

Seeing “in Pictures”: Historical Perspectives

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Among pictorial forms of representation, pictures in perspective have had a special status. The rules of perspective rendering have been thought to provide the accurate or correct way to represent space pictorially. Therefore, perspective pictures have been held to be uniquely suited to provide realistic representations of the spatial world laid out before us. Indeed, perspective renderings have been supposed to be so successful as spatial representations that psychologists have used such pictures in experiments about space perception, instead of actually taking their subjects out of doors. This practice has been considered acceptable because it has been assumed that looking at pictures in perspective replicates the experience of looking at objects in space. The task of seeing such pictures is thought to be identical to the task of seeing a spatial array.

These practices and assumptions have been upheld by a model of vision dating from the early modern period, a model that assimilates the eye to a camera, seeing by means of a picture in perspective rendering on the back of the eye, on the retina. This model of the "eye-as-camera" has been challenged by vision theorists, and it is no longer seen as adequate to explain the complexities of vision. But if seeing is not "picture-taking" by the eye, then other elements in this package, like the assimilation of looking at perspective pictures to looking at objects in space need re-examination. As my contribution to this re-examination, I propose to return to the early modern period, and the introduction of the eye-as-camera model. It turns out that this model did not spring to life full-blown, but in fact was the result of considerable theoretical negotiation. Attention to the issues that were important to theorists of this period show both the presence of the picture-taking eye and elements that contribute to its destruction.

It is undeniable that accounts of vision in the early modern period are dominated by a picture, a picture, in Descartes's phrase, of the mind that sees. Imagine to yourself a picture of a human head, facing perhaps a candle. Inside that head, behind the eyes and where the brain might be supposed to be is a replica of that candle. The candle outside the head is the physical candle, representing the physical world to be seen, and the candle inside the head is the psychological or mental candle, representing the mind seeing. The picture itself portrays a hypothesis described by Reid, at the end of the historical period I will be discussing, but it is a hypothesis that Reid presents as the one dominating the thought of the early modern period: "Philosophers must have some system, some hypothesis, that shews the manner in which our senses make us acquainted with external things. All the fertility of human invention seems to have produced only one hypothesis for this purpose, which, therefore, hath been universally received; and that is, that the mind, like a mirror, receives the images of things from without, by means of the senses; so that their use must be to convey these images into the mind." (Thomas Reid, *An Inquiry into the Human Mind*, 1764) The salient feature of the picture is that the psychological candle is like the physical candle, and this likeness is displayed pictorially -- they look like or mirror one another.

Within this theory, the likeness between the psychological candle and the physical candle is mediated by several devices, which are also most often conceived of pictorially. Reid, again, claims that there is a widespread assumption that "images of external objects are conveyed by the organs of sense to the brain" and this view is often linked with Kepler's account of the nature of the retinal image. So we can add to the pictorially represented hypothesis a physiological candle, in the form of an inverted picture on the retina. Finally, Reid adds another element to this picture. He claims that the visual appearance the mind sees when seeing a candle is tantamount to the picture of the candle a painter would paint. So lastly we can add a visual appearance candle to the picture. One thing that is striking about the retinal image picture and the visual appearance picture is that they share certain spatial properties. Both the picture painted by the artist and the picture painted on the retina are flat or almost flat, and so the visual appearance is also sometimes spoken of as if it were flat or almost flat. The picture I have been describing represents what anyone looking at the picture would exemplify, the mind that sees. One consequence of the representation is that, when the mind sees the candle, although there is nothing obviously flat about this process, it is thought to do so through the mediation of some things that are flat. The process of seeing we all exemplify has become captured by the means by which the process is represented, and visual theorists are thereby convinced that vision occurs through pictures, that we see "in-pictures." This is the theoretical

underpinning of the view that seeing pictures bears strong analogical connections with seeing, seeing "in-pictures."

Support for this way of understanding what is going on in vision theory in the early modern period is often located in the claim that the development of a theory of vision depended for its inspiration upon two devices that are actually ways of making pictures, the camera obscura and Alberti's window. Svetlana Alpers, in her book, *The Art of Describing*, has emphasized that it is important, in studying picture making, to distinguish these two devices. She wants to link the camera obscura with Northern or Dutch picture making and Alberti's window with Southern or Italian pictures. It is useful as well to recognize that, if these two picture making devices helped serve as metaphors for the process of seeing, they stand metaphorically for different aspects of the visual process. The camera obscura is a stand-in for the eye, and more particularly for the retinal image. It helps explain the process by means of which a picture can appear on the back of the eye. Alberti's window is a stand-in for a different part of the visual process, for the visual appearance, which as Reid points out, is thought to be captured by pictures in perspective, as drawn through the Alberti window. These various devices are sometimes jumbled together, but it is important to distinguish them in discussing the ways they actually enter into early modern theorizing. What I am going to suggest, through some brief forays into what is very rich terrain, is that the actual history of vision theorizing in the period is more complicated than it is sometimes presented as being and contains both the roots for the picture theory of vision as well as tools for its destruction.

1. The Retinal Image

The quotation from Reid indicates that it was his belief that the view that the picture on the retina plays a determinative role in what we see prevailed in this period. The mind is thought either to see the picture on the retina itself or to be caused by the retinal picture to see yet another picture resembling the retinal picture. Kepler himself seems to be inclined to suppose the mind looks at the retinal picture. But William Hamilton, Reid's editor, is skeptical that this view is actually so prevalent, and Hamilton seems to be upheld in his skepticism. It seems undeniable that René Descartes is important in incorporating Kepler's work on the retina into an influential theory of vision, and Descartes's work is certainly replete with images that seem to echo my original picture of the mind that sees. In his *Optics* (1637), for example, Descartes records the "wonder and pleasure" to be found in observing a retinal image, "a picture representing in natural perspective all the objects outside" at the back of a properly prepared ox eye. But Descartes is crystal clear that, except under these special circumstances, we don't see this picture on the retina (a view which he regarded as absurd) nor does the retinal image function pictorially. There is no stage in the process of seeing in which it is relevant that the retinal image resembles what is seen. "Instead", Descartes holds "it is the movements composing this picture which, acting directly upon our soul in so far as it is united to our body, are ordained by nature to make it have such sensations." When Descartes provides an image in the *Treatise on Man* of the mind that sees, it represents a process which is conceptualized in terms of Descartes's impulse physics. We are to understand it as recording the movement of corpuscles, first as they reflect off the body seen and then as they move through the body of the see-er. It is Descartes's proud boast that, understood in this way, we free our understanding of vision completely from resembling images.

Later on in the period, George Berkeley agreed with and amplified Descartes's position on the retinal image. According to Berkeley what occurs on the retina is not a picture at all, understood as something manifesting various colors, accessible to vision. What takes place on the retina during the process of seeing is, as Descartes held, the impact of light rays, and this is something that is entirely tangible. We take the process on the retina to be a picture because we confuse what happens during seeing with what we see when we follow Descartes's instructions and look at the back of some other eye than our own. When we do this, we, thanks to the blows of the light rays on our retina, do indeed see a picture, and that picture we see does indeed match the visual scene that we also see, but what is being described here is of course two visual experiences belonging to the same perceiver, and not a copy in the eye or in the mind of an extra mental "original". The tangible impact of the light rays on the retina, Berkeley held, are not pictures and cannot be held to resemble anything pictorial. Retinal image physiology in the early modern period, then, formed part of an account of vision that undercut rather than privileged the view that we see by means of resembling pictures in the head.

2. The Visual Appearance

Despite the widespread dismissal of an important role for a pictorial retinal image (and I should add that Reid himself mentions the idea in order to discredit it), the pictorial retinal image nevertheless seems to resurface as a part of an account of how the visual appearance is constructed. The idea that the visual appearance can be compared to a flat picture in perspective is often linked to the claim that the retina records a flat or slightly concave picture. So, for example, the claim that distance is not visually perceivable is often said to be supported by a reference to the fact that the retina is flat (or slightly concave). Actually, however, the relationship between these two claims in the early modern period is somewhat murky. That the retinal image is considered to be

evidence for the nature of the visual appearance is more often assumed by detractors than cited by supporters of claims about what the visual appearance is like. Nevertheless, as I will describe in more detail in a minute, certain accounts of the nature of the visual appearance do seem to require assumptions about a pictorial retinal image. But, in point of fact, of course, characterizing the visual appearance as a picture in perspective is a claim that is entirely independent of any view about the retinal image. This becomes obvious when we consider that the work in which Alberti first introduced his image of the window (*Della Pittura*, 1435) antedates Kepler's study of the retinal image (*Ad Vitellionem Paralipomena*, 1604) by almost two centuries. That is, a picture drawn in perspective can be identified as a realistic portrayal of how a perceiver, from a particular vantage point, perceives a visual scene, accurately mirroring how things look to the perceiver, without identifying the picture with the retinal image. Thus the considerations that might have led a vision theorist in the early modern period to identify the visual appearance with pictures in perspective might or might not have included reference to a retinal image.

The situation is actually rather more complicated, since it is not clear how widespread is the identification of a visual appearance with pictures in perspective. Descartes, as is often the case, is somewhat cagey on this point. A passage from the *Optics* in which he points out that engravers represent circles as ovals is sometimes taken as evidence that Descartes conceives the visual appearance to contain spatial information geometrically related to the physical spatial array. But the rest of the passage in which this remark is located is a good deal more equivocal. In fact, Descartes's main purpose seems to be to warn against a too facile use of pictures by philosophers in the development of a theory of perception. "Their sole reason", he writes "for positing such images was that they saw how easily a picture can stimulate our mind to conceive the objects depicted in it, and so it seemed to them, that, in the same way, the mind must be stimulated by little pictures formed in our head, to conceive the objects that affect our senses." Descartes has two points to make. The first is that just because pictorial representation seems relatively easy to understand is no reason to assume that whatever internal representations are involved in perceiving are necessarily pictorial -- many other forms of representation are equally successful. The second is that understanding pictorial representation as a matter of resemblance is also not entirely straightforward, for the lines and blots in an engraving bear a slim resemblance at best to the scene they represent. This is the passage in which the point about circles and ovals occurs. So, it is perfectly obvious that Descartes felt no inclination to describe or account for perception in terms of internal pictures of any sort, and it is far from clear that he supposed that vision should be understood in terms of a pictorial visual appearance.

Other theorists in this period do seem, however, to be far more in the grip of the "picture-picture" Descartes warned against. Malebranche, for example, develops an account of visual perception that not only assumes that the visual appearance is, to some extent, pictorial in nature, but also depends heavily on assumptions about the retinal image. Malebranche frequently compares the retinal image to a picture drawn in perspective. Then, when he comes to construct an account of the nature of visual perception, he conceptualizes it as a transformation of the information contained in the retinal image. So he describes the visual appearance as what we would give ourselves if we had knowledge of what was occurring in our eyes and in our brain and if we had a perfect knowledge of geometry and optics. What we end up seeing can be thought of as a geometrical transformation performed by the visual system on the retinal image, recapitulating the causal history of the retinal image. What Malebranche has in mind can be understood most readily from his account in his *Elucidation on Optics* from the *Search after Truth* where he describes seeing a white horse running to the right at full gallop. Among the many calculations that take place within us are these: "I know...that all rays of light travel in a straight line and that those reflected from above the unknown object, i. e. from the horse, upon entering my eyes converge on the retina, and the principal ray...disturbs it the most. I must therefore judge that this ray fall on it perpendicularly and that therefore this horse is somewhere on this perpendicular line; but I do not yet know its distance. Second. I know that it is standing with its head turned to the right, although its image is reversed on my retina. For since I know that my retina is not flat, but concave, geometry teaches me that perpendicular lines on a concave surface necessarily cross and that they can be parallel to each other only when they fall on a plane surface, and that therefore I must judge that its situation is opposite to that of its image. Third. I know that it is about one hundred steps away, because I simultaneously have on my retina its image and that of the ground which it is on, by which I know roughly its distance; ...Fourth. I know it is a large horse, for since I know its distance, the size of its image, and the diameter of my eyes, I construct this proportion: as the diameter of my eyes stands to its image, so the distance of the horse stands to its size; and comparing its size with that of other horses I have seen, I judge that it is one of the large horses." What is clear from this passage is that, for Malebranche, what is to be explained about seeing is the visual appearance of a spatially organized object, a horse of a certain size and spatial orientation (large and running to the right). That the visual appearance has these various spatial properties is for Malebranche to be understood in terms of spatial information recorded on the retina. Thus Malebranche has indeed drawn an account of visual perception that crucially involves two elements that are pictorial in nature. He assigns calculations to the visual system that would be required to construct a visual picture, the one he thinks we end up seeing, from the picture drawn by the stimulation of the retina, as the retina is stimulated by

light rays from an object that is of course assumed to have a spatial orientation similar to the visual appearance we end up seeing. There are also ways in which these two elements are less than fully pictorial, however. While Malebranche speaks as if the information recorded on the retina is available in the form in which it would be if we were looking at the retina, he is also perfectly clear that nothing like this occurs. We never see or apprehend the information recorded on the retina, like the changing sizes of the retinal image, rather, thanks to the goodness of God, our visual system presents us with a uniquely sized object through adjustments performed by the visual system based on the size of the retinal image and the distance from the object seen. Secondly, what I have been calling the visual picture or the visual appearance in Malebranche's account has some disanalogies as well as analogies with painters' pictures. The strongest analogy is that Malebranche's visual appearance is representational; what we see represents an object like a horse which can be distinguished from the ground it is running on, and it is also spatially organized. What we see has a top, a bottom, a right and a left. But the visual appearance that Malebranche is trying to explain, unlike a painter's picture, is, first of all, moving, secondly, it has depth as well as length and breadth, and thirdly, Malebranche seems to think, unlike the retinal image, the shapes and the sizes (and presumably the colors) we see don't change, but instead we see an object of a uniform color and a stable size and shape.

Many of the disanalogies present in Malebranche's account disappear in Thomas Reid's theory of the visual appearance. I have mentioned before Reid's explicit comparison of the visual appearance to the production of the painter. If we look at Reid's elaboration of this point, further on in the same passages, the differences between Reid's approach and Malebranche's become obvious. When Reid discusses shape constancy, for example, he claims that, while we take the shape of the object seen to be unvarying, the visible figure itself that we see changes according to the laws of perspective. What happens according to Reid is that the perceiver "hath learned to make allowances for the variety of visible figure arising from the difference of position, and to draw the proper conclusions from it. But he draws these conclusions so readily and habitually, as to lose sight of the premises: and therefore where he hath made the same conclusion, he conceives the visible appearance must have been the same." That is, unlike Malebranche, for whom the laws of perspective function, as it were, sub-personally, so that what the visual system presents to the perceiver is a "corrected" version of the retinal image, according to Reid, the laws of perspective govern directly what the visual system delivers when a person sees. So, according to Malebranche, we see circles, but according to Reid we see ovals. Reid adds that, at the personal level, we habitually draw conclusions from what we see, so that we don't actually notice the "pictorial" nature of the visual appearance and so we don't notice that when we take ourselves to be seeing circles, the visual appearance registered is of ovals. On Reid's account, the retinal image has absolutely no role to play, other than the obvious one that there must be some physiological changes for anyone to see. The cues that enable us to derive stable information from what we see are for Reid all pictorial cues, and that requires that there be a stage in visual perception with the spatial properties of a picture in perspective. What we see is representational, has a top, bottom, right and left, and also has length and breadth, but no depth. Thus, for Reid, the visual appearance is what is revealed in Alberti's window.

One thing that had occurred between the time Malebranche wrote his *Elucidation on Optics* and Reid wrote *An Inquiry into the Human Mind* was the publication of Berkeley's *New Theory of Vision* (1709). Berkeley's *New Theory* contained influential arguments against a geometric or computational theory of vision, such as that put forward by Malebranche, arguments which were important for the subsequent development of later accounts, like Reid's. In brief, Berkeley argued that a theory like Malebranche's requires assigning cues to the visual system that an impulse physics does not provide, as, for example, treating the blows of the light rays to the retina as if they contained geometric information about lines and angles. But Berkeley put forward arguments as well against accounts such as Reid's, which abandon all of the activity of the visual system contained in Malebranche's account and instead presuppose that the visual system simply registers a visual appearance like a picture in perspective. For Berkeley, even this much activity is more than we are entitled to assign to the visual system.

Berkeley's theory emerges in the context of a discussion of a problem: why the visual appearance we register is not upside down and backwards, reflecting the picture on the retina. Berkeley's central claim is that this problem is mal-posed. The visual appearance is only upside down and backwards when it is compared to another visual appearance, that is acquired when one looks at a retina looking at a visual scene. But a visual appearance is neither upside down nor right side up when compared to the larger world of objects of experience. Using a recurring image, Berkeley claims that a blind man would call a man right side up so long as the head he could feel was away from gravitational pull and the feet he could feel was in the direction of gravitational pull. But, if this blind man were made to see, he would have no information that would incline him to call his newfound visual appearance either upside down or right side up, until he had learned to correlate the visual appearance of the head with his previous information about what a head feels like and to correlate the visual appearance of the foot with what the foot feels like. But it is the fact of this correlation that teaches us to call the head we see right side up with respect to the feet. This is because we don't actually see things like heads or feet until we have

learned to correlate the lights and colors which are the only deliverance of the visual system with the feelings of rough and smooth, etc. which form the rest of our ideas of what it is to be a head or a foot.

It is in answering what seems to be an obvious objection to this story of what the blind man would see upon being first made to see that the radical nature of Berkeley's proposal emerges. The objection is that surely, upon first being made to see, the blind man could identify the portion of the visual scene containing the head and distinguish it from that containing the feet because he could see that there is only one blob where the head is and two blobs where the feet are. Berkeley's answer is that such a blind man would be in no position to count heads or feet because there is nothing in the array of colors suddenly before him that could match with the set of tangible properties he had previously used to individuate heads and feet. "A picture" Berkeley points out, "painted with a great variety of colours affects the touch in one uniform manner; it is therefore evident that I do not by any necessary consecution, independent of experience, judge of the number of things tangible from the number of things visible." The hypothesis that we see a visual appearance that can be compared to a picture in perspective requires that we take the visual appearance to have a stable spatial ordering within which we can isolate patches which can have representational content. But this is not what the visual system provides. It provides what Berkeley constantly points out is a shifting variety of light and color, which cannot be located at any distance from the perceiver and which cannot therefore be taken to lie within a single picture plane.

Many of the ways in which Reid, for example, sets up problems of size and shape constancy, for Berkeley are the result of attributing more information to the visual system than it has available to provide. Not only is there no stable visual size within the multiplicity of colors we see, but to talk of seeing ovals and diamonds instead of circles and squares assumes that the visual appearance delivered by the visual system is a flat picture plane. But this, Berkeley holds, is an unwarranted assumption: "I must confess", he writes, "men are tempted to think that flat or plane figures are immediate objects of sight, though they acknowledge solids are not. And this opinion is grounded on what is observed in painting, wherein (it seems) the ideas immediately imprinted on the mind are only of planes variously coloured, which by a sudden act of the judgment are changed into solids. But with a little attention we shall find the planes here mentioned as the immediate objects of sight are not visible but tangible planes. For when we say that pictures are planes, we mean thereby that they appear to the touch smooth and uniform. But this smoothness and uniformity, or, in other words, this planeness of the picture, is not perceived immediately by vision: for it appeareth to the eye various and multiform." For Berkeley, seeing a patch of the visual appearance as an oval, rather than a circle, is already a construction, it requires the assumption that the array of color occurs as if on a tangibly flat picture plane. And, looking at things Berkeley's way, there is no particular reason to make this assumption, for there is no obvious reason to find it a helpful step in the process of learning to see.

3. Conclusions

If we return to the original picture of the mind that sees, I think it should be clear that it requires a certain amount of annotation before it can be considered an adequate account of theories of vision in the early modern period. The first claim that I made is that the status of the retinal image in theories of this period stress its pictorial properties far less than has sometimes been supposed. The retinal image represents physiological changes of the visual system in seeing, but for most of the period no one supposes that it is a picture at which the mind gazes. The second claim is that the nature of the visual appearance is actually quite complex. Thomas Reid, at the end of the period, does make the claim that the visual appearance is a lot like a picture in perspective and therefore raises as a problem for the viewer, the task of identifying circles and squares from the visual experience of ovals and diamonds. But Malebranche, earlier in the period, in fact assigns this task, not to the viewer, but to the visual system, which delivers, not a picture in perspective, but something rather more like a moving diorama. Malebranche's visual system presents us with three-dimensional representational objects of a fixed shape and size. Berkeley's theory occurs at the opposite end of this spectrum. He holds that the visual system presents no more than varying and fleeting light and colors and that it is the job of the perceiver to come to construct representational, spatially organized objects, with the aid of information from other sensory systems. To hold that the mind sees a picture is only one of a number of possible views to be found within this period.

There is another issue that canvassing this history raises. Descartes had criticized his philosophical predecessors for relying too readily on pictures as a model for vision and for assuming that, because we think we know how pictures represent, we have in our hands the means for understanding how we see, for understanding how the visual appearance represents the world. The same kind of charge can, I think, be thought of (in an anachronistic move) as being raised by Berkeley against Reid. Reid assumes that the task of reading pictures in perspective is well-understood, so well-understood that we can use it as a model for understanding or for framing the issues of how the mind comes to see. Berkeley has claimed that perspective pictures are not something simply given by the visual system, but that we have to learn to see them by learning to place the colors seen on a single (tangible) picture plane. Before a perspective picture can turn into a full-fledged representation of a spatially organized set

of objects, there is psychological work, according to Berkeley, to be done. There are many interesting problems concerned with perceiving pictures as pictures, but Berkeley's approach suggests that before we attack these problems we have to learn to see pictures at all, because we don't in fact see "in pictures".

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