Spatial Experience, Sensory Qualities, and the Visual Field

Douglas B. Meehan (dbmeehan@yahoo.com)
Department of Philosophy, CUNY Graduate Center
365 Fifth Avenue
New York, NY 10016-4309 USA

Abstract

An explanation of the qualitative nature of visual experience must account for the spatial character of visual sensations. We need mental locations and a mental visual field to explain how visual sensations enable us to perceive physical entities as located, to explain the differences in the spatial characters of sensations revealed in introspection, and to explain the spatial character of visual anomalies such as nonillusory afterimages. But mental locations are properties of mental states, not objects, so they must not be spatial locations. I argue that the homomorphism view of sensory qualities, pioneered by Wilfrid Sellars (1956, 1959, 1960, 1967) can best explain the nature of mental space. This view explains mental locations as nonspatial mental counterparts of physical locations. Austen Clark (1996, 2000) rejects mental location, claiming that the spatial character of sensory experience can be explained in terms of the spatial properties of distal stimuli and of sensory receptors. I argue that Clark's theory fails in two respects: 1) it fails to explain how it is that we individuate our sensory experiences with respect to apparent spatial differences, and 2) we cannot make the psychophysical identifications needed to get Clark's theory off the ground without first picking out the sensations by their mental properties.

Introduction

The current philosophical literature on visual experience is rife with debate on the issue of the qualitative character of sensory experience. The debate focuses largely on the topic of color and color qualia. But an explanation of color qualia will not exhaust a philosophical account of the qualitative nature of visual experience. We must also explain the nature of the spatial character of visual experience. Just as there is a qualitative difference between seeing something red and seeing something green, there is a qualitative difference between seeing a red patch off to one's right and seeing a red patch off to one's left. What it is like to see a red patch off to one's right is different from what it is like to see a red patch off to one's left.

But what are these qualitative spatial properties and relations? Are they actually spatial? When one has a visual experience of a red patch to the left of another red patch are there two phenomenal red entities located next to one another? And if they are located in any sense, where are they located? Are they located in some mental space—a visual field?

I argue that we do need to posit a mental space or visual field to explain the spatial character of visual experience. And I argue that the homomorphism view of sensory qualities, pioneered by Wilfrid Sellars (1956, 1959, 1960, 1967)[1] offers the best solution. In so doing I examine and reject Austen Clark's (1996, 2000) recent repudiation of mental space.

1. From Sensations to Sensory Fields

At the most basic level, we become conscious of our surroundings by having sensations that represent those surroundings. Sensations have perceptual roles. We see a red firetruck because we have a sensation of a certain type. We see a yellow Volkswagen because we have a sensation of another type. We see a red firetruck to the left of a yellow Volkswagen because we have a sensation of yet another type. Visual sensations enable us to perceive the firetruck next to the Volkswagen.

If we detect differences in visual stimuli by having different sensations, those sensations must vary in ways corresponding to perceptible differences in visual stimuli. Since we see entities by seeing differences in color, visual sensations must have properties corresponding to physical color properties. I will call these properties mental colors. I adopt Sellars's notational device of suffixing a '*' to color predicates to indicate reference to mental colors—e.g., red* is the sensory quality that enables us to perceive surfaces we call red.

We also perceive visual stimuli as having spatial properties. That we perceive the red firetruck as being to the left of the yellow Volkswagen seems to entail that our visual sensations have properties corresponding to the locations of the firetruck and Volkswagen. If sensations enable us to perceive stimuli as being located, sensations must have properties corresponding to locations. They must have mental locations, or locations*. Seeing an entity off to the right requires that one has a visual sensation with a property corresponding to being off to the right. Thus, we can infer that there are mental locations from the fact that

[1] The homomorphism view has also been argued for more recently by David Rosenthal (1998, 1999, 2000) and Sydney Shoemaker (1975). The version I argue for is closest to Rosenthal's.

we can perceive distal stimuli as occupying physical locations.

We can also introspect our sensations. When we do, we are conscious of them as having certain qualities. For instance, when introspecting the sensation that enables us to perceive the red firetruck to the left of the yellow Volkswagen, we are conscious of the sensation as being of a certain type—a sensation of a big red patch to the left of a little yellow patch. Introspection reveals the ways that sensations differ from one another, so it reveals something about the mental properties of those sensations. Inasmuch as sensations can differ with respect to apparent color and apparent location, they must have colors* and locations*.

In fact, we have sensations even in the absence of the appropriate stimuli. For instance, I can have a sensation of red at the center of my visual field without there being anything red directly in front of my eyes. We might claim that I am in the kind of sensation normally had when there is a red thing in the center of my distal visual field. Inasmuch as this state differs from the kind of sensation normally had when there is a red thing in the periphery of my distal visual field, we need to explain how it differs. This suggests some property of the sensations corresponding to the locations of their normal distal causes.

A strong example of sensations in the absence of stimuli is the phenomenon of nonillusory afterimages. A nonillusory afterimage is a sensation of a bright pattern one has after a flashbulb goes off in one's eyes. The afterimage seems to occlude objects in the distal visual field. When one moves one's eyes, the afterimage appears to occlude different objects.

But these afterimages are nonillusory. One does not think that there is some bright patterned object moving along with one's eyes. One thinks that it just appears that way. As Paul Boghossian and David Velleman put it, "The after-image must … be described as appearing in a location without appearing to be in that location ..." (1989, p. 91). An explanation of this fact, according to Boghossian and Velleman, is that the afterimage is located in a visual field. This visual field overlays the distal visual field, so the afterimage occludes whatever its region of the visual field happens to overlay. Since an afterimage appears in a location without appearing to be in a location, there must be mental space in addition to physical space.

But how do we explain mental space? Is it actually spatial? Is the afterimage located on some two dimensional transparency? This hardly seems feasible. If the mental visual field is an overlay through which we look at the world, we still need to explain how it is that we look through the overlay. Such an explanation must posit further states to mediate our seeing through the overlay. This will require another overlay, and so on ad infinitum.

Further, sensations are mental states, or events, not objects. Although a state is a state of some entity located somewhere, it is not clear how that location helps explain differences in the apparent locations of sensations.

If we must posit mental space, we must explain it as nonspatial. And if mental space is nonspatial, we must explain how mental locations correspond to spatial locations. The homomorphism view of sensory experience meets these challenges.

2. The Homomorphism View

The homomorphism view explains the relationship between a physical stimulus property and its mental counterpart property in terms of a common structure between their respective quality families. I will motivate the view with respect to color vision, and I will then explain how it extends to spatial experience.

According to the homomorphism view, physical red and red* are not the same property, nor do they resemble each other. They are counterparts in virtue of a similarity between the property families of which they are members—the color and color* families.

A property family is comprised of properties that resemble and differ from one another in varying degrees. For instance, the color family is comprised of perceptible colors.[2] Red is more similar to orange than it is to green. Green is more similar to blue than it is to pink. It is a similarity between the relationships among their respective members that make two property families counterpart families. Two properties of different property families are counterparts in virtue of occupying the same positions in their respective quality families. And a property's position is determined by the similarities and differences it bears to all of the other members of the quality family.

For instance, just as red is more similar to orange than it is to green, red* is more similar to orange* than it is to green*. Red* resembles and differs from the other colors* in ways that are homomorphic to the ways that red resembles and differs from the other colors. In virtue of this, red* and red occupy the same place in their respective quality families.

The homomorphism view also explains the correlations between the spatial properties of distal stimuli and the mental spatial properties of sensations.[3]

---

[2] I take physical colors to be sets of reflectance properties. Two surfaces that appear in normal lighting conditions to be the same shade of red are the same color. But such surfaces can have very different physical makeups. These surfaces, called metamers, pose a problem for the view that colors are physical light-reflectance properties of surfaces (see C.L. Hardin, 1993). But the problem can be countered by taking colors to be sets of reflectance properties, all of which yield the same ratio of light wavelength.

[3] This paper concerns the issue of location. But the homomorphism view accounts for other spatial properties, such as shapes and sizes. Squares are more similar to trapezoids than they are to circles. Likewise a square* sensation is more similar to a trapezoidal* sensation than

Sensations have apparent locations that normally correspond to the locations of distal stimuli. A red* sensation at the center of the visual field is normally caused by a red stimulus at the center of the distal visual field. The homomorphism view posits two distinct properties: Center-of-the-visual-field* and being at the center of the visual field. Stimuli in the center of the distal visual field normally cause sensations at-the-center-of-the-visual-field (CVF*, hereafter). A red* sensation to-the-left-of* a green* sensation is normally caused by a red stimulus to the left of a green stimulus, both of which are located in the distal visual field.[4]

The sum total of location* properties of visual sensations at a given time constitute the mental visual field at that time. So the CVF* is that location* equidistant* from all opposing points on the boundary* of the visual field, where the boundary* is defined by the limits of locations*. For instance, the left* boundary is set by the sensation to which no other sensation is to-the-left* of it.

Locations* within the mental visual field correspond to locations of entities in the distal visual field in virtue of resembling and differing from other locations* in ways homomorphic to the ways locations in the distal visual field resemble and differ from one another.

Two stimuli can resemble each other more than either resembles a third with respect to location in a distal visual field. Two objects to my left are more similar to each other than either is to an object to my right, with respect to at least one dimension of location. Both have the property of being to the left of me, while the third has the property of being to the right of me. The left objects will be more similar with respect to location to a fourth object directly in front of me than they will be to the object on the right. This is because being to the left of me is more similar to being directly in front of me than it is to being to the right of me (with respect to the left/right axis of location properties).

And sensations can resemble and differ with respect to mental location. Take a red* sensation off-to-the-left*, a yellow* sensation in the CVF*, and a blue* sensation off-to-the-right*. The red* sensation resembles the yellow* sensation more than it resembles the blue* sensation, with respect to location*. This is because to-the-left* is more similar to CVF* than it is to to-the-right*.

The structures of the quality families of the distal visual field locations and of the location* properties are homomorphic to one another. So CVF* and being in the center of the distal visual field are counterpart properties in virtue of their occupying the same place in their respective quality families, as fixed by the ways they resemble and differ from other properties of those families.

The result of this view is an explanation of how we see objects as being located where they are. We have visual sensations with location* properties. These sensations are not really located in any two-dimensional overlay visual field. Rather, the sensations are located* in the mental visual field. An afterimage appears where it appears because it has a certain location*. It appears to occlude the photographer's face because its being in that location* means that no sensations of his face can have that location* at that time.

Location* properties help explain how it is that having a CVF* sensation enables us to locate a distal stimulus directly in front of us. CVF* sensations carry information to the effect that there is something directly in front of one's eyes in virtue of CVF* being the counterpart property of being in the center of the distal visual field. It is in virtue of this counterpart relation that having a CVF* sensation helps us locate an object in the center of the visual field, as opposed to one off to the left of the visual field. And it is important to note that the homorphism view explains the counterpart relation in terms of similarity matrices that are readily accessible to us in ordinary visual experience and introspection.

When we introspect our sensations we pick them out, not by their perceptual role, but by their sensory qualities—that is, by their *-properties. When I introspect my sensation of a red patch to the left of another red patch, I pick out two sensations in virtue of their different locations*. That is, I pick them out in virtue of the ways they resemble and differ from one another and other sensations.

3. Clark's Rejection of Mental Space

Austen Clark (1996, 2000) rejects the existence of mental sensory fields. He claims that we need not mention locations of sensations to explain spatial experience. And he offers his feature-placing theory to this end.

Feature-placing aims to explain spatial experience in terms of the spatial properties of distal stimuli, the spatial properties of sensory receptors, and neural activation patterns. The only space needed is physical space.

According to Clark, "Sensing proceeds by picking out place-times and characterizing qualities that appear at those place-times." (2000, p. 74) A sensation identifies a location and qualifies it as being a certain way.[5] It does this in virtue of two variables. The

---

it is to a circular* sensation. The structure of the shape quality family and that of the shape* quality family are homomorphic to one another. Square* occupies the same position in its quality family as square occupies in its quality family.

[4] Stimulus location properties are determined relative to a perceiver. Which stimulus is to the left of another depends on the location from which one sees them.

[5] Stimulus location properties are determined relative to a perceiver. Which stimulus is to the left of another depends on the location from which one sees them.

sensation characterizes the place-time as being some way in virtue of its sensory qualities. A sensation qualifies a place-time as being red in virtue of the sensation's being red*. Clark's theory is in keeping with the homomorphism view with respect to so called secondary qualities.

But which place-time is qualified as being red is determined, not by some location* property, but by the firing of what Clark calls a sensory name—a stand-in for the mechanisms of spatial discrimination. These mechanisms identify place-times by what Clark calls place-coding, which he describes with respect to somesthetic experience.

A group of sensory receptors on the surface of the skin fire when stimulated, sending a neural impulse to the somatosensory cortex, where a certain neural activation pattern occurs. That neural activation pattern is the neural correlate of some bodily sensation—e.g., that of an itch (pp. 169-170). Where it is that the physical itch is felt to be depends on which groups of receptors fire (p. 173). These receptor groups are picked out by n-tuples of coordinates corresponding to the different dimensions in which the receptor groups vary in location. Similarly, the qualities of sensations can be coordinatized according to the dimensions in which those sensations vary (p. 176).

Accordingly, in a visual experience a surface is represented as being red in virtue of receptor groups on the retina firing in a certain way, leading to an activation in the visual cortex corresponding to red*. The red surface is represented as being off to the left in virtue of receptor groups on the left side of the retina firing. The red* state realized in the cortex is indexed to a particular place-coding n-tuple picking out that receptor group.

Having a sensation of red in the left of the visual field is a function of which receptor groups fire, and how they fire. The difference between a sensation of red in the left of the visual field and a sensation of red in the center of the visual field is just a difference in which retinal receptor groups fire. Cases of sensations without distal causes, and anomalies like afterimages are just misfirings of receptor pools. Feature-placing appears to have solved the problem of the spatial character of sensations without reference to mental space.

4. Why We Need Mental Space and Why Clark Does Too

But feature-placing cannot account for differences in the apparent locations of sensory qualities for two reasons. First, we cannot pick out our sensations without reference to some kind of spatial properties of those states. And second, we cannot identify the neurophysiological processes responsible for such variations without first individuating sensations by their mental spatial properties. Clark avoids positing mental space by resorting to spatial properties of stimuli and neurophysiological mechanisms. But his theory can only get off the ground if it accepts some sort of locations for sensations.

A visual sensation of a red patch to the left of a green patch is different from an experience of a red patch above a green patch. All of us who have visual experiences know this. We are conscious of these states as differing in some locational way. Without properties of sensations corresponding to spatial properties, we cannot discriminate between these two states. They would both be states of just a green patch and a red patch. So, unless the color* patches are located in physical space[6], and thus have spatial properties, they must either (a) be located in some sensory field, or (b) not exist. Clark must reject the existence of sensory states, or accept the existence of sensory fields and the sensory locations that comprise them.

But Clark does not reject sensations. He claims that sensations have sensory qualities such as red*, itchy* and high-C*. These are properties sensations must have if they fill the perceptual roles they fill. And they are properties in virtue of which we become conscious of those sensations when introspecting them. When I introspect the sensation I have when looking at a red firetruck, I am conscious of it as a red* sensation.

But I am conscious of such sensations as varying in apparent location as well. And two sensations can only help in discriminating between two differently located, but otherwise identical objects if those sensations differ in ways relating to the differences in object locations. The best explanation is that sensations have mental locations.

Further, we need to pick out our sensory experiences by their mental properties in order to identify their neurophysiological correlates. In order to identify the neurophysiological processes responsible for the appearance of a red patch in the center of my visual field, we need to pick out the appearance of a red patch in the center of my visual field. We do not do this by identifying properties of sensory receptors, nor of neural activation patterns. We pick out the appearance by its properties. Since such appearances can differ with respect to apparent location, there must be mental location properties.

Clark claims that variation in the spatial character of appearances is explained in terms of the spatial locations of distal stimuli and sensory receptors. Clark thus appeals to the properties of neurophysiological processes to explain spatial variations in experience.

But we determine that firings of receptor groups are responsible for certain locational features of sensory experience by discovering that those firings occur when

[6] Frank Jackson (1977) has argued that colors are mental entities that exist in physical space. An important distinction between his account of colors and Clark's account is that Jackson takes colors to be sense-data, whereas Clark takes mental colors to be properties of mental states.

and only when subjects have sensory experiences with those locational features. To determine which receptor groups are firing we monitor neurophysiological activity in the subjects. To determine the kind of sensory experience the subject is having we monitor the subject's overt and verbal behavior.[7] If the subject reports having a sensation of red in the center of the visual field, we infer that he has a sensation of red in the center of the visual field. These inferences rely on the presumed ability of the subject to pick out sensory experiences by their mental properties—in these cases, in part by their mental spatial properties. So Clark's explanation of the spatial character of experience relies on the existence of spatial qualities of sensations by which we pick out these sensations.

But the homomorphism avoids these problems. We pick out our sensations by their sensory qualities. These qualities include mental locations. And since we can pick out our sensations by these location* properties, we can come to identify the neurophysiological correlates of these states. Further, the homomorphism view explains the spatial character of visual experience without the implausible claim that such character depends on actual spatial locations of sensations and sensory qualities.

References

Boghossian, Paul & Velleman, David (1989) Colour as a Secondary Quality. In A. Byrne & D. Hilbert (Eds.) *Readings on Color, volume 1*. MIT.

Clark, Austen (1993) *Sensory Qualities*. Oxford University Press.

Clark, Austen (1996) Three Varieties of Visual Field. *Philosophical Psychology*, 9, no. 4, 477-495.

Clark, Austen (2000) *A Theory of Sentience*. Oxford University Press.

Dretske, Fred (1995) *Naturalizing the Mind.* MIT Press.

Hardin, C.L. (1993) *Color for Philosophers: Unweaving the Rainbow, expanded edition.* Hackett.

Harman, Gilbert (1990) The Intrinsic Quality of Experience. *Philosophical Perspectives*, 4, 31-52.

Harman, Gilbert (1996) Explaining Objective Color in Terms of Subjective Reactions. In A. Byrne & D. Hilbert (Eds.) *Readings on Color, volume 1*. MIT.

Jackson, Frank (1977) *Perception.* Cambridge.

Lewis, David (1972) Psychophysical and Theoretical Identifications. *Australasian Journal of Philosophy*, L, 3 (December), 249-258.

Peacocke, Christopher (1992) *A Study of Concepts*. MIT.

Rosenthal, David M. (1998) Sensory Quality and the Relocation Story. *Philosophical Topics*, 26, 1 and 2 (Spring and Fall), 321-350.

Rosenthal, David M. (1999) The Colors and Shapes of Visual Experience. In *Consciousness and Intentionality: Models and Modalities of Attribution*, Denis Fisette (Ed.). Dordrecht: Kluwer Academic Publishers.

Rosenthal, David M. (2000) Color, Mental Location, and the Visual Field. *Consciousness and Cognition* 9.

Sellars, Wilfrid (1956) Empiricism and the Philosophy of Mind. In W. Sellars, *Science, Perception and Reality.* Ridgeview, 1963.

Sellars, Wilfrid (1959) Being and Being Known. In W. Sellars, *Science, Perception and Reality.* Ridgeview, 1963.

Sellars, Wilfrid (1960) Phenomenalism. In W. Sellars, *Science, Perception and Reality.* Ridgeview, 1963.

Sellars, Wilfrid (1967) Sensibility and Understanding. In W. Sellars, *Science and Metaphysics*. Ridgeview, 1992.

Shoemaker, Sydney (1975) Functionalism and Qualia. *Philosophical Studies* XXVII, 5 (May), 292-315.

Tye, Michael (1995) *Ten Problems of Consciousness*. MIT Press.

Tye, Michael (1996) Perceptual Experience is a Many-Layered Thing. In E. Villanueva (Ed.) *Philosophical Issues*, 7, 1996, 117-126.

[7] I am sympathetic to David Lewis's (1972) account of psychophysical identifications. Lewis claims that identifying the neural correlates of mental states requires an understanding of the platitudes about mental states. This seems the right way to go about identifying the neural correlates of mental states inasmuch as mental states are the sensations, thoughts, desires, emotions, etc. that we report having. This should not preclude the importance of scientific psychology in making the identifications. Scientific psychology will have to draw distinctions that the folk do not always make themselves with respect to their mental states. These distinctions are drawn by running controlled experiments designed to isolate certain phenomena. But the psychologist can only design the experiments to draw these distinctions if he accepts that what he is trying to determine is somehow determined first by folk psychology.