

Visual Ephemera and Causal Theories of Perception

Note: Aside from section I, this paper is taken from “Some Principles of Ephemeral Vision,” forthcoming in Clare Mac Cumhaill and Tom Crowther (ed.) *Perceptual Ephemera* (Oxford University Press). Since it is an excerpt, it is not meant for publication. The intention is to summarize one theme in the longer piece. There I argue that Grice’s Causal Theory of Perception is incomplete and needs to be supplemented. Roy Sorensen and Kendall Walton have used the unsupplemented version to argue in support of positions that most find unintuitive. I show how these conclusions can be avoided.

Abstract: H.P. Grice’s Causal Theory of Perception was advanced as a place-holder, advanced in order to discuss the differing roles of semantics and pragmatics of ‘looks as if’ locutions. However, it became very influential in the theory of perception, where it has typically been treated as a completely articulated analysis of direct-object uses of ‘see.’ In this paper, I examine several counter-intuitive (and somewhat sensational) applications of the Causal Theory and show how they depend on such an understanding. I propose that if we fill our our understanding of visual perception in terms of the modalities and functional benefits of vision, these applications can be corrected. On this understanding, some sensory states will turn out not to be material object seeings because they are either not created in the normal way or fail to provide information in the normal way.

Visual Ephemera and Causal Theories of Perception

H. P. Grice's paper, "The Causal Theory of Perception," (1961) is one of the most important contributions to the philosophy of language of the twentieth century. Exploring the connection between verbs of perception such as 'see' and verbs of perceptual appearance such as 'looks like,' it pioneered a distinction between pragmatics (which he elsewhere calls 'assertion and implication') and semantics (= 'meaning').¹ Ironically, given the title of the paper, the treatment of the perceptual verbs themselves is somewhat tangential to Grice's main aims. They are taken up mainly because he wanted to show that certain prominent attacks on H. H. Price's (1932) causal theory of perception founder because they neglect the distinction between assertion and meaning as they apply to verbs of perceptual *appearance*. Grice didn't develop Price's theory in detail—this wasn't his goal—but his version proved, nevertheless, to be very influential among philosophers of perception.² Unfortunately, it is sometimes used as if it can stand without further elaboration; this has led, as I shall show, to misunderstandings.

In this paper, I examine how Grice's semantics must be adjusted and filled out to accommodate what Clare Mac Cumhaill and Thomas Crowther (forthcoming) call "perceptual ephemera," in particular *visual* ephemera—things we see, but which neither are nor fully look like material objects—shadows, mirror images, depicted objects, etc. Some suggest that causal theories apply in a straightforward way to these phenomena, yielding surprising results. I'll argue instead that they reveal gaps that need to be filled.³

¹ The terminology in parentheses is from Grice (1989), v-vi.

² The causal theory was in circulation long before Grice, but his argument was novel, and its many homologues became very familiar in the following decades. Up until the 1960s, many mind-world connections had been asserted on grounds of content-matching: for example, it was taken for granted that if it looked to one that there was an object in location *l*, and there actually was an object *O* (of the right kind) in *l*, then one saw *O*. Grice (1961, 142) contested this; this was the novelty of the perceptual side of his paper. He imagines looking into a mirror while standing in the middle of a hall of pillars. Not being aware of the mirror, it looks to him that there is a pillar at *l*, though in fact what he sees is a mirror image. But there actually is a pillar where the reflected pillar seems to be. The content-matching thesis implies that you see the pillar at *l*. But you don't: rather, you see the one that is reflected in the mirror. Grice says that this is because the pillar at *l* is "causally irrelevant" to its looking as if there is a pillar at *l*. This move to introduce causation to supplement content-matching is repeated in the causal theory of reasons for actions by Donald Davidson (1962) and in the causal theory of remembering by Charlie Martin and Max Deutscher (1966). In a somewhat more complicated form, it occurs again in the causal theory of names due to Saul Kripke (1972).

³ A fuller discussion of visual ephemera can be found in Matthen (forthcoming).

I. Some Methodological Preliminaries

Grice adumbrates the semantics of direct object perceptual verbs in the following passage:

for an object to be perceived by *X*, it is sufficient that it should be causally involved in the generation of some sense-impression by *X* in the kind of way in which, for example, when I look at my hand in a good light, it is causally responsible for its looking to me as if there is a hand before me, or in which . . . (and so on), *whatever that kind of way may be*; and to be enlightened on that question one must have recourse to the specialist" (*ibid*, 143-44; ellipsis in Grice's text).

Central examples of *hearing* and *touching* would, no doubt, take their place among the ones elided by the "or in which . . .", but for present purposes, I'll take this as an attempted definition of direct object *seeing*. You see a material object when it generates "some sense-impression" *in the kind of way that a hand is causally responsible for how it looks*. I'll call the italicized part of the quotation above the "kind-of-way" or KOW clause.

The above is an attempted elucidation of 'see' with a direct object. But Grice's main aim was to disentangle the meaning and the assertion conditions of verbs like 'look as if,' which are key to this elucidation. As the above makes evident, he thought that it sufficed to sketch why 'looks as if' is needed; he does not examine a broad range of perceptual phenomena. Here, for example, is a kind of question he does not touch upon explicitly: Can I *see* an immaterial mathematical construction such as the Dow Jones Industrial average? Can I, for instance, see the Dow rising?

How would Grice's analysis treat of this case? It seems permissible to say that the Dow *looks* to me as if it is on the rise. And arguably the Dow's fluctuations are causally responsible for its looking this way to me—at any rate, there is a counterfactual-supporting correlation between its behaviour and how it appears to me. So, the question turns on the KOW clause: is its causal responsibility relevantly like that of my hand? That's a lot of weight for a vaguely worded clause to bear.

Grice implies that the application of the KOW clause is properly left to "specialists." We get a hint of why he thinks this in his introductory remark that the Causal Theory does not say merely that "perception is the terminus of a causal sequence" that begins with its object, because this proposition is contingent, and thus non-philosophical (121). Fred

Dretske (1969, 50-54) takes this line of thought a step further. Philosophical analysis is prohibited from appealing to considerations about light and the retina, according to him, because one can imagine a person who knows what it is to see but knows nothing about these. If we allowed considerations about such matters to determine the semantics of 'see,' it would follow 'that prior to the discovery of these matters, no one knew what the verb 'to see' meant' (54). (As we'll see later, Grice is not totally in agreement with this.)

I'll return to the role of specialists in a moment. First, let me make two small observations about seeing immaterial entities. The first is that, putting aside questions concerning light and the retina, it is clear that I do not, and cannot, learn about the Dow by using my eyes, at least not directly.⁴ I can close my eyes, and it makes no difference. I can shift my visual perspective, and once again it makes no difference. My eyes are not at work in my finding out whatever it is that leads me to use this locution. That we don't use our eyes makes this case a violation of the KOW clause. I do not need to be a specialist to know this.

Secondly, consider, in view of this, an imaginary dialect of English in which people say unhesitatingly and without qualification that we see the Dow Jones average. It seems clear that we'd say that 'see' is not a purely perceptual verb as it is used in such a dialect. Otherwise it would violate our conception of *vision* as involving the use of the eyes. This shows that in focussing on 'see' as a target of the Causal Theory of Perception, Grice is working with a prior notion of perception. Dretske suggests that our assertions about seeing should be restricted to those that depend on a grasp of English and logic (54). This seems wrong. Our conception of vision is invariant across local linguistic variation. It depends, at least in part, on our conception of what a visual state is like, and this, in turn, grows out of our individual and collective experiences with seeing.

Now, here's a slightly different kind of case, one in which specialist information may help because non-specialist intuitions seem to conflict. Consider a speech-to-colour synaesthete, who regularly has an impression of red when she hears the sound /ba/. Does this person *see* the speech sound /ba/ in virtue of the red-impression? On the one hand, /ba/ engages the ears; the red-impression arises even if this subject's eyes are closed, but it

⁴ Of course, we may use our eyes to read about the Dow, but this is indirect: the Dow can change without the text that we read changing and vice versa.

depends in the usual way on the ears. On this reckoning, red is a way the phoneme *sounds*. On the other hand, *red* is a characteristically visual phenomenology, and this gives us a reason to say that the synaesthete sees /ba/. Given this dilemma, it might be helpful to find out whether visual brain processes are engaged here. Is the speech sound processed exclusively through the ears and cochleae and the speech processing part of the brain, or does the sound somehow excite the retina (perhaps top-down inside the brain) and thus engage visual processes? If it does not engage visual processes at all, then it may make sense to say that it is not visual. This invokes a specialist contingency in the sense prohibited by Dretske. Nevertheless, it seems relevant.

Grice says that we need “recourse to the specialist” to determine how to apply the KOW clause. Given how vague and indeterminate this clause is, the most plausible way to take him is as proposing that the concept of seeing contains a blank place for contingent facts that needs to be filled out by the specialist:

X sees $O =_{df}$ O looks a certain way to X by the standard visual process
(whatever that happens to be).

Thus defined, the concept of vision contains blanks that need to be filled out, possibly by a reference to light and the retina and other such “specialist” matters. On this understanding, it may indeed turn out that, as Dretske says, ‘prior to the discovery of these matters, no one knew what the verb ‘to see’ meant.’ But this need not be counter-intuitive. An ancient philosopher like Aristotle could accept the above definition, but be ignorant about what exactly the standard visual process actually is. However, given the large role of non-specialist knowledge, he might nevertheless have been quite good at saying what people see without fully understanding why.

To sum this section up: Grice’s philosophical elucidation of material object seeing is incomplete; it must be supplemented by facts that we know by our everyday experience of vision, and possibly some that only specialists can provide. The philosophical understanding of vision does not rely wholly on logico-linguistic analysis of the verbs, ‘to see’ and ‘to look as if.’

II. Dretske-Seeing vs. Grice-Seeing

Now, consider this case:

Camouflage Suppose there is a perfectly camouflaged animal in front of you—say a moth that perfectly blends in with the tree trunk on which it lies. No matter how closely you look, and no matter how you adjust your perspective, you simply cannot discern the presence of the moth.

Do you see the moth? On a perfectly normal understanding of the question, the answer is ‘no.’ Vision doesn’t reveal its presence. True, the case is different from failing to see something in the dark, because in *this* case light from the object does not reach your eyes, whereas light from the moth does reach your eyes. But it is very much the same as a failed test of colour vision: a colour-blind person shown an Ishihara plate sees a uniform field of dots. She just doesn’t see any number written there.⁵ Similarly, in the *Camouflage* case, you just don’t see the moth.⁶ Or at least, there is a sense of direct object seeing in which you do not see it.

On a strict construal of Grice’s definition, you see the moth. The moth is brown; the bark of the tree is the same shade of brown. The moth is “causally involved in the generation of some sense-impression” in you, namely that of a brown patch that overlaps the brown tree-trunk. Presumably, it is causally responsible for this sense-impression in just the way that a hand in good light creates a sense-impression in you.⁷

Fred Dretske (1969, 20) casts some light on this issue; he proposes that you (“non-epistemically”) see an object if and only if you visually differentiate it from its immediate environment. Dretske is not thinking exclusively of material objects, but I’ll adapt his analysis to them. The camouflaged moth is a material object that you cannot visually differentiate from its surroundings; thus, you don’t see it. But now consider the tree *without*

⁵ Some Ishihara plates are subtler. Red-green deficient subjects will see one number, say 3, while colour-normal subjects see another, say 5. Each subject sees something that the other does *not* see.

⁶ Grice seems partially to concede the force of this conclusion; he writes (147) that “in some contexts” one would say that one sees a battleship when what one has seen is a speck on the horizon that one does not recognize as a battleship.

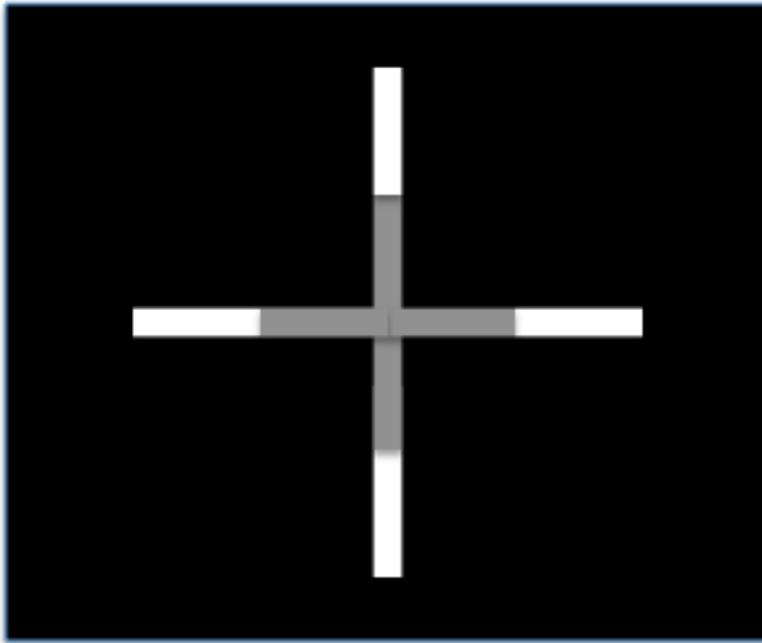
⁷ Grice says that the hand in front of you makes it look as if there is a hand in front of you. So it’s possible that he meant that the hand in front of you should generate an object-impression, as it doesn’t in the *Camouflage* but this is not how he is usually taken.

the moth. You have the same visual impression; however, this time you *do* see the part of the bark where the moth was previously sitting. The difference between the cases is that when the moth is not there, you see a part of the tree in virtue of seeing the whole. But when the moth was sitting there, it seemed as if you saw that part of the tree, but you didn't actually see either it or the moth. I'll amend Dretske's definition slightly to accommodate this wrinkle:

S D-sees (or Dretske-sees) *O* if and only if it looks to *S* as if *O* is the whole or part of a material object that *S* visually differentiates from its immediate environment.

One way of visually differentiating a material object from its surroundings is by means of what Gestalt psychologists called "figure-ground organization." Here, you seem to see a contour (some parts of which may seem to be occluded) that marks out an object. The contour is "assigned" to a continuous three-dimensional object; it seems to be projection of this object's edge. Normally, the contour is closed; when it is not, it seems as if you see only a part of an extended object with the closure of the contour out of view. Further, the parts of the scene that immediately surround the contour seem to be a background that is occluded by but continues behind the object enclosed by the contour.

Figure 1 is a classic example of figure-ground seeing:



At first glance, you seem to see a white and grey cross (the figure) against a black ground. The edges of the white and grey form seem to be the visual projection of the cross; they are not seen as belonging to the black area. The black area is seen as indefinitely extended, but continuing behind the occluding cross.

Now, if you fix your gaze on the intersection of the two arms of the cross, a new figure comes into view. Most people seem now to see a transparent grey disc above a uniformly white cross. This grey disc is marked out by a contour that, actually, is only partly present, namely where it intersects with the white of the cross. This is an *implied contour*; note that it is closed. The black background continues to be the indefinite ground here; the white cross and transparent grey disc present as two figures bounded by contours against this background.

Figure-ground seeing, then, is the visual discernment of a contour that is seems to be the projection of a material object's edge. We D-see something when we visually discern such

a contour. This is one way we D-see. Note that D-seeing does not imply the existence of any object. In the above figure, I seem to see a grey disc. There is no such thing there.⁸

D-seeing doesn't require an enclosing contour. Another case of D-seeing is what I call 'motion seeing.' Imagine a white paper marked with large blue polka dots. Now overlay on this a white paper with cut-outs that precisely match and are laid on top of the polka-dots. The overlaid polka-dot paper looks precisely like the original paper. Looking at it, you seem to see a single paper, just as in the *Camouflage* case, you seem to see the naked bark of a tree. Now, imagine the overlay paper jiggling back and forth. The polka-dots do not stay covered; there's a jiggle that cuts off their contours and reveals some of the surrounding white. The result is that you now see two objects; the overlay and polka-dot papers are visually differentiated from each other

Let's return now to the *Camouflage* case. I will say that we *Grice-see* (or G-see) a moth in this case, because Grice's definition implies this, and because there are contexts in which ordinary language endorses the idea that you see a moth. G-seeing is different from D-seeing. I amplify the notion of seeing a material object by requiring that you must both G-see it and D-see it. D-seeing is seeing that enables you to realize the benefits of vision. It ensures that you are aware of it, you can attend to it, you can select it for action and response.

III. Mirror Images

Mirrors present a different test case. The images you see in a mirror are visually differentiated from their surroundings, but because they are not real objects, they are not causally responsible for the appearances they create. In short, you D-see a mirror image but you don't G-see it. What about reflected objects? Do you see yourself in a mirror, or do you only D-see an image of yourself? This depends on how vision operates in this case. There is certainly a causal connection between your face and how it looks in a mirror. So, if the KOW clause is satisfied, then you G-see your face. But is the resulting state sufficiently like what vision provides? Does the look of your face in a mirror directly inform you of the condition and location of your face, as is the case with visual states, or do you have to learn how to

⁸ Dretske insists on the existence condition, but allows for things like after-images (and perhaps the grey disc) by making them private objects that exist.

interpret the visual display available in a mirror? In the second case, it would be more appropriate to say that you see the image of your face and infer something about its condition and location.

This is a question regarding which specialist knowledge seems relevant. There is some evidence (by no means conclusive) that infants have trouble differentiating between shapes that are mirror-reversed—they tend to confuse p and q, b and d, etc., as well as left and right mirror-image profiles of the same face (Bornstein, Gross, and Wolf 1978, Dehaene et. al 2010). This suggests that they are deficient with regard to performing the reversals necessary for gaining spatial information about objects from mirror-images. This would likely lead them to treat mirror-reflections “at face value,” rather than directly seeing the objects they reflect. In other words, there is some reason to think that we do not D-see objects by D-seeing their images. This throws into doubt whether we G-see reflected objects; the question is not whether there is a causal connection, but whether the product of the connection is of the sort that obtains in ordinary, direct vision.

IV. Sorensen and the Eclipse

Now let’s move to a more controversial case, Roy Sorensen’s (2008) treatment of solar eclipses. When the Moon totally eclipses the Sun, we see the Moon as a dark disc against the glow of the Sun’s corona. Which surface of the Moon do we see? Sorensen says, provocatively, that we see its back surface—for it is this surface that is causally responsible for our sense-impression of the eclipse. The *back* surface of the Moon is the one that intercepts the light from the Sun, thus giving rise to the sense-impression of a dark disc.

Now, to talk of seeing surfaces is something of a departure from Grice, who says that we see a *hand*, not the facing (or, for that matter, the rearward) part of it. Grice’s focus on three-dimensional material objects is a natural way to think about visual objects. What compels us to say that we see a surface in the case of backlit objects—any surface at all?

Look at it this in light of the KOW clause. With regard to the eclipse, we are dealing with a backlit object. Sorensen assumes that Grice’s analysis implies that we see the eclipsed Moon. Let’s concede this; let us allow that the case of the eclipse is sufficiently like that of objects in good reflected light. Sorensen claims, further, that the *rear* surface of the eclipsed

Moon affects us in the way that three-dimensional objects do in virtue of reflected light. This is much less obvious. Though the rear surface of a backlit object does clearly cause us to see the object's silhouette, it is not clear that the causal connection between this surface and vision is of the right sort to justify saying that we see it.

In the following section, I will deal in more detail with how to elucidate the KOW clause. For now, let's stick with the idea that we don't see something if our visual state brings none of the benefits of seeing. Suppose that we see X if it is causally responsible for not just any sense-impression, but one that enables us to attend to X, select it for action, etc.—in short, to *track* it. Then, it would seem, we see the Moon: it *is* causally responsible for such tracking sense-impressions—it is responsible for the impressions that enable us to track its progress across the Sun. However, it seems that I cannot track either the front or the back surface of the Moon during an eclipse—either could radically be modified, or even completely destroyed (and thus replaced by a new surface), without my being able to register the change. However, the two surfaces are untrackable for rather different reasons. We cannot track the back surface because light cannot travel from it to our eyes; we cannot track the front surface because light does not fall on it. The front surface is not occluded: if light were to fall on it from some other source, we would see it. The same is not true of the rear surface—we cannot see it even though it is brightly illuminated.⁹

In its original form, the Grice criterion gives us no guidance as to whether we see the eclipsed Moon. Revising that criterion so as to admit the cause of tracking sense-impressions, we find that neither surface is seen, though the front one could be seen if some light were to fall on it. We see backlit objects, but we don't see their surfaces.

V. Walton and Photographs

Kendall Walton (1984) claims that we see *real objects* in photographs, but not in paintings.¹⁰ When I look at my dog, my dog is what I see. When I look at the painting of Mary Magdelene,

⁹ It's worth mentioning that the facing surface of the Moon is dark, just as it appears to be. And if it were to be illuminated by some source other than the Sun, then we would see it. So there is some room to argue that we G-see it.

¹⁰ Walton acknowledges that a special kind of seeing is involved here, not altogether different from Wollheim's seeing in a picture. There is a difference between seeing something directly and seeing it through a photograph. He nevertheless claims that we really see things through photographs.

I see a depicted woman. However, he says, when I look at a photograph of my long-deceased grandparents, I see my grandparents. Just as my dog is what I see when I look at her, my grandparents are what I see when I look at the photograph of them. It is not depicted objects I see, according to Walton. I see *them*; I see the clothes they were wearing that day; I see the room they were photographed in.

Walton's point is that photographs are the product of an entirely non-mental causal chain from object to photographic paper, whereas in the case of even the most realistic paintings, the causal chain goes through the mind of the artist.

Part of what it is to see something is to have visual experiences which are caused by it in a purely mechanical manner. Objects cause their photographs and visual experiences of viewers mechanically; so we see the objects through the photographs. By contrast, objects cause paintings not mechanically but in a more "human" way, a way involving the artist; so we don't see through paintings. (*ibid.* 261)

Walton fully recognizes the following obvious facts: photographs are no more realistic than paintings can be; they no more create an illusion of seeing the depicted object than paintings; they are no less interpretations of reality. Photographs can be manipulated; for this reason, the viewer may not know what she is seeing. Nonetheless, there are elements of photographs that trace "mechanically" back to objects without the intervention of a mind. Walton holds that we see the objects from which these elements of photographs originate.

Perceptual contact with the world is to be distinguished from two different sorts of nonperceptual access to it: access mediated by intervening descriptions as well as access via another person. . . . when someone describes a scene to us, we are doubly removed from it; contact is broken both by the intervention of the person, the teller, and by the verbal form of the telling. Perceptual contact can itself be mediated—by mirrors or television circuits or photographs. But *this* mediation is a means of *maintaining* contact. Viewers of photographs are in perceptual contact with the world. (*ibid.* 273)

For present purposes, I do not wish to deny that there may be parts of photographs that come about as a result of a causal chain that does not include any mental events. Walton usually outrages photography critics, who point out that photographers often insert their own mental attitudes into their photographs, but he has responses to these criticisms. I'll leave these issues to the side. My question here is whether (by contrast with paintings),

photographs offer us a view of objects and facts such as our deceased ancestors and the style of clothes they wore on a particular day. Do we G-see them in photographs? Oddly enough, Walton does not cite Grice's paper on the causal theory. Instead, he cites Grice's (1957) paper on meaning. This is because his concern is with "mechanical" or non-mental causation, and he argues that at a crucial juncture, photographs have natural meaning, while paintings have non-natural meaning. The point I want to make here skirts this issue. It is that (for reasons that derive directly from Walton) mechanical causation is necessary for Grice-seeing, but not sufficient.

I want now to come to an issue that earlier I had only hinted at. Grice has a view about how the KOW clause should be expanded. He assumes that the causal story will be *mechanistic* (or "mechanical" as Walton says). It will involve "a reference to the transmission of light-waves to the retina," he says. "We may be in a position to say that the same kind of mechanism is involved in a plurality of cases without being in a position to say what that mechanism is" (p.144).

Grice goes astray in fixating on process. It is true that light is always involved in vision. It is *not* true that retinas and their homologues are always involved. There is machine vision, invertebrate vision (which involves compound eyes, no retina), and who knows what other sorts of possible mechanisms for processing the information contained in light. Grice says that to adjudicate the KOW clause, "we might well wish to hear from a specialist a comparative account of the human eye and the relevant sense-organs of the creature in question." My contention, however, is that this comparative account will be *functional*, not mechanistic. To be clear about roles, philosophers can contribute to recognizing that the correct account is functional; biologists, physiologists, and psychologists are needed to fill in the details of that functionality.

Here is my suggestion. Vision purports to offer the perceiver tracking information about objects, information about circumstances that are concurrent with the visual state. A perceiver extracts information from visual perception; she uses this information to form beliefs about objects and act on them. She is also able to recognize when the information she possesses through this source is inadequate or misleading, and in this circumstance, she knows how to go about getting more visual information to remedy the shortcoming.

Thus:

S sees *X* if *X* causes a sense-impression (not necessarily conscious) in *S* that *S* is able, concurrently with the sense-impression, to use to gain information about *X*, form beliefs about *X*, and act on *X* . . .

To this, we may add, in deference to “the specialist”:

. . . in the kind of way in which, for example, when I look at my hand in a good light, my hand is causally responsible for my having such a tracking sense impression.

The functional elaboration of Grice’s proposal closes the gap between Grice-seeing and Dretske-seeing.

S sees *X* if *S* can track *X* by the use of her eyes, and *X* is the cause of the impressions by which *S* tracks *X*.

Coming back to Walton, how would we now assess the claim that we see our dead ancestors? Here, the crucial fact is that, as Walton is fully aware, photographs are pictures, and the objects we see in pictures neither look real nor look as if they are located in the same space as ourselves. A photograph of your deceased ancestor does not give you the ability to gain information about her *as she is now*. Also of relevance: you have no impression of *when* the information conveyed by the photograph was concurrent. The photograph does not enable you to attend to her. It does not give you the ability to scrutinize her in the way that you need to do in order to find out specific information that you desire. It does not give you the means to move to investigate her visual attributes beyond what is given in this view.¹¹ What is more, looking at a photograph does not give you even the impression that you have these abilities relative to the ancestor. It is clear from the outset that this is a picture. In all of these ways, seeing a photographic depiction of your ancestor is different from seeing her.

¹¹ Movies give you information about what goes on in an extended period of time, but do not give you the ability to change your point of view or to inquire.

Let me summarize. Grice's Causal Theory was influential among philosophers of perception, some of whom have used it to say, contrary to intuition, that we see ourselves in mirrors, the rear surface of the Moon during an eclipse, and objects that existed in the past in photographs. I have argued that these conclusions follow only when you take the theory as not only self-contained and complete, but also as putting virtually no restrictions on how we understand the causal connection involved. I have suggested two correctives to this tendency. First, we must understand seeing as a functional state that enables "tracking" by the use of the eyes. Second, we must restrict things seen to those about which vision by itself gives us information.

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