# Learning to see

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**Abstract**

It is often assumed that the empirical literature on sight restoration tells us something important about the relationship between visual and haptic representations of shape. However, I maintain that, immediately after having their sight restored, at least some newly sighted individuals undergo visual experiences that instantiate basic shape phenomenology but which do not present the corresponding shape properties. Consequently, the empirical literature on sight restoration tells us something important about the role that perceptual phenomenology plays in our perceptual awareness of an object's properties—it tells us that the properties presented by perceptual experiences are not "built into" perceptual phenomenology.

**KEYWORDS**

Molyneux's question, naïve realism, perception, property perception, representationalism, sensory phenomenology

## 1 | INTRODUCTION

Molyneux asked whether a congenitally blind person who had his sight restored would immediately thereafter be able to recognize a cube and a sphere by vision alone. The reports of individuals who have had their vision restored after a long period of blindness suggest that the answer is "no": immediately after regaining vision there is a period during which they are not able to recognize shapes by sight.[1]

The inability of these individuals to visually recognize shapes immediately upon regaining vision is presumably due to one of two potential difficulties: first, they might be unable to connect their new visual experiences of shape with their haptic experiences of shape; alternatively, their visual experiences might not present the shapes of visible objects at all. Many philosophers assume that the crux of Molyneux's question is the nature of the relationship between visual and haptic experiences

[1] See Gregory and Wallace (1963), Valvo (1971), Sacks (1995), Kurson (2007), and Held et al. (2011).

of shape. Accordingly, such philosophers tend to downplay the significance of the existing empirical literature concerning sight restoration, since it's not clear that the subjects who are reported to have failed to recognize the shapes of objects nonetheless had visual experiences of those shapes.[2]

However, if the inability of these newly sighted individuals to visually recognize shapes results from the fact that their early visual experiences simply do not present shapes, then the empirical literature on sight restoration has significant implications for a distinct philosophical issue: the role that perceptual phenomenology plays in our perceptual awareness of properties. Very many philosophers maintain that the properties a given experience presents are "built into" that experience's *phenomenal character* or *phenomenology*—what it's like for the subject to have the experience. All defenders of *naïve realism* (the view that when you perceive a given object, your experience's phenomenology is constituted by your acquaintance with that object and its properties) and many defenders of the *content view* (the view that perceptual experiences possess representational contents) are committed to what we can call the *sensory presentation thesis*: if an experience possesses a certain specific phenomenal character it thereby presents certain specific properties.[3] For instance, if you view a square each part of which is perpendicular to your line of sight, your visual experience will instantiate a specific phenomenal property. Defenders of the sensory presentation thesis claim that every perceptual experience caused by a square in the usual way that instantiates this phenomenal property thereby presents a specific shape property. Consequently, if some newly sighted individuals' early visual experiences instantiate the relevant phenomenal property but do not present the shapes of the objects these individuals see, then the sensory presentation thesis is false.

The evidence concerning sight restoration following long-term blindness is limited; accordingly, the conclusions we draw from that evidence should be somewhat tentative. Nonetheless, I maintain that the evidence we currently possess suggests that immediately after having their sight restored, at least some newly sighted individuals undergo visual experiences that instantiate phenomenal shape properties but which do not present (i.e., neither represent nor involve acquaintance with) the corresponding shape properties.[4] For instance, the evidence suggests that a newly sighted individual viewing a square object under ordinary conditions soon after having her sight restored might have a visual experience that instantiates the relevant phenomenal property, but which neither acquaints her with the squareness of the object she sees, nor represents that this object is square. Consequently, I maintain that we should reject the sensory presentation thesis.

However, it is plausible that at least some of these very same individuals can eventually come to have visual experiences that present the shapes of objects in the ordinary way; this fact suggests that, while not inherently presentational, sensory phenomenology can acquire representational content as a perceiver interacts with her environment. Accordingly, the evidence concerning individuals who have had their sight restored after long-term blindness not only suggests that the sensory presentation thesis is false, but also suggests an alternative theory concerning the role that sensory phenomenology plays in our perceptual awareness of properties. Specifically, this evidence suggests that sensory phenomenology functions in much the same way as linguistic symbols function in thought: while not

[2] See, for example, Evans (1985), Jacomuzzi, Kobau and Bruno (2003), Van Cleve (2007), Schwenkler (2012, 2013), Connolly (2013), and Clarke (2016).

[3] I will refine this thesis further in Section 2. Defenders of naïve realism include, for instance, Campbell (2002), Martin (2004), and Fish (2009). Content theorists who endorse this thesis include representationalists, such as Tye (1995), Chalmers (2004), and Pautz (2007), and defenders of phenomenal content, such as Siewert (1998), Horgan and Tienson (2002), and Kriegel (2007).

[4] The restriction to "at least some" individuals is necessary because the nature of the visual experiences that occur once sight has been restored can vary a great deal between individuals. For instance, compare Ackroyd, Humphrey and Warrington (1974) and Ostrovsky, Andalman and Sinha (2006).

inherently representational, sensory phenomenal properties can serve as vehicles for the representation of an object's properties.

First, in Section 2, I discuss the phenomenal properties characteristic of shape experience in greater detail, and explain what defenders of the sensory presentation thesis claim regarding such phenomenal properties. In Section 3, I argue that there are compelling reasons to think that the initial visual experiences of at least some newly sighted individuals instantiate phenomenal shape properties; in Section 4, I argue that there are also compelling reasons to think that those same experiences neither represent nor acquaint the subject with objects' shapes. The argument in Section 4 does not rule out a Fregean variety of the sensory presentation thesis according to which the contents necessarily connected to phenomenal shape properties are composed of modes of presentation of shapes rather than shapes themselves; in Section 5, I argue that this Fregean variety of the thesis is inconsistent with the fact that some newly sighted individuals can come to have ordinary visual experiences of at least simple shapes. Finally, in Section 6, I consider what the evidence regarding sight restoration implies regarding the role that shape phenomenology plays in our perceptual awareness of shapes.

## 2 | THE SENSORY PRESENTATION THESIS AND SHAPE PHENOMENOLOGY

It is not plausible that the initial visual experiences enjoyed by an individual who has had her sight restored after many years of blindness are phenomenally exactly like an ordinary perceiver's visual experiences. Accordingly, the claim that a newly sighted individual's initial visual experiences instantiate shape phenomenology must be restricted to specific kinds of phenomenal properties. I will claim only that the experiences at issue instantiate certain specific *sensory qualities*. Sensory qualities are the sorts of phenomenal properties that perceptual experience and conscious imagining possess but which conscious thought lacks.

For present purposes, it will suffice to introduce two classes of sensory qualities: color qualities and shape qualities. For example, consider what your experience is like when you view a red wall under white light and a white wall under red light. These two experiences share a certain specific aspect of their phenomenology that neither shares with your experience of a white wall under white light.[5] This shared aspect of the phenomenology of these two experiences is a sensory quality we can call *phenomenal redness*. We could use more detailed examples to isolate the different shades that make up the class of *red qualities*; and this class is included in the more general class of *color qualities*.

Next, consider what your visual experience is like when you view a circular object that is tilted relative to your line of sight, and what your experience is like when you view an elliptical object that is not so tilted. These two experiences share a certain specific phenomenal property that neither shares with your experience when you view a circular object that is not tilted relative to your line of sight—a sensory quality we can call *phenomenal ellipticalness*.[6] A similar procedure can be used to

[5] I am borrowing both this example and the following example from Hellie (2006, p. 6).

[6] The assumption that there is a phenomenal similarity between your experiences of the tilted circle and the untilted ellipse is controversial and the arguments that follow depend on it. I'm not able to defend this assumption due to space limitations, but see Hill and Bennett (2008), Bennett (2012), and Hatfield (2016). For a more general survey of the issue, see Green and Schellenberg (2018). Note that while this issue is often framed in terms of whether tilted circles *look like* ellipses, I have claimed only that the phenomenal character of your experience of the tilted circle and the phenomenal character of your experience of the ellipse are similar in a certain specific respect (I have not claimed that these experiences both attribute a certain specific property to their respective objects).

identify *phenomenal circularity*, *phenomenal squareness*, and so on; and all of these sensory qualities are included in the more general class of *shape qualities*.

These shape qualities do not exhaust the characteristic phenomenology of shape experiences because shape phenomenology also includes phenomenal properties characteristic of depth perception. For example, when you view a square that is not tilted relative to your line of sight your visual experience instantiates phenomenal squareness; but when you view a tilted square your visual experience does not instantiate phenomenal squareness, even if you accurately perceive that the object is square (i.e., even in an ordinary case of shape constancy). Similarly, you might accurately perceive that a surface is white even if your experience of that surface does not instantiate phenomenal whiteness (e.g., if the surface is in shadow).

The sensory presentation thesis is a claim about the relationship between the properties perceptual experiences present and perceptual phenomenology in general; so, defenders of the thesis will disagree about the relationship between the properties perceptual experiences present and shape qualities in particular. A first disagreement concerns whether the properties every experience instantiating shape qualities present are intrinsic shapes or *perspectival shapes*. An object's perspectival shape is a relational property constituted by the direction of each part of the edge of its facing surface relative to the perceiver's viewpoint. Consider the set of lines connecting each point along the edge of an object's facing surface and the perceiver's viewpoint—if we abstract from the length of these lines and the magnitude of the resulting angles, the pattern they form is the object's perspectival shape. (Alternatively, we can characterize an object's perspectival shape as the two-dimensional shape occupying a plane perpendicular to the perceiver's line of sight that would perfectly occlude that object).[7] For instance, a square viewed head-on and a trapezoid, which is tilted away from the perceiver, the most distant side of which is longer than its closest side, might possess precisely the same perspectival shape—call this *perspectival squareness*. Accordingly, some defenders of the sensory presentation thesis will claim that every experience that instantiates phenomenal squareness represents or acquaints the subject with perspectival squareness.

Amongst those defenders of the sensory presentation thesis who maintain instead that every experience instantiating shape qualities presents intrinsic shapes, there will be further disagreements (from now on, whenever I use "shape" without qualification, I mean intrinsic shape). Some might claim that every experience that instantiates a certain specific shape quality thereby presents a certain specific shape. But because that claim makes it difficult to account for shape constancy, others will restrict the thesis to less determinate phenomenal properties.[8] For instance, one might claim that every experience instantiating phenomenal squareness in a certain phenomenal context thereby presents squareness, but that in other phenomenal contexts (i.e., cases where the experience instantiates other phenomenal properties), experiences instantiating phenomenal squareness might thereby present some other shape property.[9] And some defenders of the sensory presentation thesis might claim that the property presented by experiences instantiating phenomenal squareness can vary amongst different subjects, since the contents of experiences instantiating phenomenal squareness are composed of a mode of presentation that can pick out different properties in different subjects.[10]

[7] The relational property at issue may be what Reid refers to as "visible figure" (see Van Cleve (2002) and Nichols (2002) for discussion). If ordinary perceivers' visual experiences do not present objects' perspectival shapes, then this variety of the sensory presentation thesis is false; I will assume for the sake of argument that ordinary perceivers' visual experiences do present such properties.

[8] Thompson (2006) makes this point regarding color constancy. See also Pautz (2009, pp. 502–505).

[9] Thompson (2009) develops a view of this sort regarding color experience.

[10] See Chalmers (2004) and Thompson (2010).

However, all defenders of the sensory presentation thesis are committed to the claim that every experience that instantiates a certain specific shape quality under certain specific circumstances thereby either acquaints the subject with or represents a specific intrinsic or perspectival shape, or represents a mode of presentation of that shape. Accordingly, we can restrict the relevant range of cases to those involving an individual viewing an object that is not tilted relative to his line of sight under ordinary viewing conditions, and who, as a result, has an experience instantiating phenomenal squareness. All defenders of the sensory presentation thesis must claim that every experience that instantiates phenomenal squareness under these circumstances thereby either acquaints the subject with or represents intrinsic or perspectival squareness, or represents a mode of presentation of squareness. In the following three sections I argue that the evidence concerning sight restoration suggests that this claim is false.

## 3 | SIGHT RESTORATION AND SHAPE PHENOMENOLOGY

Individuals who have had their sight restored after long-term blindness often exhibit persistent difficulties with the visual perception of three-dimensional shape.[11] Consequently, it seems likely that the initial visual experiences of such individuals are phenomenally unlike those of typical sighted subjects. However, the existing evidence concerning sight restoration provides three interconnected reasons to conclude that at least some newly sighted individuals' initial visual experiences instantiate shape qualities.

First, some such individuals undergo visual experiences that instantiate color qualities, and possess the phenomenal cohesion and determinate boundaries characteristic of the experience of unified objects. According to multiple case studies, newly sighted individuals' initial visual experiences frequently instantiate color qualities. For instance, in von Senden's comprehensive review of 66 case studies, he describes multiple instances in which newly sighted individuals had no difficulty identifying colors soon after regaining vision—in one case, as early as 10 min following the relevant operation (1932/1960, pp. 107, 110). Similarly, Valvo, who followed four patients for an extended period following surgery to restore their vision after at least 20 years of blindness, notes that "from the beginning, our patients had no difficulty in recognizing and naming colors" (1971, p. 36). In addition, Valvo (1971, p. 27) notes that these subjects were able to use their perception of color to draw inferences about the kinds of objects they were presented with. Kurson (2007, pp. 127–128) characterizes the initial visual experiences of a newly sighted individual in similar terms: while still in the operating room, the subject's initial visual experiences involved patches of color with boundaries sufficiently determinate to enable him to identify the objects he saw. And Sacks (1995) notes that his subject, Virgil, enjoyed color experiences as soon as the bandages were removed from his eyes.

Crucially, there are good reasons to think that these individuals' initial visual experiences of color also possessed the phenomenal cohesion and determinate boundaries that characterizes experiences of unified objects. Kurson reports that his subject's initial visual experiences involved a patch of color that very quickly came to be experienced as "an object" (2007, p. 127). And Valvo (1971, p. 47) notes that his observations confirm Köhler's claim that when newly sighted individuals are asked about the shapes of nearby objects they immediately understand the question:

> When asked about "that thing" which he has before him, he understands the question. Obviously, he has before him a specific entity to which he refers the question, and

[11] See, for example, Fine et al. (2003) and Ostrovsky, Meyers, Ganesh, Mathur and Sinha (2009).

> which he tries to name. Thus, if the object has a simple and compact form, he need not learn what "aggregate of sensations" he must regard as one thing. Elementary visual organization seems to be given to him at once. (Köhler, 1947, p. 150)

Moreover, these experienced objects are evidently experienced as having determinate boundaries. In none of these cases do the newly sighted subjects describe their experiences in terms of color patches with indeterminate boundaries; and in some of these cases, experimenters note that subjects are able to tell that certain shapes are distinct from one another (more on this point below).

Consequently, the evidence suggests that some newly sighted individuals' initial visual experiences possess everything that the basic shape phenomenology at issue requires. If you have a visual experience where a particular region of your visual field is filled by a color that is distinct from the area surrounding it, each part of which is experienced as belonging together to form a unit, and that unit is experienced as possessing determinate edges, then your visual experience thereby instantiates some particular shape quality. Whether this experience instantiates phenomenal squareness or phenomenal circularity (or what have you) is simply a matter of how that color is spread out in your visual field. Of course, the overall phenomenal character of the experience that results when a newly sighted individual views a square likely differs from the overall phenomenal character of your experience when you view a square. The present claim is simply that certain specific phenomenal properties—shape qualities like phenomenal squareness—are instantiated by the initial visual experiences of some newly sighted individuals.

Second, on the basis of their initial visual experiences, some newly sighted individuals are able to tell that certain basic shapes are distinct. For instance, some of these subjects are reported to have recognized that certain shapes are distinct even though they were unable to identify them. von Senden (1932, pp. 107, 114) discusses two separate cases in which a subject viewing a cube and a sphere was able to determine that the objects were different shapes but could not determine which was the cube and which was the sphere. Similarly, Valvo (1971, p. 31) describes an instance in which, during "the first visual exercises," one of his subjects correctly claimed that the circle and the square presented to him were "different things" but could not identify the difference between them. Presumably these individuals would not have been able to tell that the shapes shown to them were different unless those shapes caused their experiences to instantiate distinct shape qualities.

Third, a recent experiment demonstrated that some newly sighted individuals are able to reidentify shapes by sight alone. Richard Held et al. (2011) conducted an experiment with five congenitally blind subjects, each of whom had his or her sight surgically restored within the previous 48 hr. The stimuli presented to these individuals consisted of 20 pairs of Lego blocks. Each subject was first presented with a target object and subsequently presented with both the target and a distractor simultaneously; the subject was then asked to identify the target object. Each pair of objects were presented in three separate conditions: a touch-to-touch condition, in which every object was presented haptically; a vision-to-vision condition, in which every object was presented visually; and a touch-to-vision condition, in which the target object was first presented haptically and then the target and distractor were presented visually. While these individuals performed at near chance levels in the touch-to-vision condition, they performed almost as well in the vision-to-vision condition as they did in the touch-to-touch condition (means of 92 and 98%, respectively).

These subjects' successful performance in the vision-to-vision condition suggests that their visual experiences instantiated shape phenomenology of at least the basic sort at issue. These subjects were able to distinguish between Lego blocks that were the same color and which were relatively similar in terms of size and overall visual appearance. Their experiences' shape phenomenology need not

have been especially detailed—in particular, their experiences need not have possessed any phenomenology characteristic of the perception of depth. Held et al. are explicit that, given the long-term deficiencies that such individuals exhibit with regards to three-dimensional shape perception (see above), these subjects likely relied on experiences of "two-dimensional features, such as corners, edges and curved segments" to identify the targets in the vision-to-vision condition (2011, p. 552).[12] The researchers assume, in addition, that the subjects' visual experiences *represented* these two-dimensional features; however, visual representation of these features was not required to successfully identify the targets. Rather, the subjects would have been able to identify the targets in the vision-to-vision condition by attending to the shape qualities that those objects caused their experiences to instantiate while remaining entirely ignorant of the corresponding shapes (just as you would be able to re-identify words in a foreign language without understanding the meaning of those words, or as someone using a sensory substitution device would be able to re-identify patterns of auditory or tactile sensations while remaining entirely ignorant of the distal stimuli causing those patterns). In any case, the crucial point is that both potential explanations entail that these subjects' experiences instantiated shape qualities corresponding to at least some of the Lego blocks' shape components. As such, we should assume that these individuals' successful performance in the vision-to-vision condition required that their visual experiences instantiated shape qualities.

## 4 | SHAPE PHENOMENOLOGY WITHOUT THE PRESENTATION OF SHAPE

While there are good reasons to conclude that some newly sighted individuals' initial visual experiences instantiate shape qualities, there are also good reasons to conclude that some of these same experiences neither represent nor acquaint the subjects with either the intrinsic or perspectival shapes of the objects they see. In particular, the existing evidence suggests that the visual experiences of some individuals viewing a square object under ordinary conditions soon after having their sight restored will instantiate phenomenal squareness but will neither acquaint their subjects with the object's intrinsic or perspectival squareness, nor represent intrinsic or perspectival squareness. I begin by arguing that such visual experiences do not present squareness. The argument for this claim has two stages: first, some newly sighted individuals' initial visual experiences leave them entirely ignorant of the specific shapes of the objects they see; second, visual experiences that leave their subjects entirely ignorant of the specific shapes of the objects they see do not present those shapes. Subsequently, I argue that parallel points suggest that neither do these experiences present perspectival shapes.

von Senden notes that "in their first attempts to see" newly sighted individuals "cannot recognize by eye even the simplest structural shapes" (1932/1960, p. 106). For instance, he describes two cases (mentioned above) in which subjects were presented with a cube and a sphere and were unable to recognize these shapes. We should not expect newly sighted individuals to be able recognize three-dimensional cubes and spheres as such; however, one of these particular subjects was not able to say which of the cube and the sphere was round and which possessed corners (von Senden, 1932, p. 114). In addition, von Senden describes a separate case in which a subject who was shown a round watch was immediately able to identify its color, but was unable to determine whether it was round or possessed corners even after repeated presentations (1932/1960, pp. 108–109). In a similar case, a

[12] See also Schwenkler (2012, p. 187 and 2013, pp. 91–92).

subject who was shown a coin against a dark background mistakenly guessed that it was not round (von Senden, 1932, p. 113).

More recently, Held et al. (2011) found that individuals who were tested within 48 hr of having their sight restored were unable to visually identify a target that had been presented to them by touch alone.[13] While the subjects of this experiment were asked to identify three-dimensional target shapes, the fact that three of these subjects succeeded in this task as little as 5 days later—at which time they would presumably still have had significant deficiencies perceiving three-dimensional shapes—suggests that recognizing the Lego blocks' two-dimensional components was all that was required to complete the task successfully (Held et al., 2011, p. 552). The initial failure to visually identify the targets, then, suggests that these individuals were at first not able to visually recognize the Lego blocks' two-dimensional components. Moreover, a similar deficiency is evident even with regards to simpler shapes. Valvo (1971, pp. 31-33) notes that the subjects he studied were not able to recognize any shapes that they knew by touch immediately after regaining their sight—in one case, during "the first visual exercises," the subject was unable to correctly identify a square and a circle. And Sacks makes a similar observation regarding Virgil: "he had at first been unable to recognize any shapes visually—even shapes as simple as a square or a circle, which he recognized instantly by touch" (1995, p. 126). In fact, Valvo goes so far as to say that, "immediately following the operation," his newly sighted subjects "show by their behavior, by their answers, and by their framing of precise questions, that everything concerning the shape of objects is completely strange to them" (1971, p. 27).[14]

The crucial question is whether this ignorance of the specific shapes of the objects they see entails that some newly sighted individuals' initial visual experiences do not present those shapes. There are different accounts of what it is for a perceptual experience to present a property. Naïve realists claim that perceivers are *acquainted* with the properties of ordinary objects, and that the subject's acquaintance with such properties constitutes the experience's phenomenology. Content theorists claim that perceptual experiences *represent* properties; and different content theorists provide different accounts of what it is for an experience to represent a property. But any plausible version these views is committed to the following principle: necessarily, if a subject's experience presents a certain specific property, then in virtue of having that experience the subject acquires at least a *minimal grasp* of that property.[15] In the case of perceiving a square, the subject has a minimal grasp of the object's squareness only if some of the following conditions are satisfied: the subject can tell whether the object is round or has corners; the subject understands that the object is not a circle; the subject recognizes that the object has multiple sides; the subject has expectations regarding how the object would interact with the environment in virtue of its shape (e.g., regarding how it would behave if set in motion, or

[13] Note that the failure of the subjects in the touch-to-vision condition in Held et al. (2011) is only indirect evidence that these individuals were not able to visually recognize shapes. Also, the success of these subjects in the vision-to-vision condition does not establish that they recognized those shapes. As I noted above (Section 3), the subjects would have been able to identify the targets in the vision-to-vision condition by attending to the shape qualities that those objects caused their experiences to instantiate while remaining entirely ignorant of the corresponding shapes.

[14] Some newly sighted subjects have been shown to be susceptible to the Ponzo and Müller-Lyer illusions (Gandhi, Kalia, Ganesh & Sinha, 2015) very soon after having their sight restored. However, even if one were to assume that this result establishes that such individuals' initial visual experiences presents the length of objects, it does not establish that these experiences present shapes. In addition, because the presentation of stimuli in this experiment took place up to 48 hr after sight restoration, it is plausible that these individuals had enough time prior to the experiment to make connections between their visual sensations and a property as simple as length.

[15] This claim is somewhat similar to Pautz's (2009, p. 505) *reverse grounding principle*. If it's possible for an experience to present a property without the subject attending to or being aware of that property, then what the subject necessarily acquires is the *capacity* to grasp a property by attending to it.

whether it would fill a certain space). Crucially, one can have a minimal grasp of some object's squareness without possessing the concept squareness; so, the proposed principle in consistent with the claim that shape perception is nonconceptual in some important sense (more on this point below).

For instance, as the naïve realist understands it, the acquaintance (or perceptual awareness) relation is a mental relation more basic than representation. To be acquainted with some property is for that property simply to be given to your mind, just as it is. Consequently, you cannot be acquainted with an object's squareness without possessing a minimal grasp of its shape. For example, if you see a square object located so far in the distance that you do not recognize that it is not a circle and cannot tell whether it is round or has corners, then you are not acquainted with (or aware of) its squareness. One might think that a naïve realist would say that you can be acquainted with an object's squareness without, for instance, recognizing that the object has corners, so long as you are not familiar with the kind of shape phenomenology that your experience instantiates when you view a square object. However, that is precisely the kind of claim that is not available to the naïve realist since he claims that for an experience to instantiate shape phenomenology just is for the subject to be acquainted with an object's shape.[16]

Conversely, according to the content theorist, what it is for an experience to present a property is for it to represent that property—a given property is presented when it is included in the experience's representational content. As Pautz (2009, p. 484) notes, the two most theoretically neutral accounts of what it is for a perceptual experience to possess content are the *appears-looks conception* and the *accuracy conception*. According to the appears-looks conception, what it is for a perceptual experience to possess content is for something to perceptually *appear* or *seem* some way to the subject. So, what it is for a particular property to be included in a given visual experience's content is for something to visually appear to the subject to possess that property. According to the appears-looks conception, then, your experience cannot represent that an object is square without you possessing a minimal grasp of its squareness, because an object cannot seem to you to be square unless you possess a minimal grasp of its squareness. For instance, if you view a square object located some distance from you and you do not recognize that it is not a circle and cannot tell whether it is round or has corners, then it does not visually appear or seem to you to be square.

Next, according to the accuracy conception, what it is for a perceptual experience to possess content is for there to be conditions such that the experience is accurate if and only if those conditions are satisfied. However, any given perceptual experience is accurate only if that very experience is accurate, and only if $2 + 2 = 4$ (since these are necessary truths), but such propositions are not contents of perceptual experiences.[17] Consequently, the accuracy conception needs to be supplemented with the claim that the only accuracy conditions that are perceptual contents are those that, as Siegel puts it, "are conveyed to the subject by her experience" (2010, p. 43). Accuracy conditions are conveyed to the subject if those conditions are "manifest to introspection" of the relevant experience, and only if those conditions figure in beliefs it would be natural for the subject to form on the basis of the relevant experience (Siegel, 2010, pp. 51–52). Accordingly, what it is for a particular property to be included in a given visual experience's content is for that property to feature in those of the experience's accuracy conditions that are conveyed to the subject.

[16] In fact, as Campbell (1996) suggests, it does not seem that the naïve realist can allow for any sort of phenomenal difference between haptic acquaintance with squareness and visual acquaintance with squareness. However, even if the naïve realist can coherently posit a phenomenal difference between visual and haptic acquaintance with shape (see Logue, 2012), the resulting view would not allow for acquaintance with a particular shape without even a minimal grasp of that shape.

[17] See Pautz (2009, p. 487) and Siegel (2010, pp. 43–44).

But, again, if this account is correct, your experience cannot represent that an object is square without you possessing a minimal grasp of its squareness. An experience represents that an object is square only if, first, it is accurate if and only if there is a square object present, and second, only if this fact is conveyed to the subject. And the fact that your experience is accurate only if a square object is present cannot be conveyed to you unless you possess a minimal grasp of its squareness. For instance, if when you view a square object you do not recognize that it is not a circle or cannot tell whether it is round or has corners, then it is not manifest to introspection that your experience presents a square, and neither is it natural for you to form the belief that a square is present on the basis of your visual experience.

A final account of perceptual content is what Pautz (2009, pp. 492–495) calls the *identity conception*. According to the identity conception, perceptual experience is a unique kind of propositional attitude. For instance, according to the standard account of belief, for a particular subject to believe that the book is on the table is for that subject to stand in the belief-relation to the proposition *that the book is on the table*. So too, for a subject to have a perceptual experience as of the book being on the table is for that subject to stand in the *sensorily entertaining* relation to the proposition *that the book is on the table*. But, then, if this account of what it is for a perceptual experience to possess content is correct, an experience does not represent a certain specific property unless the subject acquires a minimal grasp of that property. The very feature that distinguishes propositional attitudes from other kinds of representational mental states is that the *subject* entertains the relevant proposition. For instance, an individual might see two objects that happen to be the same size, and the fact that they are the same size might be represented by some subpersonal perceptual process occurring in her brain, and that subpersonal process might even influence her behavior; but if the subject herself acquires no understanding of the fact that the objects are the same size, then that the objects are the same size is not included in the contents of any of her propositional attitudes. Similarly, if you see a square object in the distance and you do not recognize that it is not a circle and cannot tell whether it is round or has corners, then you do not sensorily entertain the proposition that the object is square.

One might object that your experience can present some object's shape without you thereby acquiring a minimal grasp of its shape because your experience can present a particular shape without you deploying the corresponding shape concept. That is, an experience might acquaint you with an object's squareness, or represent that an object is square, but because you do not see the object *as square*, you fail to grasp the object's squareness.[18] There is a clear sense in which a perceiver can be presented with a specific shape and not realize that she is looking at that specific shape. For instance, you might visually perceive a 10-sided figure and fail to recognize that you are looking at a decagon—fail to see it *as* a decagon—because you fail to deploy your decagon concept. But while in such a case there is a sense in which you do not recognize that you are viewing a decagon, your experience still provides you with a minimal grasp of the shape you see. You can tell, for example, whether the object is round or has corners, and you recognize that it is not a circle and that it has multiple sides. If you did not possess at least this minimal grasp of the shape, we would deny that your experience presents the object's shape even in some nonconceptual manner. In fact, when an animal that lacks geometric concepts altogether has visual experiences, it still thereby acquires a minimal grasp of the shapes it sees—for instance, a cat has distinct expectations regarding how the squares and circles she sees will interact with the environment. So, even when you are presented with some property and fail to deploy the corresponding concept, your experience still provides you with a minimal grasp of that property.

[18] See Hopkins (2005, p. 457).

Consequently, given that any plausible account of what it means for an experience to present a property entails that an experience does not present a given property unless the subject acquires a minimal grasp of the property in virtue of undergoing that experience, the evidence surveyed above suggests that some newly sighted individuals' initial visual experiences do not present the shapes of the objects they see. Moreover, that evidence concerns some of the same individuals whose initial visual experiences instantiate shape qualities; so, this evidence suggests that visual experiences sometimes instantiate shape qualities without representing or acquainting their subjects with the shapes of the objects they see.

For example, imagine that soon after having his sight restored one of Valvo's subjects is shown a red square, not tilted relative to his line of sight, under ordinary viewing conditions. In virtue of undergoing the resulting visual experience, this subject recognizes that there is an object before him and that it is red; so his visual experience presents a red object. His experience's visual phenomenology is also sufficiently detailed that he would be able to tell that the red square is unlike a simultaneously presented circle; so his visual experience instantiates phenomenal squareness. However, in virtue of having this visual experience, he does not acquire a minimal grasp of the object's squareness. This subject has no more understanding of the object's shape than you do when you view a square object at a great distance. He cannot tell whether the object is round or has corners, nor whether it has multiple sides. He has no idea what shape the object is—for all he can tell by looking, the object might be a circle, it might be a square, and it might be some other shape altogether. And, as a result, he does not possess any understanding of how the object would interact with the environment in virtue of its shape. Rather, as Valvo puts it, "everything concerning the shape of objects is completely strange" to him. Despite instantiating phenomenal squareness, then, this visual experience does not present the object's squareness.

A defender of the sensory presentation thesis might respond that such a newly sighted individual's initial visual experiences present perspectival shapes rather than intrinsic shapes. However, the available evidence suggests that in virtue of undergoing their initial visual experiences the newly sighted individuals at issue do not acquire a minimal grasp of the perspectival shapes of objects; so, we should conclude that their initial visual experiences do not present objects' perspectival shapes either. In particular, we have already seen that when certain newly sighted individuals are presented with simple objects they are unable to determine whether those objects are round or have corners. The present proposal is that when a newly sighted individual is presented with a square, he does not perceive its specific shape but he does perceive the directions of the object's sides relative to his viewpoint. Accordingly, this proposal requires that the subject has a minimal grasp of the relative directions of the object's different sides in virtue of undergoing his experience. However, he cannot possess a minimal grasp of the relative directions of the object's different sides unless he grasps that the object has multiple sides; and given that this subject cannot determine whether the object he is looking at is round or has corners, he does not grasp that the object has multiple sides.

In addition, if these newly sighted individuals' initial visual experiences provided them with a minimal grasp of objects' perspectival shapes, one would expect them to use their understanding of perspectival shape to help determine objects' intrinsic shapes (just as such individuals frequently use their grasp of color to help them identify objects).[19] After all, while the fact that some object instantiates perspectival squareness does not enable you to determine its specific shape, it does enable you to rule out a number of possibilities. Yet, the reports of many of the cases discussed above indicate that these newly sighted individuals do not engage in such reasoning. For instance, Sacks notes that when Virgil was given "a child's wooden pegboard, with large, simple blocks—square, triangle,

[19] Van Cleve (2007, pp. 261–264) makes a similar point while discussing Reid's approach to Molyneux's question.

circle, and rectangle—to be fitted into corresponding holes" he found "the task impossible at first" (1995, pp. 126–127). Similarly, Valvo (1971, p. 46) notes that his subjects have difficulty recognizing a particular shape at different relative distances. Furthermore, he notes that when his subjects are first learning to identify shapes, when "an object varies slightly from the position in which it was learned as a shape, it is no longer recognized" (Valvo, 1971, p. 46). If Valvo's subjects grasped objects' perspectival shapes in virtue of undergoing their initial visual experiences, they could use similarities of perspectival shape as a clue to an object's intrinsic shape. What they appear to do instead is to simply memorize that certain specific phenomenal properties are caused by certain specific intrinsic shapes. Ultimately, then, the relevant empirical evidence suggests that the initial visual experiences of the newly sighted individuals at issue leave them as completely ignorant of the nature of perspectival shapes as they do of the nature of intrinsic shapes.

## 5 | THE SENSORY PRESENTATION THESIS AND MODES OF PRESENTATION

The evidence surveyed above suggests that sometimes a newly sighted individual who has a visual experience when shown a square object will fail to acquire a minimal grasp of the object's squareness; and, consequently, we should deny that such an experience represents squareness. But, in virtue of having her visual experience, the individual may grasp that the object she sees has a property that satisfies certain conditions. For instance, she might recognize that the object in front of her has a shape of some sort, and that this shape is distinct from the shapes of other nearby objects. According to a Fregean view of perceptual content, the propositions that are the contents of perceptual experiences are composed not of properties but of *modes of presentation*—conditions that a property must satisfy in order to be the property that figures in a given experience's accuracy conditions. A defender of the sensory presentation thesis, then, can claim that the contents possessed by every experience that instantiates phenomenal squareness under the relevant circumstances are not composed of squareness, but of some mode of presentation that happens to pick out squareness under those circumstances (i.e., some condition that squareness satisfies under those circumstances).[20]

A natural proposal is that the content that every experience that instantiates phenomenal squareness possesses includes some demonstrative element—some element that picks out an object's shape in much the same way as the expression "that shape" does. For instance, perhaps when a newly sighted subject is shown a circle and a square simultaneously, instead of representing that there is a circle and a square in front of him, his visual experience represents that one object possesses *this shape* and the other *that shape*. However, a defender of the sensory presentation thesis cannot plausibly claim that the content that every experience that instantiates phenomenal squareness represents is a mode of presentation like *that shape*, because this proposal is incompatible with the possibility of visual experiences misrepresenting shapes. This proposal entails that the content that every experience instantiating phenomenal squareness possesses is a mode of presentation that picks out whatever shape is causally connected to the experience in the ordinary perceptual way. But, then, if when viewing a circular object under normal conditions you have a visual experience instantiating phenomenal squareness due to some temporary neurological anomaly, the resulting experience is accurate.

[20] Alternatively, a defender of the sensory presentation thesis might claim that the relevant mode of presentation picks out perspectival squareness instead. The arguments that follow apply to either version of the Fregean view, so I will ignore this complication.

In order to allow for the possibility of misrepresentation, a defender of the sensory presentation thesis must characterize the relevant modes of presentation along the lines that Chalmers (2004) and Thompson (2009, 2010) suggest. Specifically, the content that every experience instantiating phenomenal squareness possesses must be understood to be a mode of presentation that picks out the property that *normally* causes phenomenally square experiences in the subject (at least in a certain phenomenal context). According to this proposal, if when viewing a circular object under normal conditions you have a visual experience instantiating phenomenal squareness due to some temporary neurological anomaly, your experience is inaccurate—squareness is the property that normally causes you to have phenomenally square experiences under the relevant circumstances, so this experience is accurate only so long as the object causing your experience is square.

This Fregean variety of the sensory presentation thesis—*Fregean representationalism*—may be consistent with the evidence regarding newly sighted individuals' initial visual experiences; but it is not consistent with the fact that the vision of some such individuals improves over time. There is evidence that at least some individuals who have their sight surgically restored eventually come to have ordinary visual experiences of simple shapes. For instance, regarding individuals who have had their sight restored after becoming blind later in life, Valvo reports that "vision at first is reduced to the level of mere sensation" but that "visual integration proceeds relatively rapidly, even after many years of blindness; and is recovered almost completely" (1971, p. 20). And regarding the four individuals that are the focus of his study, Valvo reports that "after a long and gradual learning period" the "immediate recognition of the shapes of objects" was eventually achieved (1971, p. 31). Similarly, Ostrovsky et al. (2006, p. 1012) found that a congenitally blind individual who was tested 20 years after having her sight restored demonstrated a "high level of proficiency" on tasks involving shape perception. And Held et al. (2011, p. 552) found that three test subjects who initially performed at chance levels when attempting to visually identify a target object that had been presented haptically, performed significantly better at this task in as little as 5 days following the initial test.[21]

We should assume that a newly sighted individual's visual phenomenology changes as he learns to see simple shapes. When a normally sighted individual sees that some object is square, he does not first experience a visual sensation and then infer that the object is square—the attribution of squareness to the object is something that happens at the experiential level, not only at the level of post-perceptual judgments. Accordingly, assuming that a newly sighted individual's initial visual experiences do not represent specific shapes, if he learns to visually perceive shapes as a normally sighted subject does, the nature of his visual experiences must change. That is, learning to see shapes will not simply involve learning to make new post-perceptual judgments, but will involve his visual experiences' phenomenology changing.

An analogous change occurs when an individual uses a sensory substitution device (SSD)—a machine that uses information collected by a camera to generate tactile or auditory stimuli—for a sufficient length of time. A subject using such a device at first experiences only the auditory or tactile sensations it produces; but with practice, the subject is able to use the device to make judgments regarding the distal stimuli causing these sensations. One might think that attributing sensory input to distal stimuli in such cases does not involve any phenomenological change at the level of experience—perhaps the subject merely learns to make cognitive inferences about the kinds of distal stimuli that tend to cause certain specific auditory or tactile sensations. However, there is

[21] Held et al. (2011) and Sinha, Wulff and Held (2014) characterize this improvement in terms of cross-modal mappings being established. However, if the initial visual experiences of these individuals do not represent shapes (as I have argued in Section 4), then the improved performance in the touch-to-vision condition should be explained in terms of the subjects' visual experiences coming to represent shapes.

considerable evidence that distal attribution after sustained use of a SSD is an experiential process: users of such devices frequently describe phenomenological changes; they are vulnerable to prototypical perceptual illusions when using these devices; when explicitly instructed to attend to proximal sensations in order to draw inferences regarding distal stimuli, their performance is diminished significantly; and brain imaging and transcranial magnetic stimulation experiments have shown that distal attribution relies on prototypical perceptual brain areas.[22]

Consequently, we should assume that when an individual learns to use a SSD to attend to distal stimuli, she does not simply learn to make new judgments in response to her perceptual experiences—her perceptual experiences themselves are different. Yet, the available evidence also suggests that, in such cases, subjects do not stop experiencing auditory or tactile sensory phenomenology.[23] Rather, the phenomenal change that occurs concerns the kinds of properties that experiences instantiating the relevant sensory phenomenology represent. For instance, when an individual begins using a visual–auditory substitution device, her initial perceptual experiences are of arrays of sounds. But when she is trained to use the device to identify, for example, the shapes of distal objects, her experience changes—her perceptual experiences still instantiate auditory sensory qualities, but these experiences are now experiences of the shapes of the objects detected by the camera.

So, the experiences of an individual using a SSD and those of a newly sighted individual change in similar ways as each learn to perceive shapes. When a subject learns to use a SSD to perceive shapes, while at first he has experiences instantiating auditory sensory qualities that do not represent objects' shapes, later he has experiences instantiating auditory sensory qualities that do represent objects' shapes. Similarly, a newly sighted individual's initial visual experiences that instantiate shape qualities do not represent objects' shapes, but later that individual can have visual experiences instantiating shape qualities that do represent objects' shapes.

Even if the Fregean representationalist is correct, then, that a newly sighted individual's initial visual experiences instantiating shape qualities possess contents composed of modes of presentation, his view has the unacceptable consequence that the representational contents of experiences instantiating shape qualities do not change as the subject learns to see shapes. According to the Fregean representationalist, the representational content of an experience instantiating phenomenal squareness is built into that phenomenal property—every experience that instantiates phenomenal squareness under certain circumstances represents that the perceived object possesses whatever property normally causes phenomenally square experiences in the perceiver under those circumstances. The Fregean representationalist claims, then, that as a newly sighted individual learns to see shapes, the contents of his visual experiences that instantiate shape qualities do not change.[24] And so, the Fregean representationalist must explain the process of learning to see shapes entirely in terms of the judgments that the subject learns to make in response to his unchanged visual experiences. Consequently, because we should reject the claim that a newly sighted individual's visual experiences do not change as he learns to see shapes, we should reject Fregean representationalism.

[22] See Renier et al. (2005), Amedi et al. (2007), Merabet et al. (2009), Siegle and Warren (2010), Kim and Zatorre (2011), Hartcher-O'Brien & Auvray (2014, pp. 427–428), Proulx et al. (2014, section 5), and Kiverstein et al. (2015, pp. 669–671).

[23] Subjects report that the proximal sensations persist, and they can attend to these sensations when instructed to do so: see Block (2003) and Deroy and Auvray (2015, section 2.2). For direct neurological evidence, see Kupers et al. (2006) and Kupers and Ptito (2014).

[24] While a Fregean representationalist might claim that when a newly sighted individual eventually learns to see shapes his visual experiences acquire additional contents, such a proposal would be ad hoc. Fregean representationalists who maintain that perceptual experiences possess multiple contents, such as Chalmers (2010), claim that any additional contents an experience possesses are grounded in the experience's Fregean content.

## 6 | SHAPE PHENOMENOLOGY AND SHAPE PERCEPTION

Sensory phenomenology plays a crucial role in our perceptual awareness of properties. When you view a square object that is not tilted relative to your line of sight and can see that it is square, clearly you perceive that the object is square in virtue of the fact that your visual experience instantiates phenomenal squareness. The sensory presentation thesis provides a simple account of the way in which sensory qualities makes us aware of ordinary objects' properties. According to that view, sensory qualities are inherently presentational of such properties: to have an experience that instantiates phenomenal squareness under the relevant circumstances just is to be acquainted with some object's squareness, or just is for your experience to represent that the object is square (or to represent some condition that squareness satisfies under the circumstances). But we have just seen that there are good reasons to reject the sensory presentation thesis. The available evidence suggests that a newly sighted individual's initial visual experiences can instantiate phenomenal squareness while failing to present squareness; but, at least in some such cases, subsequent experiences instantiating phenomenal squareness will present squareness. If sensory qualities were inherently presentational, this process of learning to see shapes could not occur and would not be necessary.

Consequently, we need an account of the role sensory phenomenology plays in our perceptual awareness of properties that is consistent with the fact that the properties presented by experiences instantiating a particular sensory quality can change over time. How, for instance, can the instantiation of phenomenal squareness by an experience sometimes convey to the subject that some object is square and sometimes not?

One proposal—*indirect realism*—is that we are directly aware of our perceptual experiences' sensory phenomenology, and thereby indirectly aware of the properties of perceived objects. For instance, you might be directly aware of the phenomenal squareness your visual experience instantiates and typically interpret that phenomenal property as indicating the presence of a square (in the same way that you typically interpret a square patch of paint on a canvas as depicting a square object). An alternative proposal—*dual component theory*—is that our experiences' sensory phenomenology precipitates mental representations which are concerned exclusively with the properties of ordinary objects. For example, perhaps your visual experience instantiating phenomenal squareness typically causes a mental representation with the content that some object is square.

However, while both of these proposals are consistent with the fact that the representational contents of experiences instantiating certain specific sensory qualities can change over time, they are unacceptable for a variety of reasons. In particular, indirect realism is unacceptable because we are not aware of our experiences' sensory phenomenology in the way that this proposal requires. And the dual component theory is unacceptable because the instantiation of sensory qualities, rather than simply causing mental representations of ordinary objects and their properties, is the means by which ordinary objects and their properties are represented in perceptual experience.[25] In order to avoid the difficulty with indirect realism, then, we must deny that the subject of a perceptual experience is aware of the properties of physical objects in virtue of being aware of the sensory qualities that her experience instantiates. And in order to avoid the difficulty with the dual component theory we must deny that sensory qualities play a merely causal role in our perceptual awareness of the properties of ordinary objects. The only remaining alternative is that having a perceptual experience that instantiates a certain sensory quality is a way of being aware of a certain property that a perceived object instantiates.

[25] For more detailed discussions of the difficulties facing indirect realism and the dual component theory see Smith (2002), Hopp (2011), and Millar (2017).

One might wonder how a perceptual experience can represent a certain property in virtue of instantiating a certain sensory quality if an experience's representational content is not built into its sensory phenomenology. However, as Hall (1961) and Clark (1973, 1975) suggest, we can think of sensory qualities as functioning to represent properties in much the same way that linguistic symbols do.[26] For instance, Clark claims that "the occurrences of sense impressions in acts of perception are the vehicles for the ascription of qualities to what is before one as the use of predicate words in the making of assertions is our way of describing an object of reference" (1975, p. 117). Clark appeals to an analogy with overt speech here, but there is an even closer analogy with how linguistic symbols function in "inner speech" (i.e., thinking with words): when you think about a particular property using inner speech, the words you use constitute a way of thinking about that property that does not seem to you to be mediated by an awareness of the words themselves. In this respect, there is a contrast between thinking with words and hearing or reading words. When you hear words spoken or read words on a page you are aware of the meaning of the words, but your awareness of the meaning of those words seems to you to be mediated by your awareness of the words you are hearing or reading. Conversely, when you think with words you are typically not aware of the words you are thinking with.[27]

According to this proposal, then, shape qualities are representational vehicles—they are the means by which our perceptual experiences represent the shapes that they do. When you view a square object that is not tilted relative to your line of sight under normal viewing conditions, your experience represents that the object is square in virtue of the fact that it instantiates phenomenal squareness. And because the instantiation of phenomenal squareness is causally connected in the right way to the object's squareness, you are perceptually aware of the object's squareness in virtue of the fact that your experience represents squareness. So, while a sensory quality such as phenomenal squareness is not inherently representational, when you have an experience that instantiates phenomenal squareness under the right circumstances you thereby perceive that some object is square—just as the word "square" is not inherently representational, but when you token the word "square" in inner speech under the right circumstances you thereby think that some object is square.

This theory of the role that sensory qualities play in our perceptual awareness of the properties of ordinary objects provides a straightforward explanation of how a newly sighted individual's visual experiences change as she learns to see shapes. Consider the change that occurs when you token a particular word in inner speech, first without knowing what the word means, and later after having learned its meaning. When you token the word in inner speech without knowing what it means, there is something it's like for you to token that word in inner speech, but you are not thereby thinking about whatever property the word happens to represent; after you have learned the meaning of the word, a certain phenomenological element of auditory imagery remains when you token the word in inner speech, but now you are thereby thinking about a particular property. Similarly, when a newly sighted individual is first shown a square object her visual experience instantiates phenomenal squareness but she does not thereby perceive that some object is square—the squareness of the object is not conveyed to her by the fact that her experience instantiates phenomenal squareness. But when she is given time to interact with her environment—most obviously, by touching the objects that she can now see—the shape qualities instantiated by her visual experiences come to acquire a specific

[26] For discussion of Hall's and Clark's views, see Aquila (1975) and Smith (2002, pp. 91–93).

[27] Some empirical evidence suggests that there are different varieties of "inner speech" that may differ phenomenally (for a review of this evidence, see Perrone-Bertolotti, Rapin, Lachaux, Baciu and Lœvenbruck (2014, pp. 222–227). For present purposes, the important point is that there is a kind of inner speech that is not like hearing a voice in one's head, nor like imagining hearing a voice.

meaning for her as she learns which specific shapes correspond to which specific sensory qualities. So, when she is shown a square object sometime later and her experience instantiates phenomenal squareness, now the object's squareness is thereby conveyed to her. That is, now by having an experience that instantiates phenomenal squareness she thereby perceives that some object is square.

## 7 | CONCLUSION

The empirical literature concerning sight restoration suggests that individuals who have their sight surgically restored must learn to see shapes despite the fact that their initial visual experiences instantiate shape qualities. If so, then this literature has significant implications, not for the relationship between visual and haptic representations of shape, but for the relationship between visual shape phenomenology and our visual awareness of shapes. In particular, the evidence concerning sight restoration suggests that the properties a perceptual experience presents are not built into its sensory phenomenology. A defender of the sensory presentation thesis claims that every visual experience that instantiates phenomenal squareness under certain circumstances either acquaints the subject with or represents intrinsic or perspectival squareness, or represents a mode of presentation of squareness. But the evidence surveyed above (Sections 3 and 4) suggests that when some newly sighted individuals initially view a square object under the relevant circumstances, their visual experiences will instantiate phenomenal squareness but will neither acquaint them with nor represent the object's squareness (nor its perspectival squareness). In addition, we have seen (Section 5) that there is evidence that, after sufficient training or practice, some of these same individuals eventually have visual experiences instantiating shape qualities that represent the shapes of perceived objects (just as when an individual is trained to use a SSD, certain auditory sensory qualities that previously represented the properties of sounds, come to represent shapes). So, we also have reasons to reject the claim that every experience instantiating phenomenal squareness represents a mode of presentation of squareness—a condition that squareness happens to satisfy under the relevant circumstances.

Instead, we should conclude that the representational contents of experiences instantiating specific shape qualities change as a newly sighted subject learns to see shapes. The available evidence suggests that the initial visual experiences of some newly sighted individuals instantiate phenomenal squareness but do not represent that some object is square; but, this evidence also suggests that, after a sufficient period of adjustment, some such individuals will go on to have visual experiences that represent that some object is square in virtue of instantiating phenomenal squareness. If the shape qualities visual experiences instantiate do not inherently represent particular shapes but nonetheless can come to represent shapes, then this fact suggests a particular account of the role that sensory qualities play in our perceptual awareness of shapes—it suggests that shape qualities function as representational vehicles in the same way that linguistic symbols function in inner speech. The word "square" is not inherently representational, but when you token the word "square" in inner speech under the right circumstances you thereby think that some object is square; so too, while phenomenal squareness is not inherently representational, when you have an experience that instantiates phenomenal squareness under the right circumstances you thereby perceive that some object is square.

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