-type phenomena.

Now, I have claimed that Molyneux patients cannot conceptualize visual information when it comes to three-dimensionality and other stimuli which they fail to recognize. Does this mean that they are access conscious of bidimensional information then? Results do show that they perform similarly to controls when it comes to simple shapes and movement in two dimensions. In order to guide their action to answer correctly in these experiments, some access might be required, and so we can conclude that they are access conscious of bidimensional information coming into the visual system.

Nonetheless, we cannot conclude that they are conscious of the same information as we are, since experiments do not control for the methods these patients are using to answer the questions posed to them. In a criticism of Held's report, for example, Schwenkler (2012) argues that a possible method of answering the pairing task is to rely on very local form cues. A patient in a Molyneux-type scenario as that constructed by Held might guess correctly that a square is a square by focusing on the presence of just corners, without accessing the information with a holistic SQUARE concept. Similarly, lack of any corners would imply that the subject is seeing a sphere, even though the subject might not be able to access the concept of SPHERE. In the reports regarding MM, this line of argument can run as well. For instance, taking into account that MM reported seeing a cube as a "square with lines" (Fine et al., 2003, p. 1) might lead us to think that even in identifying two-dimensional shapes, he is relying on cues and accessing information in terms of "square with a weird change" in the case of rectangles or "sphere with something different" for ovals, and so on. In this sense, there is indeed some type of access to visual information from Molyneux patients, but it is still questionable whether they access the information in the same way in which sighted subjects are.

Another interesting sense in which Molyneux patients are access conscious, but not in the same sense as the sighted are, is in terms of the *affordances* they can access. In a short blog commentary about Held's experiments, Hilary Putnam (2015) claims that Molyneux patient's experience is not "transparent" (at least at first), that is, they do not see objects visually as having the *affordances*, in Gibson's (1986) sense, that we see in them. While a sighted person might see an object as affording being picked up at arm's length or affording being thrown three meters away, Molyneux patient's might not. Failures in identifying a third dimension could prevent them from accessing affordances that we commonly access, and so they are not access conscious of them. Again, they might have access of a sort, but not the same as sighted subjects.

As we can see, the discussion regarding access consciousness is closely related to that of concepts. Judging whether Molyneux patients are access conscious of what they are seeing is asking for the concepts they use to organize the information, reason about it and guide their action. As such, the question about access consciousness is the Molyneux's question in the traditional interpretation, presented briefly in the beginning of this text. If this is so, then the empirical evidence available can answer Molyneux's, Berkeley's and Locke's questions regarding the original problem. In other words, it seems that an answer in terms of the traditional interpretation is possible (if not yet available).

Phenomenal consciousness

Having discussed whether Molyneux patients are access conscious regarding their visual information, let us turn to the second sense of consciousness, phenomenal consciousness. Initially, we might be tempted to claim that they are phenomenally conscious since they do report on their visual experiences to some degree, in spite of failing regarding three dimensionality and other characteristics of their visual input. Yet, there are conceptual difficulties to be considered.

Distinguishing phenomenality from accessibility empirically

One of the main difficulties regarding phenomenality, not only in Molyneux cases but in general for empirical research, is disentangling it from accessibility. After all, as stated above, empirical methods rely on reportability of a sort when asking subjects about their conscious states, and so a criterion to tell both kinds of consciousness apart is required. Moreover, if we abide by Block's idea that these are two distinct and independent types of consciousness, we cannot conclude phenomenality from accessibility or the other way around.

To phrase the issue, consider a classic thought experiment in philosophy about consciousness: the zombie experiment. Chalmers (1996) proposed thinking of a zombie that is functionally identical to regular human beings, that is, his brain has exactly the same neural processes, he answer to the very same questions and responds accordingly to every single input just as any other regular human being. However, he does not have experience in the sense of phenomenality, that is, there is nothing that it is like to be in his states. In a sense, he is access but not phenomenally conscious at every moment. This thought experiment, at least in principle, shows that phenomenality is conceivable independently of functional processes, and so has been used by defenders of explanatory gap arguments and even dualism.

I will not discuss the philosophical branches this kind of argument implies. Nevertheless, we can run a similar version of the zombies argument for Molyneux patients: how can we know if they are phenomenally conscious, if phenomenality is in principle different from functional difference? All that is available for neuroscience are the latter, and so we cannot possibly know anything about these patients' phenomenal states. This strong variant of the argument, however, is not completely relevant for our discussion. After all, we have good reasons to think that tested subjects are not zombies (leaving philosophical considerations aside). There is yet an interesting problem to consider from this strong version: how can we infer about phenomenality if all we have available is reportability and imaging evidence? In other words, telling what kind of phenomenal consciousness Molyneux patients have involve inferring it from third-person information, inference that is problematic.

Opponents of the zombie argument claim that there must be a way of bridging this gap between functional differences and phenomenality, or to phrase it in other terms, to infer something about phenomenal consciousness from functional differences. Pauen (2015) has dubbed this working hypothesis the "Functional Mapping Hypothesis". Let us adopt such a hypothesis and explore whether the information available allows to say something about Molyneux patient's phenomenal states.

Methodologically, the issue becomes one of devising a way of disentangling phenomenal consciousness from access consciousness empirically. Block (2007) proposed perceptual overflow as a candidate for such disentanglement. Inspired by Sperling experiments, Block argues that it is possible to tell apart the mechanisms underlying reportability (and therefore access) from those underlying phenomenality.

Before explaining Block's argument from Sperling paradigms, let us rephrase the problem of inferring phenomenality from third-person information in methodological terms. The puzzle is put forward by Block in the following terms: let us suppose we have a clear case of phenomenal consciousness, a subject completely confident of his phenomenal states and no reason to doubt his reports. We can then find the neural machinery behind these phenomenal states, and see whether they exist inside Fodorian modules, that is, modules inside which we have no cognitive access and so we cannot report on their internal states. However, the puzzle becomes how to tell whether the machinery that eventually makes these states reportable is part of the machinery required for phenomenality. In other words, how can we judge whether a given cognitively unaccessible representation is indeed phenomenally conscious?

We cannot rely on subject reports, since the machinery behind these will of course include machinery underlying reportability and thus accessibility. Looking at the subject's brain does not clear up the situation, since we would already need a criterion to distinguish phenomenally conscious processes from cognitively accessible ones, which is precisely the criterion we are looking for. An example might clear up this difficulty. In Block's words:

> Suppose empirical investigation finds a neural state that obtains in all cases in which a phenomenally conscious state is reportable. Such a neural state would be a candidate for a core neural basis. Suppose in addition, that we find that the putative core neural basis is present sometimes when the state is unreportable because mechanisms of cognitive access are damaged or blocked. Would that show the existence of unreportable phenomenal consciousness? No, because there is an alternative possibility: that we were too quick to identify the core neural basis. Perhaps the supposed core neural basis that we identified is necessary for phenomenal consciousness but not quite sufficient. It may be that whatever it is that makes the state unreportable also makes it unconscious. Perhaps the cognitive accessibility mechanisms underlying reportability are a constitutive part of the core neural basis, so that without them, there cannot be a phenomenally conscious state. It does not seem that we could find any evidence that would decide one way or the other, because any evidence would inevitably derive from the reportability of a phenomenally conscious state, and so it could not tell us about the phenomenal consciousness of a state which cannot be reported. So there seems a fundamental epistemic (i.e., having to do with our knowledge of the facts rather than the facts themselves) limitation in our ability to get a complete empirical theory of phenomenal consciousness. (Block, 2007, p. 483)

Thus, in order to identify the mechanisms underlying phenomenally conscious states without reportability, we would need a criterion independent of reportability, while still having evidence to think that these states are indeed phenomenally conscious. The way out of the puzzle, as proposed by Block, is using Sperling paradigms.

Let us recall what Sperling experiments consist on. In his classic experiment, George Sperling (1960) showed subjects three-by-three or four-by-three grids consisting in nine or twelve letters, respectively. The stimulus was presented and shortly after removed. After stimulus removal, Sperling asked subjects to recall as many letters as possible. In this condition, subjects were able to recall as much as four letters out of nine or twelve, that is, less than half of the letters. In the other condition, however, an auditive stimulus consisting on a tone was presented after the visual stimulus. If the tone was high, subjects were supposed to recall the letters from the top row of the grid; if the tone was medium, the target were the letters in the middle row; and if the tone was low, the target were the letters in the bottom row. In this condition, subjects were able to recall almost all letters in the target row. The conclusion given by Sperling was that sensory memory registers last longer than the presentation time, even though they fade rapidly.

Building on paradigms of this sort, Block argues that there is evidence that phenomenality overflows accessibility. The register that remains in subject's memory and that allows them to tell the letters even after the stimulus has disappeared is of a phenomenal character. In the first condition, subjects are only able to access as many as about four letters in the whole array, but in the second condition, subjects are able to access the phenomenal remainder in their sensory memory in order to identify correctly the letters in the target row. In other words, subjects are able to access the stimulus due to phenomenality being still present despite the stimulus having disappeared. Thus, Block concludes, phenomenality overflows accessibility: there is more information phenomenally than what is accessible at a given time, such that subjects can use phenomenal information shortly afterwards.

Can phenomenal overflow inform us about the sort of experiences Molyneux patients have? The empirical evidence at hand does not provide grounds to evaluate whether there is such overflow, and so we cannot currently infer about the sorts of phenomenality involved in these patients' visual experience. We can, however, devise interesting experiments using these arguments and test whether there is such overflow.

A possible experimental design could perhaps use Sperling paradigms on Molyneux patients. One alternative is to do a Sperling-Molyneux experiment: provide patients with visual stimuli, and then ask them to do tasks after stimulus presentation. For example, it is not clear whether crossmodal transfer can occur after stimulus presentation, or even identification tasks of simple form in which these patients are successful. If they are successful in using visual information even after it has disappeared, we have evidence to believe that there is overflow and so that their phenomenal experiences are similar to those of controls.

Other variants of Sperling experiments might also inform us about the phenomenal character of Molyneux patient's experiences. One such variation, discussed by Block as well, is Landman's Sperling-type paradigm for change blindness. In this paradigm, researchers show a stimulus consisting not of letters as in the classic Sperling paradigm, but on rectangles with different orientations arranged in a circle. Subjects are then showed a null stimulus (in this case a fixation cross) and then they are showed a similar array in which there is sometimes a change in orientation of one of the rectangles. The expectation is that when subjects are cued towards a direction, this time using an arrow either in the first presentation, during the fixation cross or in the second presentation, they are going to behave like in Sperling's experiment, that is, they are going to perform better than without such a cue. In terms of overflow, the idea is to evaluate whether subjects can still detect changes even if cued after the first presentation by using sensory memory registers to access a particular rectangle's orientation. This paradigm might also inform us about Molyneux patient's capabilities in using visual information.

In any case, it is still important to take into account that even if overflow arguments and Sperling-like paradigms say something about the phenomenal character of human experience, there is still a gap to be filled between third-person approaches and first-person descriptions. I do not want to defend the idea that such an explanatory gap will always be present, and arguments regarding the Functional Mapping Hypothesis and the like provide grounds to doubt that this will be the case. What is to be concluded, then, is not that we will never learn about phenomenality, but that further research is needed. In this regard, Molyneux-type scenarios provide an interesting laboratory for such research. These cases allow us to evaluate how we learn to access the contents of our experience, and maybe even whether using phenomenal overflow and the like requires learning and what are the neural mechanisms underlying these capacities.

Conclusions

In this text, I have explored what Molyneux-type cases inform us about consciousness, and how conceptual distinctions regarding consciousness can aid our understanding of these scenarios. First, I have presented the classic version of Molyneux's question, and I claimed that the canonical interpretation has only been concerned with the concepts being used by newly-sighted subjects. I then presented three empirical reports in which researchers have evaluated patients with some kind of congenital blindness that have after some years recovered vision thanks to surgical interventions. These patients appear to be successful in accessing simple form and movement, but lack the ability to use cues about three-dimensionality and even identification of faces and places. Moreover, imaging data provided grounds to believe that their brains do not use visual information in the way in which sighted subjects do, since they do not respond in the same ways in which controls' brains respond.

Afterwards, we went over a distinction between access consciousness and phenomenal consciousness, in order to apply it to empirical evidence and evaluate what kinds of consciousness are involved in these cases. This distinction allowed us to claim that there is, on the one hand, some access consciousness regarding the patients' visual information, that is, they are conscious of some forms in their visual field in the sense that they can access and report on them. However, the second sense of consciousness, phenomenal consciousness, seems still somehow elusive. There are conceptual and methodological issues when debating about phenomenality that have to be sorted out before evaluating the sorts of phenomenality newly-sighted patients have. These patients, however, do provide a promising case of research about the phenomenal character of visual experience, since they provide a case of newly acquired vision that might contrast with our own phenomenality. In other words, there are interesting questions regarding whether phenomenality requires learning and whether these patients can present the same overflow and sensory memory phenomena that controls do. In this line, I propose using Sperling-like paradigms and other similar experimental conditions on Molyneux patients.

As an ending remark, I want to shortly go over what can evidence coming from these Molyneux cases do for consciousness research in general. I have already presented one of these conclusions: Molyneux patients provide an interesting scenario to test phenomenal overflow and therefore a case to test Block's distinction between access consciousness and phenomenal consciousness. I want to propose another conclusion in this line of argument: Molyneux patients also provide an interesting laboratory to test the supposed holistic character of consciousness. By testing these subjects and finding out the neural mechanisms available to them, we can find out how is experience constituted in our brains, how does the brain engage in crossmodal transfer and how are we capable of using information from one perceptual system to navigate the world and anticipate information coming from other systems. We have already some evidence coming from Molyneux cases towards this phenomena, but further research might show interesting results that illuminate not only Molyneux's question, but our overall understanding of experience and consciousness. As such, it seems that even after centuries of William Molyneux's question, there are still promising lines of research to be pursued and more to learn about our psychological and neurological capabilities.

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