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In The Dioptrics, Descartes notes in discussing the mechanics of vision that “very perfect images” are produced in back of the eye “representing in natural perspective, all the objects outside.”¹ This observation follows an apparently paradoxical remark about the relation of “perfect images” to the objects they represent:

very often the perfection of an image depends on its not resembling the object as much as it might. For instance, engravings, which consist merely of a little ink spread over paper, represent to us forests, towns, men and even battles and tempests. And yet, out of an unlimited number of different qualities that they lead us to conceive the objects, there is not one in respect of which they actually resemble [the objects] except shape. Even this is a very imperfect resemblance: on a flat surface, they represent objects variously convex or concave; and again, according to the rules of perspective, they often represent circles by ovals rather than by other circles, and squares by diamonds rather than by other squares. Thus very often, in order to be more perfect qua images, and to represent object[s] better, it is necessary for the engravings not to resemble [them].²

2. Discourse 4 of The Dioptrics, in Descartes, p. 244.
Descartes remarks are paradoxical only if we believe, as most of us are inclined to do, that the significance of a picture is based upon its resemblance to the objects of depiction or on other kinds of privileged or natural correspondences (such as impression or isomorphism), and that pictures are “more perfect” or “realistic” in proportion to the completeness of the relations. Yet Descartes is surely correct in insisting that some pictures, at least, are more fully representative of objects or actions to the extent that they fail to resemble them.

Perhaps the most revealing way of measuring the success of picture makers in making “very perfect images” is to note the strength and tenacity of our belief that they do so by forging natural or privileged relations between picture and world. The belief in these relations accounts for the facile use by many art historians and critics of the visual arts of such weighty but indeterminate expressions as “reality” or “visual reality” in their explanations of key elements of realistic depiction. This ontological approach assumes a relation of resemblance between picture and referent as the condition of pictorial significance. The least complicated of these accounts, the so-called copy theories, maintain that pictures make sense to us because they “refer”—the referent being the (or, at least one) “meaning” of the picture. In the case of realistic pictures, the referent is “reality” or one of its ontological cohorts (“the facts of the moment,” “the way things are,” “the way things look,” “the forms of things”).

Ernst Gombrich has proposed a far more sophisticated and subtle analysis of realistic depiction in which he characterizes our response to such pictures as being “something akin to visual hallucination.”

3. I have used the word “realistic” in preference to “realism” in order to avoid any possible confusion of my topic with the issues raised by Realism, the dominant movement in French painting roughly between 1840 and 1880. It will soon become clear that I regard “realistic” as an elastic category label that defies informative definition. Webster’s New Twentieth-Century Dictionary, 2d ed., defines “realistic” as follows: “1. of, having to do with, or in the style of realism or realists” and defines “realism” as “2. in art and literature, the attempted picturing of people and things as they really are; effort at faithful reproduction of nature.” Definition often proceeds by replacing general vagueness with a more specific kind of vagueness.


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Gombrich's account, perception itself is the product of habituation, although at "bottom" it is automatic and "programmed" to seek out certain natural features of the visual field (p. 204). For Gombrich, vision is essentially a process of making judgments about "meaning"—judgments about expectations that are elicited by certain clues in the environment. Artists invent rules or schemata for laying down clues on canvas. These clues substitute for the bits of information we seek when looking at nature. Thus, at least a certain portion of the recent history of art is a progressive history in which artists have sought to invent artificial "keys" that open the natural "locks of our senses" (p. 201). Gombrich's solution to the problem of realistic representation allows him to deny that pictures really look like nature. Realistic pictures achieve their purpose by "suggest[ing] a reading in terms of natural objects" (p. 202). Gombrich shifts the question of "looking like" away from the representation itself to the judgment of the viewer. The similarity of a picture to nature is not like the similarity of a facsimile to an original (which is the explanatory basis of copy theories), but "it is the similarity between the mental activities both can arouse, the search for meaning, the testing for consistency, expressed in the movement of the eye and, more important, in the movements of the mind" (p. 240).

While Gombrich's observations about realistic representation are interesting and suggestive, they only postpone the question of natural or privileged relations between picture and world. Judgments of similarity are based upon similar uses of visual skills, and ultimately these skills are "rooted" in automatic and natural mechanisms. For Gombrich, the standard for illusion ultimately resides outside of the reciprocal relation between skills of perception and skills of representation. Information that preexists perception and representation provides the standard for judgments of similarity.

According to Gombrich, any picture that provokes a response in the viewer "akin to visual hallucination" rates a position on the "ladder" of illusionistic representation. Now, it may very well be the case that we ordinarily do make hierarchical judgments about pictures being more or less realistic. But problems of discrimination become acute at the upper reaches of the "ladder," and recourse to "information" or to the power of induced "hallucination" does not help in assigning particular pictures to specific rungs.

I find it more than merely suggestive that we call many different kinds of pictures "realistic." As a category label, "realistic" is remarkably elastic. We cheerfully place into the category pictures that are made in strict accordance with the rules of linear perspective, pictures that are at

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*Illusion* (Princeton, N.J., 1960) because it is a compact and updated version of Gombrich's original statement of his illusion theory. All further references to this work will be cited in the text.
slight variance with those rules but that nonetheless look perfectly "correct" (e.g., paintings that have been "fudged" so that certain "distortions" generated by strict adherence to the stipulated geometry have been "softened" or corrected), and pictures made in flagrant contravention of perspective geometry (e.g., pictures that look like they were made with one point perspective but that have two vanishing points). We accept as realistic pictures that are made in strict accordance with the rules of perspective construction that we could never judge as being similar to anything we might or could ever see (e.g., a picture done in three point perspective looking down at skyscrapers). We accept as realistic pictures that are in sharp disagreement with what we now take to be the facts of vision (e.g., an architectural view across a plaza in which all objects in every plane and across every plane are in focus; a brief look around the room he is sitting in will convince the reader that we cannot see that way).

The above list could be extended, but the point has been made. It explains little to note that in each case cited above the picture leads us to a judgment that is similar to the kind we would make if we were looking at the real thing; because now, "the real thing" fails to mean very much at all. Of course, it is always possible to suggest that pictures have had such an enormous impact upon our perceptual skills that our judgments of similarity are as much influenced by what we know of pictures as by what we know of nature. But this suggestion only underscores the futility of seeking a standard of correctness that resides outside of the reciprocal relationship between skills of representation and skills of perception.

There is something charming and yet nasty about the belief in the special relation of picture to world. It is charming because it allows us to "enter" with ease into pictures and allows them to "extend" into our world. It allows us to think of pictures as "true to life," to use Gombrich's beguiling term, to look at a picture and ask questions of it, as if we were looking at the world through a window. It allows us to treat pictures as substitutes for the objects they represent (I do not mean to imply that they represent only objects) and so, for example, to buy clothing from an illustrated catalogue, or to analyze architectural styles from pictures of buildings. In brief, it allows us to feel a proximity to what is depicted and urges us to conclude that in certain important respects looking at a picture is equivalent to looking at what is pictured.

But this belief in the special relation of picture to world has a pernicious aspect; it holds sway over us and mocks thought with a vengeance. I have no inherent objections to beliefs that are beyond reason, but this one defies it. It seems to me that the conclusive refutations of copy or illusion theories somehow fail to be convincing; we are left with a strong feeling, after all the refutations are advanced, that there must, nonetheless, be a natural or privileged or unreasoned relation between realistic picture and world.
Nelson Goodman has asserted that our “privileging” of realistic modes of depiction is a product of inculcation or habituation.\(^5\) But to attribute this privileging to familiarity does not explain the habit, the ease with which we “pick it up,” or its strength. We have all kinds of habits, some of which are easy to break and others which are like second nature. If we think about a comparable case in literature, the relation between familiarity and conviction seems to be weaker than Goodman requires. The suggestion that there are no privileged modes of writing that get us closer to “the facts” might horrify a reporter for the \textit{New York Times}, but most of us find it easy to accept because we understand that rules of objective reportage in journalism or realism in literature may change as the habits of audiences and writers change. The arguments against privileged modes of written reportage are conclusive and convincing. But the arguments against privileged modes of depiction, while conclusive, do not carry the same power of conviction. To call the privileging of realistic depiction a product of inculcation grossly understates the case; it is more like an addiction. A belief of this kind that resists coherent formulation and that nonetheless defies conclusive and convincing refutation is obviously an important element in the structure of our thought. It is the source and nature of this belief that I shall examine.

I do not think it is possible to find features that are common and peculiar to all pictures that we classify as realistic. Realistic depiction is conceptually and historically based upon the adoption of a model that permits both picture maker and viewer to demand and, indeed, to find systematic relations between picture and object of depiction. But this “object” is not simply “the way the world is,” “the way the world looks,” nor even “the ways we use our vision”; it is rather a standardized, or characterized, or defined notion of vision itself.

In order to establish the “program” of realistic depiction, we must adopt a model of vision itself as pictorial. Once we characterize vision as pictorial, it is possible to devise means of “transforming,” or “translat-

\(^5\) Nelson Goodman, \textit{The Languages of Art} (Indianapolis, 1968), pp. 34–39. Goodman’s discussion of copy and illusion theories is a model of analytic demolition. However, his suggestion that familiarity with the “standard” mode of depiction in a given culture defines “realistic” and accounts for the ease with which we use and understand such pictures is not satisfactory. I do not know what “the” standard mode of depiction is in our culture. By the time a child is three, he has “picked up” an astonishing number of “pictorial habits” and can use them intelligently, for example, in watching cartoons and detective shows on television and in looking at books. The habit of reading words is obviously much more difficult for a child to acquire as are habits of hygiene, speech, dress, and game playing. I am not suggesting that philosophers should build their accounts of depiction around observations like these, but a system that cannot be used to account for them except by invoking “familiarity” certainly begs some important questions.
ing,” or “copying” the visual picture. In saying that the basic requirement of realistic representation is the “picturing” of vision, I do not mean to imply that there is only one standardized model of vision as picture that operates in all or even in most cases of realistic depiction. While I shall show that the first text on linear perspective does, in fact, characterize vision as being amenable to only one kind of pictorial definition, such picture making today assumes that vision may be characterized by reference to many different kinds of pictures. The choice of any particular pictorial model of vision depends upon numerous factors, purpose of representation and expressive requirements being two of the most important. Moreover, the relationship between characterizing what we see as pictorial and making pictures becomes a reciprocal one. This account of realistic depiction is the only way that we can understand our powerful belief in the privileged relation between picture and object of depiction. What we do in depicting is to establish a congruence between a “natural” seen picture that we construct according to pictorial rules and a re-presentation of that “natural” picture. The rules of construction are the same for both pictures.

Before I present the account of vision as picture, it is worthwhile to take a hard look at a picture that most of us would agree is unequivocally realistic—a photograph. This exercise has a dual purpose: it will help us understand just what claims are made for realistic pictures, and it will allow us to see if at least one kind of realistic picture, because of special “genetic” factors introduced by the photographic process, avoids the most obvious objections to privileged relations theories. Photographs make a special claim upon our attention because they are supposed not only to look realistic (although they do not all look realistic) but also to derive from or be caused by the objects they represent. This “natural connection” has been taken as a reinforcement and even as a guarantee of realistic depiction.

Most modern accounts of photography place special emphasis on the unique way that photographs come into being, a process essentially different from the genesis of handmade pictures. Thus, while a painter must resort to invented schemata—rules of representation that work because they trigger projection responses in us (or because they aid painters in delineating “the forms of things”), a photographer uses a camera which “captures” a “trace” of the object itself. The photographer does not intervene in the process of representation. The world delivers itself to the film in the form of the image of nature, and the act of exposure allows the world to trace or impress itself in a purely natural way. This view, or views similar to it, allows critics to speak of photo-
graphs as "cosubstantial with the objects they represent," "perfect analogons," "stencils off the real," "traces," or as "records" of objects or of the images of objects. Photographs apparently do an "end run" around the conventions of representation; painters can, by genius or guile or conceit or simple human error, "mutilate" the given, but a photographer can only record it.

The accounts of photography that accord it a special status within the picture-making arts are often unclear about the specific claims being made for photographs. The camera is sometimes construed as a substitute for or an extension of the eye, so that what is depicted represents what we would have seen had we been at the camera at the instant of exposure. Some accounts emphasize the causal links between photographs and the objects of depiction. These links are supposed to explain why the picture looks the way it does, whether or not it looks like what we would have seen. Clearly, these two models for explaining the special status of photographs do not amount to the same thing, though it has often been held that they do.

Since photographs differ one from the next as much as other kinds of pictures, I will not provide an analysis of the photograph but of a particular photograph: Walker Evans' Hotel Porch, Saratoga Springs, N.Y., made in 1930 (fig. 1). Evans' picture seems unmediated: the view looks neither upward nor downward but straight ahead and at eye level; the angle of view is neither unusually wide nor narrow. We see the subject as if looking through a window.

Now, the first and most obvious thing about the picture is that we could never see what is shown here in this way, if by "see" we mean how all the depicted objects would have appeared to a viewer standing at the side of the camera. To begin with, our vision is not formed within a rectangular boundary; it is, per Aristotle, unbounded. Second, even if we were to close one eye and place a rectangular frame of the same dimensions as the original negative at a distance from the eye equal to the focal length of the lens (the so-called distance point of perspective construction) and then look at the field represented in the picture, we would still not see what is shown in the picture. The photograph shows everything in sharp delineation from edge to edge, while our vision, because our eyes are foveate, is sharp only at its "center." The picture is monochromatic, while most of us see in "natural" color (and there are some critics who maintain that the picture would be less realistic if it were in color). Finally, the photograph shows objects in sharp focus in and across every plane, from the nearest to the farthest. We do not—because we cannot—see things this way.

No doubt some readers find these observations trivial and beside the point. In answer, I can only say that while they are indeed trivial, they precisely constitute the point. Recall that at least one theory maintains that photographs give us an image of nature that corresponds to what
FIG. 1.—Walker Evans, *Hotel Porch, Saratoga Springs, N.Y.* Courtesy of the Art Institute of Chicago.
anyone might see from the same vantage point as the camera. The picture is supposedly realistic because it gives us a substitute for vision, that is, a piece of visual experience. Evans' picture, however, clearly and unequivocally fails to do that; the picture is perfectly realistic even though it defies what we now know about the ways that things appear to us. One may object that the photograph need not look exactly like what we see in order to qualify as realistic. But this is not my point; my claim is not that the photograph has failed in some specific respects, but that our visual experience is not like the photograph. As far as I can tell, the objects depicted look just fine—but they look like objects in a picture. Whatever we might have seen from the side of the camera, it would not have looked like the picture.

But if the picture does not derive its realistic quality from its similarity to visual experience, how does it derive that quality? The second explanation for the realistic quality of the picture stresses the natural connections between photograph and photographed. Realistic depiction is allegedly guaranteed by the impression of the object upon the photosensitive material by natural means and in accordance with the laws of nature.

As a general explanation for resemblance, causal genesis is certainly lacking. Suppose that in a fit of anger I smash a wall with a large hammer. The wall may dent, but there is no reason to conclude that the dent must bear a resemblance to the head of the hammer. This is not to suggest that causal laws are inoperative in this case but simply that such laws do not guarantee even the suggestion of resemblance. In the case of devices designed to produce recognizable impressions, like signet rings and cylinder seals, the peculiar fact is that a well-produced impression does not stand to the impressing device as facsimile to original. Aside from possible differences in color and texture, what is raised on the device is depressed on the receiving medium and vice versa. And the final result of such an impression is critically dependent upon the careful choice of an appropriate medium and the proper use of the impressing device. If the device is moved laterally during the procedure, for example, or if too little or too much pressure is applied, an impression will result but not the desired one. It is, then, highly misleading to characterize the wax impression of a signet ring as a "natural" impression: such a view ignores the purpose for which the ring was made, the standards employed for the choice of medium, and the complicated rules governing the impression procedure. Finally, if I ink up my thumb and slide it across a sheet of paper, the resulting smear would certainly be an impression produced by the agency of my thumb, but it would nonetheless fail to look like my thumb. Even if I make what detectives consider to be a good thumbprint, it will work to identify me and only me but it will fail to be either a facsimile or a realistic representation of my thumb.

It is clearly dangerous to take the already problematic notion of
impression by means of physical contact between object and medium and extend it to photography. Much of the apparent explanatory power of impression derives from what appears to be the transfer of formal properties from the impressing object to the receiving medium. Even if impression by means of physical contact does work that way, there is no comparable contact in photography. Objects are not active in the photographic process, rather it is light that effects a change in the photosensitive medium. Thus, even if “impression” is the right term to characterize the changes effected on photographic film, what impresses the film is light. And light in nearly any form will have an effect upon film. Thus, the film will be impressed by light if it is exposed to focused light entering through the lens of the camera, or if it is exposed to unfocused light entering through the lens, or if it is simply taken out of the camera and placed in ambient light.

The notions of impression and natural law, invoked as a means of explaining why a photograph looks realistic, actually prove too much; such notions can account for whatever a photograph looks like. If Evans had exposed his negative to thirty-two times more light than he did, the resulting picture, although it would be a nearly white blank, would owe its appearance to the laws of nature (perhaps we should call such pictures “overactive impressions”). Similarly, a corresponding under-exposure would result in a naturally caused black patch. Under these circumstances, it simply begs the question to argue that realistic depiction in a photograph is the result of natural connections between picture and world.

Let us return to the Evans photograph. I do not doubt that a catalogue listing of the objects in the picture might possibly accord with what an observer standing at the side of the camera might have listed as worthy of attention—though it might not. A skeptical viewer might have returned, picture in hand, to the place where the picture was made, to assure himself that Evans did not resort to photographic “distortion” or fabrication in order to obtain the final print. But this kind of matching game is not at issue; the game could be played with drawings, schematic diagrams that utilize some sort of arbitrary notation, or, for that matter, with plain English sentences. To return to the original question: it is simply false to say that we regard the picture as realistic because it comes close to recording a visual experience that we might have had; it simply does not do this. The picture does not provide a “copy of an appearance,” nor does it attempt to duplicate vision or even to suggest how we might have seen what is shown. We accept the picture as realistic despite its failure to substitute for a visual experience. I am intrigued by the strong inclination many of us have to gloss over substantial and obvious discrepancies between picture and the experience of seeing what is pictured and still continue to maintain that the picture does indeed sub-
stitute for that experience. This conviction grows out of confusing what we might report having seen with how we would have seen what we report.

When we use our eyes with some definite purpose in mind, we anticipate, attend, discriminate, seek out. We do not find information in any simple sense of the term. Perhaps the most splendid feature of the concept of "information" is that it requires that form be actively imposed upon something. Only in the most equivocal sense is information "out there." We find, or fail to find, what we are trained to look for. Without the impetus of purpose, which gives definition to the activity, we identify what is easiest to locate, and by "easiest" I mean only what we are predisposed to find. It is unfortunately the case that what is easiest to find often gets characterized as what is "natural" to locate. And once we begin to speak of what we find in nature it is easy to believe that the information preexists in neat packages, out there, without regard to purposeful discrimination. We come to believe in privileged routes of access to pure information. But certainly there is a congruence between what we look for and what we find; purposeful looking is anticipatory. It is ludicrous to believe that a photograph captures images or records them, as if they managed to escape the reciprocal relations involved in purposeful attending.

The Evans photograph neither shows nor suggests the way we might have seen what is represented in it. The suggestion that this or any other photograph can stand in for vision is simply wrong if by "stand in" we mean somehow "replicate" vision. Vision cannot be formulated without reference to the enormously varied and complicated ways of attending, and the product of any such formulation will be relative to some purpose or to a set of operations incorporated in a purpose.

If we shift our terms, so that rather than characterizing the picture as the representation of a visual experience we discuss instead the depiction of objects we determine when looking at or attending to what is in front of us, a new possibility emerges. I suspect that if we just happened by Evans at the moment he made the exposure, we would have missed most of what is represented in the picture. If, on the other hand, we had been asked to attend to the field before the camera in a certain way, we might possibly have come up with a good or adequate laundry list of the items a photographer might choose to represent. If we had been provided with some information about the way Evans worked, the sorts of things that interested him and the kinds of photographs he made, chances are we could have provided a good list of objects he would represent, or a good description of the photograph he was engaged in making. But without some notion of what we were supposed to look for and list, without some rules of attending, it is far from clear that our catalogue would match the objects depicted in the photograph.
What Evans did in making this picture can best be characterized as an act of imagination. He gave expression to his rules of attending, and in so doing he taught his audience to attend in the same manner. Evans' achievement rests upon his power to make pictures that integrate all sorts of items represented in sharp focus, each of which competes with the rest and all of which nonetheless resolve into a unit. There is no referent for this unit; it does not exist outside of the picture. We could not see what is represented in this way, though we might hold it all together in an act of imagination.

None of this denies the possibility of using certain photographs to verify some statements about "the" way things were at the time of exposure. In many pictures like Evans', the viewer has a legitimate reason to say that such and such was in front of the camera at some past time. But in this regard, two points need to be kept in mind. Photographs are not self-warranting any more than, say, paintings are. More to the point, photographs do not owe their significance to the possibility of using them to establish facts about the world.

One strong motive for investing photographs with special powers—powers to represent what was "really there" or "the facts of the moment"—is that some photographs can serve a number of different uses—uses not intended by the photographer. Thus, in a quaint family snapshot of Aunt Maude, we also get a glimpse of a Model-T Ford and can use the photograph to establish something about old cars. But the ability to use certain photographs for a multiplicity of ends is a property shared with any kind of realistic picture. A painting of Delft by Vermeer can serve the ends of art historians, city planners, architects, stone masons, cultural historians, and so on.

The problems engendered by the analysis of photographs come about, in great part, because of a peculiar set of beliefs concerning the camera that have grown up during the past two centuries. The camera has taken on the status of natural machine—the giver of "the image of nature." Some critics believe the camera image is not only an independent and scientific corroboration of the schemata developed by realistic painters from, say, the time of Giotto onward but is a correction and fulfillment of those schemata. That we have failed to understand that this is quite simply false is as much an indication of our ignorance of the history of the camera, the purpose of its construction, and the source of its design as it is a mark of the ease with which we have come to accept certain tools as being products of nature. In our own age, surrounded as we are by consumer goods and gadgets built to average or indifferent standards, we have lost the sense of the tool as fit for its work and the extent to which the design and construction of a tool carries with it the standards of its intended use. To the extent that we believe cameras automatically give natural images, we have lost the sense of what these
tools are and have forgotten that they are instruments at all. And it is clear that most modern critics of photography have had no sense of the instrumentality of cameras. Cameras do not provide scientific corroboration of the schemata or rules invented by painters to make realistic pictures. On the contrary, cameras represent the incorporation of those schemata into a tool designed and built, with great difficulty and over a long period of time, to aid painters and draughtsmen in the production of certain kinds of pictures.

It is unfortunate that art historians have not provided us with a critical history of the camera. Aside from its inherent interest, such a history would do much to rid us of the tendency to think of photographs as sui generis—as standing outside of the "family" of handmade pictures. The following brief remarks on the history of the camera are intended to show that the construction of the camera did not flow out of the abrupt discovery of the "image of nature" but rather that it was developed as an aid for the production of realistic paintings and that such paintings provided the standard for the kind of image the camera was designed to produce.

The principle of what we now call "pinhole image" production was known from antiquity and was used to observe solar eclipses. From the tenth century through the late fifteenth century, pinhole image formation was carefully studied by Arab and Latin natural philosophers, and this study was an important element of the theory of vision known as perspectiva. I have been unable to find any evidence that during this

6. When light from a radiant source or light reflected from an object is allowed to pass through a small aperture into a darkened room or box, a reversed and inverted image of the source or object will form on a surface held in back of the aperture. This phenomenon is called "pinhole image formation." Even in its simplest form, numerous "design decisions" are built into a pinhole camera. For example, the size of the aperture will have a decided effect on the quality of the image. More important, the shape and position of the surface upon which the image is formed will have a great effect on the visual properties of the image. We favor a planar surface at right angles to the aperture: a planar projection surface at an acute or obtuse angle to the aperture will produce a "naturally distorted" image as will a concave or convex projection surface. Even at the simplest level, tools must be built to standards.

7. I will be discussing the relevance of perspectiva to Leon Battista Alberti's seminal work, De Pictura, in section 3 of this essay. This medieval theory of perception provided Alberti with a material and a formal account of vision. On the material explanation of vision, sight is initiated by the passive reception of light and color by the eye. This impression upon the eye can be mapped geometrically in terms of correspondences between points on the object and points on the lens of the eye. The impression, however, is in no way coextensive with what we see. The formal account of vision requires that what we see be understood as the product of a construction, initiated by the impression, but informed at the level of imagination. The rules of perspective construction are, for Alberti, the same rules employed by the imagination in attending to the visible world. These rules are given in depiction as rules of delineation and composition. Thus, visible objects and their struc-
period such imagery was thought of as having a possible use for the production of pictures. Not only was the phenomenon ignored for its potential pictorial applications, the natural philosophers who studied it were not at all concerned with the image produced by pinhole apertures but confined their interest rather to the shape of the outer boundary of the image. Indeed, they did not even refer to the image as an "image" at all; they spoke rather of the rays of light that passed through the aperture and were incident upon a surface in back of it.

The images produced by the kinds of cameras studied by medieval philosophers, flawed, reversed, and upside down as they are, do suggest a pictorial application to a modern eye—but they did not to the medievals. And they did not suggest a pictorial use until well into the sixteenth century, when the principles of linear perspective, "sharp" delineation of objects, and the coherent use of light and shade—in other words, the basic principles of realistic picture construction—had taken root in Italy. We have completely reversed the history of the camera in our popular accounts of photography. The problem for post-Renaissance painters was not how to make a picture that looked like the image produced by the camera, it was how to make a machine that produced an image like the ones they painted.

The first published account of the camera, or as it was known then, the camera obscura ("dark room"), appeared in 1521, nearly a century after the publication of Alberti's treatise on linear perspective, in Cesare Cesariano's annotations to Vitruvius' Treatise on Architecture. Cesariano's camera obscura was a darkened room with an aperture fitted into a door or window. An image of illuminated objects outside the room was projected upon a sheet of paper inside. The camera obscura described by Cesariano is in all essentials the same kind of instrument used by the medieval perspective theorists. Cameras made in keeping with Cesariano's description produced reversed, inverted, and very dim images that were in focus no matter how close or far from the aperture the plane of projection was placed. The next step in the development of the camera was the introduction of a lens at the aperture that greatly increased the brightness of the projected image. This advance, most probably invented by Girolamo Cardano in 1550, introduced the complication that with any particular lens the resulting image was in focus at a set distance from the aperture, and only those illuminated objects at a mathematically determined distance in front of the aperture were sharply delineated in the image.

9. See Girolamo Cardano, De Subtilitate Libri XXI (Nuremberg, 1550), bk. 4.
The first suggestion for a specifically pictorial use of the camera was published by Giovan Battista della Porta in 1558.10 His brief remarks concerning the use of the camera for making pictures were aimed, however, at amateurs who did not know how to paint. The production of cameras that were useful aids for artists took nearly a century more to be produced. By the late seventeenth century, cameras were portable and were fitted with reflecting mirrors that projected the image upon a surface fitted to receive drawing paper. Two major problems remained to be worked out: lenses were still crude and did not produce particularly sharp images, and since objects at different distances from the lens could not be held in focus at the same time, artists had to learn how to draw on one plane at a time and to focus progressively from plane to plane. Artists had to instruct lens makers about the focal length of lenses. Since artistic practice demanded that painters stand at a set distance from portrait sitters in order to avoid exaggeration of features, specific lenses were required for portraiture. Likewise, special lenses for city- and landscapes had to be developed. Lenses for landscape depiction could not be used for portraiture without introducing “distortions” into the painting. Moreover, a portrait lens for a small camera could not be used as a portrait lens for a large one. By the middle of the eighteenth century, cameras and lenses had been specifically designed for the special uses of artists, and manuals of instruction for their correct use were produced by both lens manufacturers and artists. What I wish to emphasize is the relation of purpose to design: camera makers had to be told what the specific need of the artist was before they could work out a design for a camera that would satisfy that need. The mechanism of the camera was thoroughly standardized to meet specific pictorial requirements.

Despite these developments, as late as 1829 Charles Chevalier, the premier French optician who provided cameras to Joseph Niepce and Louis Daguerre, the two French inventors of photography, was able to write

the camera obscura bore many imperfections as it came from the hand of its inventor; the numerous modifications it had undergone [until recently] had only slightly improved its design; and painters, mindful of their reputations, had ceased to use it because it presented badly defined images, with confused outlines. Moreover, these images had a tonal crudeness which became a characteristic of the works of artists who used the instrument too frequently.11

10. Giovan Battista della Porta, De i miracoli et maravigliosi effetti dalla natura prodotti libri IV (Venice, 1560), bk. 4, pp. 139–45.

Photography did not sidestep the standards of picture production, it incorporated them.

3

Our willingness to accept photographs as natural and mechanical records of what we see underscores the power of our belief that certain kinds of pictures achieve significance because they are "natural"—meaning that such pictures are related to what they depict in exactly (or roughly) the same way that vision is related to what we see. In my brief remarks on the history of the camera obscura, I have shown that the significance of photographs cannot be accounted for by mechanical explanations of natural phenomena. The question that lies beneath the modern (and futile) discourse about the ontological status of photographs is a far more interesting one than has yet been posed: How is it that we ever came to think of photographs as being natural phenomena at all? This question cannot be answered by reference to the mechanics of photography but must itself be referred to an examination of those pictorial standards that are the principles of camera design. These standards grow out of a deliberate and thoroughly successful attempt on the part of Western artists, beginning in the early Renaissance, to construct a pictorial equivalent to vision. It is this pictorial equivalent to vision which is the source of our unshakable belief in the congruence of picture and world.

The history of Western painting during the past five hundred years has been characterized by an attempt to secure a scientific basis for picture construction that serves, in turn, to warrant the viewer's belief in the fidelity of the picture to what it represents. Broadly speaking, "the object" of representation is what we see. But this must be understood as a characterized or defined object that has been structured in accord with an account of how we see. The primary condition for this kind of picture making is the belief that vision is amenable to depiction because it is itself pictorial. New theories of vision breed new "facts" concerning what we "really see." The visual facts enshrined in a painting by Piero della Francesca not only differ from but are incompatible with the facts of vision represented in a work by, say, John Constable. And yet, we may call both pictures "realistic." The joining of artistic practice to a scientific theory of vision that generates facts about what we see grants the artist a new kind of freedom. Since the Renaissance, artists have had the ability to move ahead of the viewer, to make fresh discoveries about what we really see. This is not an unconditional freedom, but its very possibility implies a paradox. The artist can depict what we see because what we see is pictorial. And yet, in his paintings, the artist can achieve fidelity to his own vision based upon his knowledge of vision and depiction, and we
will accept the picture as credible and warranted even though we may insist at the same time that we never quite saw things that way before.

The aims of art are enormously varied, and I do not mean to imply that all artists at all times have been concerned with depicting what we see. As far as I can determine, abstract expressionists are not terribly concerned with accounts of the way the world looks. Nonetheless, the joining of artistic practice to scientific theory in the early Renaissance gave a new rationale and impetus to artists who wished to depict what they saw. And it provided rhetorical assurance to the audience that what they saw in paintings was related by the sure methods of science to what they saw when looking at the world.

The first text on linear perspective, De Pictura, written in Florence in 1435 by Leon Battista Alberti, also marks the first effort by a painter to establish the certainty of his method of picture construction by deriving it from a scientific account of vision. The grounding of depiction in contemporary science has both an immediate and a long-lasting impact. Painters were quick to adapt linear perspective to their own needs. The system continues to be used today in its purest form, in many kinds of handmade illustrations and, of course, in nearly all applications of photography, including motion pictures and television. We remain strongly under Alberti's influence. On the level of theory and criticism, Alberti's system continues to engender lively and passionate debate in questions concerning its natural or conventional foundations.

Alberti sets out to derive depiction from an account of perception. De Pictura lays out procedures that permit an artist to paint what he sees by means of rules derived from a mechanical and psychological account of how he sees. For Alberti, a painter is able to represent what he sees because the elements of vision and the rules for their composition are themselves pictorial. Once this principle is established, Alberti identifies what he sees as a constructed picture, analyzes it, and uses the product of the analysis for the artificial and correct representation of the perceived image. The scientific examination of vision and its application to depiction provides the standard for pictorial correctness. This, in turn, requires a scientific and mathematically sanctioned method of picture construction. Linear perspective, by definition, requires the painter to "fix" his eye in a determined and unvarying relation to the picture surface in order to recreate within the picture the rational structure of perceptual judgments. It is precisely this notion of structured perception that is central to Alberti's text. The scientific account of vision adopted by him

12. Leon Battista Alberti, On Painting and on Sculpture: The Latin Texts of "De Pictura" and "De Statua," ed. and trans. Cecil Grayson (London, 1972). All references to De Pictura, unless otherwise noted, are to this text. Alberti originally wrote the text in Latin in 1435 and rewrote it in Italian in 1436 under the title Della pittura. The Italian text, to quote from Grayson's preface, "has undeservedly enjoyed the greater fortune." I have used Grayson's text because it is more complete and precise than the Italian.
provides a basis for explaining how we are able to make "certified" judgments about the sensible things of the world. It is not an account of momentary glances or "impressions," nor is it, strictly speaking, an account of "appearances." A completed perceptual judgment, that is, a unified one in which we correctly identify objects, their attributes, and their interrelations, can be made only under specified observation conditions through time, by means of discrimination, comparison, and integration. What is fragmentary or unsure in perception cannot be certified, unified, or identified. Such fragments of perception have no place in depiction because they are irrational and incomplete; they fail to achieve the purpose of vision. The depiction of incomplete and shifting appearances would imply an inability to act rationally and harmoniously. A full perceptual judgment establishes objects as having existence apart from perception. Even a brief look at a painting produced in strict accordance with Alberti's method demonstrates how thoroughly unusual, by our standards, his notion of perception is. All visible things are delineated with exacting clarity, from one edge of the picture to the other and across planes from the foreground to the background. (The most distant objects cannot be clearly depicted because our perceptual capacities do not allow us to make certified judgments about things that are too far off.) Every object is rationally related to every other object in the picture, and distance and size relations can be given objective, that is, numerical, value by counting off the "tiles" of the "pavement" upon which the entire picture is structured. We still resort to this mode of depiction, or modes very closely related to it, when we wish to make "literal" pictures. But when we do so, we adopt a thoroughly medieval notion of vision and an early-Renaissance conception of depiction. That we can still respond to such pictures by saying "That is just the way it looked" is a demonstration of just how complex and capricious our behavior with pictures is—and a testimony to the power of Alberti's achievement.

With no hint of modesty, Alberti claims that his analysis has led him to the first true understanding of painting. He asserts that painters before him worked instinctively, without an understanding of what they were trying to do and therefore without a warranted mode of depiction. Unanchored by a correct and systematic approach to painting, painters had inevitably produced irrational pictures. According to Alberti, De Pictura does not outline one method of picture construction, it presents the only method. It is a manual for young painters and therapy for older ones. Yet the instincts of painters, while they have been insufficient to produce pictures that correctly represent vision, are essentially correct because painters have attempted, without knowing it, to depict what they see in accordance with how they see.

Alberti's criticism of previous artistic practice is a criticism of correction, not of demolition. His rhetorical problems therefore are consider-
able. He must provide a conservative analysis of vision and a revolutionary program for depiction. After all, people are in general agreement about what they see; the ease of navigation through the world is one clear indication of this. The problems arise in the practice of painting, in which there is scant agreement about how to make pictures. Like moral philosophers who claim to provide an analysis of ordinary moral judgments and not to correct them, Alberti must express principles of vision that explain ordinary perceptual judgments without doing violence to them. Unlike those philosophers, he must provide a corrective to irrational modes of behavior—the accepted manner of picture making. His solution is as simple as it is profound; the conservative is linked to the revolutionary by the instinctual. By nature, we all know how to see, though we do not know how we see. What painters have not recognized is that in painting they aim to re-present what they see. The ease and rapidity with which linear perspective was adopted by Alberti’s contemporaries suggests, though it certainly does not demonstrate, that painters were prepared to accept his formulation of the true aim of painting.

Erwin Panofsky has argued that artistic practice in Italy during the two centuries prior to Alberti was, in fact, tending toward an equation of perception with depiction, and that this equation was one of two essential preconditions for the development of linear perspective.

The *perspectiva pingendi* [painter’s perspective] or *perspectiva artificialis* [artificial perspective] was thus quite literally the child of optical theory and artistic practice—optical theory providing, as it were, the idea of the *piramide visiva* [the visual pyramid], artistic practice, as it had developed from the end of the thirteenth century, providing the idea of *intersegazione* [a plane intersection of the visual pyramid].

Panofsky’s elegant, though not unchallenged, account of artistic practice in thirteenth- and fourteenth-century Italy suggests that the work of Duccio and Giotto established a new beginning in Western painting. He contends that Hellenistic and Roman painting had been “illusionistic” and had attempted to give the viewer a sense of looking through the picture surface at the objects behind it. While the ancient painters had not achieved an “exact perspective construction,” they had produced something like a “prospect through a window.” Panofsky further argues that the surface-as-window began to close during the early-Christian period and that while certain devices to suggest recession in depth continued to be used by Byzantine artists, “the Art of the

13. Erwin Panofsky, “I primi lumi: Italian Trecento Painting and Its Impact on the Rest of Europe,” *Renaissance and Renascences in Western Art* (Stockholm, 1960), p. 139. All further references to this work will be cited in the text.
Western Middle Ages . . . came to abandon perspective ambitions altogether” (p. 130). Although they worked in quite different ways, Duccio and Giotto re achieved the sense of transparency of the picture surface that is an essential precondition for the development of linear perspective. This development allowed some painters to derive their work “from visual experience rather than from tradition” (p. 142), so that by the end of the fourteenth century, the “window pane feeling” had been well established. The sense of depth was greatly aided by a new treatment of “orthogonals” (lines parallel to one another and perpendicular to the picture plane) which came to be drawn as converging to a centrally defined area, or even to a point. By the beginning of the fifteenth century, the surface of the picture was intended to convey the impression of looking through a transparent surface into the space beyond as seen from a reasonably well-defined point of view. While such pictures invited the viewer to see the objects receding from the picture surface, odd inconsistencies remained; to use one of Alberti’s examples, large men sat balled up in small houses, their heads touching the ceiling. The space constructed by painters did not “behave” in accordance with “visual experience.” Panofsky sees the application of the medieval theory of vision, *perspectiva*, to this new kind of picture as a way of rationalizing it, of giving coherence and consistency to the objects of depiction in order to complete the analogy to window gazing. Panofsky’s strategy, then, is to demonstrate how the reemergence of the picture surface as a transparent plane to be seen through provides the motivation to adapt the explicit geometric diagrams of visual rays as taught in *perspectiva* to specifically pictorial problems. The development of linear perspective is an outgrowth of the need to extend artistic practice. For my own part, I am comfortable with Panofsky’s discussion of developmental tendencies within certain “schools” of Italian painting prior to the invention of linear perspective as well as with his demand that the system be seen as the joining of artistic practice to the theory of vision. Beyond this (and I say this with some trepidation), his argument is curiously ambiguous, at points misleading, and, in some places, to which I will return, simply false.

Throughout *De Pictura*, Alberti insists that the aim of the painter is to depict “visible things.” This seems to be a straightforward indication of intention, but its usefulness obviously hinges upon a definition of “visible thing” as well as on a choice of representational mode. For example, an artist might draw a stick figure and reasonably claim that he has depicted a visible thing. The primary problem in the interpretation of Alberti’s text is to provide an account of what Alberti takes a visible thing to be, for, as I will show, the definition of visible thing carries with it the manner and means of depiction. A number of commentators on the text have sought to clarify Alberti’s program by drawing attention to the justly famous window analogy that is stated in the
first book of *De Pictura*. Alberti writes, “I describe a rectangle of whatever size I please, which I imagine to be an open window through which I view whatever is to be depicted there” (p. 120). Panofsky finds in this statement a definition of what Alberti means by “picture”: “Alberti’s window simile defines the picture not only as the record of a direct visual experience but also, more specifically, as a ‘perspective’ representation” (p. 123). Elsewhere, Panofsky somewhat ambiguously states that the window analogy demands of the artist “a direct visual approach to reality” (p. 121). The expression “visual experience” is in itself problematic, and the addition of the qualifier “direct” further complicates it (are we to understand it in opposition to “indirect”?). Far more troubling is Panofsky’s assumption that window gazing is a self-defining activity. The question of how we are to look through a window and what we are to look for is left unanswered. Of course, it is possible to find the rules for window gazing in the kinds of pictures that were produced prior to *De Pictura*, but then “a direct visual approach to reality” becomes a prescription for looking out of windows in the way that we look at these pictures. The window analogy does, indeed, state Alberti’s entire case, but it does so only if we come to it equipped with a definition of visible things and with the rules for constructing such things. By itself, the analogy is far too equivocal to be of much use in understanding the relations between seeing and depicting.

Alberti defines visible things in terms of the physical and formal account of vision provided by *perspectiva*. The tendency to beg essential questions about the nature of “direct visual experience” comes, I would suggest, from the misunderstanding by art historians of the account of vision provided by *perspectiva*. Scholars who have dealt with the major role of medieval optical theory in *De Pictura* have treated it as a mechanical means of “cranking out” vision and have isolated the physical aspects of the theory from the faculty psychology that provides the formal principles of vision. This has the effect of distorting medieval optics by overlaying on it more modern theories of vision (some of which owe their genesis to Alberti’s system of picture making), and, more to the immediate point, it thoroughly misrepresents Alberti’s conception of visible things. Panofsky asserts that the exact geometric construction of linear perspective is founded on two premises accepted as axiomatic in classical as well as medieval optics: first, that the visual image is produced by straight lines (“visual rays”) which connect the eye with the objects

14. I have used Panofsky’s translation of the line from *Della pittura* since the upcoming quotation from Panofsky refers to this translation. Grayson gives this line as follows: “I draw a rectangle of whatever size I want, which I regard [contueatur] as an open window through which the subject to be painted is seen” (*De Pictura*, p. 55). *Contueatur* carries the sense of careful observation.
seen (no matter whether these rays were thought of as proceeding from the eye, the object or both), the whole configuration thus forming the . . . "visual pyramid" or the "visual cone"; second, that the size and shape of the objects as they appear in the visual image is determined by the relative position of the "visual rays". What was fundamentally new was the assumption . . . that all the points constituting this visual image are located on a plane rather than on a curved surface. [Pp. 123–26]

The crucial error in Panofsky's account of perspectiva is the reference to "the visual image." In medieval optics, on the level of rays and their geometry there is no image formation whatsoever. It is not "axiomatic" in classical or medieval optics that a (let alone the) image is produced in straight lines. There is no image formation by means of rays on the lens of the eye, on the retina, or even on the optic nerve. Panofsky's suggestion that there are points that constitute the visual image is not only false, it fails to understand Alberti's conceptual achievement. All perceptions, according to perspectiva and its allied faculty psychology, come about by means of image formation—there are images of hearing, sight, olfaction, and so on. Images are completed perceptual judgments about the objects of sense. They are made in the mind where one would expect to find them—in the imagination. What Alberti did was to conceive of this mental construct, the image, as a picture (this obviously will work only for vision—it will not do to have pictures of odors or tastes). This picture metaphor controls the text. But the genius of Alberti was not simply in conceiving of a visual image as a picture; he also provided a method by means of which that image could be projected and copied by art.

De Pictura begins with a catalogue of the elements of vision. Alberti states, "...things which are not visible do not concern the painter, for he strives to represent [copy, imitate] only the things that are seen." He then gives a listing of "things that are seen." The least visible thing is a point that is a "sign" that exists on a surface. A line is a series of points joined together so that its length may be divided, but not its width. Many lines joined together "like threads in a cloth" produce a surface that possesses two kinds of properties: those that belong to the surface itself which are fixed and give the surface its name, and those that are changeable owing to the relation of the surface to the eye that sees it. And finally, "A surface is the outer part of a body which is recognized not by depth, but by width and length, and also by its properties" (p. 37). With

15. De Pictura, p. 37. Imitari is the verb for which I have given alternate translations. All further references to this work will be cited in the text.

16. Depth is constructed by the combination of surfaces; it is not a property of a surface. Alberti does not conceive of the problem of depicting what we see in terms of a "translation" of a three dimensional world into a two dimensional picture. His concern is to depict objects in relief. Issues of three dimensionality and binocular vision are foreign to perspectiva, although the question of why we do not see double, given the fact that each of
the addition of light and color, this listing exhausts the category of "things that are seen." All objects that are seen must be constructed out of these fundamental elements.

Alberti notes that while surfaces remain unchanged, they may appear to change. Such alterations are "related to the power of vision." These changes are judged by sight. Rays, which are the servants or "ministers" of vision, measure surfaces. There are three kinds of rays: extrinsic rays measure the periphery of a surface, they determine its outline; median rays are "tinged" with color and give the surface its color and light; the centric ray, the single most important, fixes the surface at a definite distance and direction from the eye. These rays taken together form a pyramid of vision with its apex at the eye and its base at the surface seen. In the first twelve paragraphs of De Pictura, Alberti lists the elements of vision together with the basic notion that rays measure quantities. A quantity is the distance between any two points on a surface. Mensuration is a fundamental power of vision, and measurement must find a precise expression in depiction. Exactly measurable quantity is one of Alberti's central concerns because it is by means of measurement that we are able to give certainty to the judgments of vision.

Thus far, Alberti has been concerned only with single surfaces. He then adds, "Since bodies are covered in surfaces, all the observed quantities of bodies will make up a single pyramid containing as many small pyramids as there are surfaces embraced by the rays from that point of vision" (p. 49). This establishes a congruence between the composition of natural bodies and the composition of vision. In vision we see surfaces. Bodies themselves are covered in surfaces. In the last book of De Pictura, Alberti is able to complete the statement of congruences, for, as it turns out, nature is an artist herself: "Look at Nature and observe long and carefully how she, the wonderful maker of things, has composed the surfaces" (p. 73).

Once the pictorial nature of vision is established, Alberti gives a remarkable statement of how a painter can match the process of vision by means of the process of depiction:

We divide painting into three parts, and this division we learn from Nature herself. As painting aims to represent things seen, let us note how in fact things are seen. In the first place, when we look at a thing, we see it as an object which occupies a space. The painter will draw around this space, and he will call this process of sketch-

our eyes is active in vision, is answered. The reason for having two eyes is explained by John Pecham in the following way: "[Proposition] 32–{35}. The duality of the eyes must be reduced to a unity. The benevolence of the Creator has provided that there should be two eyes so that if injury befalls one, the other remains" (John Pecham, Perspectiva Communis, in John Pecham and the Science of Optics, ed. and trans. David C. Lindberg [Madison, Wisc., 1970], p. 117).
ing the outline, appropriately, circumscription. Then, as we look, we discern how the several surfaces of the object seen are fitted together; the artist, when drawing these combinations of surfaces in their correct relationship, will properly call this composition. Finally, in looking we observe more clearly the colours of surfaces; the representation in painting of this aspect, since it receives all its variations from light, will aptly here be termed the reception of light. [P. 67]

The visual process is structured and moves in moments, and therefore the process of depiction will also be structured and move in analogous moments. We first see a thing in space and we attend to its outlines; then we see constituent surfaces within the outlines and note how they are composed; and finally, we observe the colors of surfaces and their lights. The process of seeing has exact counterparts in depiction because seeing is the construction of a picture out of pictorial elements that proceeds systematically, in an ordered sequence.

Visible things, the particulars of picture construction, and the window analogy are brought together by the mechanics and the formal principles of *perspectiva*. In practice, Alberti's system begins with the construction of a rational structure of composed surfaces—the pavement—that is, the picture space consisting of tiles that recede into the background in a precisely known and measured way. The pavement is itself a visible thing and serves as the principle of ordering and measurement for all objects that are depicted in that space. In order to depict “real objects,” the picture space must be a rational structure because our perception itself has a rational structure. Alberti states, “no objects in a painting can appear like real objects, unless they stand to each other in a determined relationship” (p. 55). The pavement is the expression of the cross section through the visual pyramid. In other words, by standing at a fixed distance and position in relation to what we are viewing, an unvarying visual pyramid is established between the viewer and the world. The window, or the picture surface, “cuts” through the pyramid at a precise point exactly perpendicular to the eye.

None of this, however, gives final definition to the window analogy and the nature of the things to be represented in the picture. Why are all

17. The mechanics of *perspectiva*, given expression in ray diagrams and the pyramid of vision, explains the material basis of sight and the point-to-point correspondences between visible objects and the *anterior glacialis* (the anterior surface of the lens) of the eye. Alberti makes use of these principles in describing the elements of vision, the pyramid of vision, and its intersection which is the surface to be painted. But these principles cannot provide him with the formal properties of vision or depiction. This may best be understood by noting that we may look at, say, a friend and fail to see the color of his jacket. The eye was impressed with the color, but we failed to attend to the jacket. The formal principles of *perspectiva* provide Alberti with the formal properties of vision which entail self-conscious attention to the aspects of sensible things.
the objects depicted shown in sharp delineation? Why does the viewer have to look out the window straight ahead rather than upward or downward? The system seems to be so patently artificial and at odds with what we ordinarily take to be the “facts” of vision that Alberti’s window analogy seems contrived in the extreme, or, perhaps, merely fanciful.18

Panofsky’s explanation of the window analogy depends upon a formulation of “direct visual experience” that is at fundamental odds with Alberti’s goals. For Panofsky, the notion of “visual experience” is an inherently subjective affair, one that defies rationalization without a corresponding distortion of the “facts” of experience. The definition of “visual experience” is posterior to the invention of the system of depiction. In other words, it is the goal of depicting what we see that leads Alberti to find a “symbolic form” for its depiction. Central to Panofsky’s analysis is the principle that the depiction of what we see can follow only from a redefinition of experienced space—by hypostatizing space it becomes possible to find a rational pictorial expression for the inherently subjective experience of seeing. Panofsky states:

It was not only that with [perspective] art was “elevated” to science (and for the Renaissance, that was an elevation); the subjective visual experience was rationalized to such an extent that it could form the foundation for the construction of a world of experience firmly grounded and yet in an entirely modern sense “infinite.” . . . What was achieved was a translation of psychophysiological space into mathematical space: in other words an objectification of the subjective.19

By characterizing what we see in terms of visual experience and by disregarding the formal principles of perspectiva, Panofsky misrepresents Alberti’s program. Alberti is not concerned with subjective experience, he is concerned with finding a means by which he can depict objects established by perception. For Alberti, there can be no issue that involves the “rationalization” of vision, because what we see is established by rational processes. The structure of perception is integral. If this were not so, we would be unable to act rationally and harmoniously in accordance with our perceptual judgments. Indeed, the very possibility of science itself is dependent upon the principle that perception has a ra-

18. Alberti’s analogy is literally fanciful: perceptual judgments about things are made in the faculty known as phantasia, the seat of self-consciousness which produces phantasmata or complete images. The phantasia, which came to be called “fancy,” consists of two organs of inner sense: the imagination and the sensus communis. “Since sight is the chief sense, the name φαντασία [phantasia] . . . is derived from φαίνομαι [phos] (light), because without light it is impossible to see” (Aristotle, On the Soul, trans. W. S. Hett [Cambridge, Mass., 1936], 429a, p. 163).

tional basis. The use of the geometry of *perspectiva* is a clear indication of the measured and reasoned basis of vision.

*Perspectiva* is a system, based in part on Aristotle’s *De Anima*, that distinguishes between the passive and active components of vision. The purpose of vision is to make certified judgments about sensible things. The passive component of vision is initiated by rays that come from the sensible objects and make an impression upon the lens of the eye. The eye “suffers” the impression. The impression initiates perceptual judgment, but the perceiver is not conscious of it. The impressed points on the eye correspond in a one-to-one fashion with points on the object. This system of points and rays can be charted geometrically and forms the material basis of sight. Forces set up by the impression are received by the *sensus communis* ("common sense"), an internal sense organ that discriminates among the many sensory “inputs” from each sense and from all of the senses. The *sensus communis* is active only when there are impressions flowing to it from the “proper” senses. The imagination, which can work in the absence of sensory stimulation, “takes” the discriminated bits and pieces from the *sensus communis* and integrates them into a judgment about the objects of sense. *Perspectiva* requires that the axial or centric ray of the eye be swept across an object in order to certify it. Each of these “sweeps” is momentary; only the imagination can grasp them in a unity, in the form of a constructed image with a rational

20. According to Aristotle, the senses allow us to identify correctly the attributes of natural things, and knowledge of attributes “contributes materially” to the knowledge of the thing’s essence. “For when we are in a position to expound all or most of the attributes as presented to us [in the *phantasia* in the form of images, or presentations], we shall also be best qualified to speak about the essence” (*On the Soul*, 402b, p. 13). This is the notion of perception that dominates *perspectiva*. All perception involves purposeful discrimination and the use of reason. Roger Bacon in his treatment of *perspectiva* gives an excellent example of how different his (and Alberti’s) notion of perception is from our own. According to Bacon, if we place a square standing on end at an oblique angle to our eyes, we will note that the more distant edge of the square makes a much smaller angle at the eye than does the foreword edge (i.e., the more distant edge looks smaller than the leading edge), “and yet, the sides are equal, and the vision perceives that sides of this kind are equal” (*The Opus Majus of Roger Bacon*, trans. Roger Belle Burke, 2 vols. [Philadelphia, 1928], 2:531). Perception establishes the way things are. It is interesting to note that Euclid’s angle axiom is sufficient in itself to determine the size or distance of objects. Two other conditions are needed, both of which are “built into” Alberti’s pavement. In addition to Bacon’s *Opus Majus*, I have relied on the following texts in my treatment of *perspectiva*: *The Opus Majus of Roger Bacon*, ed. J. H. Bridges, 3 vols. (London, 1900), vol. 2, *De Multiplicatione Specierum; John Peckham and the Science of Optics*, pp. 62–239: Alhazen, *Opticae Thesaurus*, Libri VII, ed. Federico Riserno (Basel, 1572); and David C. Lindberg, *Theories of Vision from Al-Kindi to Kepler* (Chicago, 1976). Lindberg’s book provides an excellent account of the mechanics of *perspectiva* and its history, but unfortunately he has little to say about the formal principles of vision that are crucial to an understanding of perception.

21. Strictly speaking, rays are fictions created for diagrammatic purposes. The cause of impression on the senses is properly termed “species” which is a “power” that all natural agents send off and which is received by sense organs.
structure, and make a completed judgment about the objects of sense. This activity is purposeful, and without purpose there can be no perceptual judgment.

The numerous authors of *perspectiva* were explicit about the conditions of observation that were required to make certified judgments. For example, distance and size relationships require ordered and measured distances between objects of known size. To certify judgments about distance and size, a standard of comparison, in the form of a human figure or part of a human figure, must be available to the perceiver. Such judgments do not take the form of qualified assertions. If I have certified an object, I say, for example, “It is a cube,” and not, “From where I stand it appears to be a cube.” The judgment that the object is a cube carries with it, by definition, the implication that as I move it will look different. It remains, nonetheless, a cube. Moreover, without moving, I can predict how the cube will look from another vantage point—this is assumed in a certified judgment.

Alberti’s system gives a painter the ability to depict the rational structure of perceptual judgments. Perceptions are not mere appearances, they are established judgments about objects. The whole point of the pavement is to give the viewer a means of “checking out” what is depicted. Everything in the picture can be assigned a numerical value. The pavement itself is constructed out of tiles that are one-third the size of human figures standing on them within the picture. The standard of comparison for judgment is literally built into the pavement. For Alberti, the structure of depiction is the structure of perception.

Alberti’s window is literally a frame of reference with the standard units of measurement incorporated into its periphery. By standing at a set distance and position relative to the frame, and by stipulating that objects seen through the frame remain in a set position, Alberti provides viewing conditions that are essential for the certification of individual surfaces. We are to understand the window as a plane surface, placed at a right angle to a stationary viewer, through which many individual, certified, measured, and measurable surfaces are seen. In depiction, the artist scrutinizes each surface, delineates its outlines, and fills the surface with the appropriate color and light. By careful adherence to the viewing conditions, the artist is able to compose or bring many surfaces together in their correct relationship, the standard of correctness being the viewing conditions themselves which are built into the surface of depiction. Thus, the viewer is given a warrant to make his own certified judgments about visible things depicted on the surface of the window. Without precise delineation of outlines, without a standard of comparison and a means of measuring interrelated surfaces, no such warrant could be given.

If there is a paradigm inherent in the invention of linear perspective, as Panofsky urges us to believe there is, it is the model of vision as
picture. What Alberti accomplished was not the objectification of the subjective, but rather the externalization of the internal. In a sense this was nothing new; for all structured, harmonious, and rational behavior regarding the objects of sense had been conceived of as flowing from the images of sense. What was new was the belief, formed by the confluence of artistic practice and visual theory, that the visual images that give structure to our lives had a pictorial form and that they could therefore be given artistic expression. Alberti speaks of his demonstrations of linear perspective as affecting the audience like "miracles." To an early-Renaissance lover of paintings, the sight of these pictures must have been extraordinary—something akin to looking into the soul.

The grab bag category of realistic pictures will forever defy general analysis. If we can paint what we see because we define what we see as intrinsically pictorial, we can also change our artistic or scientific accounts of what we see without abandoning the notion of its "pictorial-ness." What is certain is that the depiction of what we see will always require a defined notion of the object of vision. And as it did for Alberti, that notion will begin with our habits of depiction. There are no end runs that get us out of language or depiction to the really real, to the inchoate traces of stuff that stand in back of things or our experience of things.

If there is a given in depiction, it is the traditions and assumptions of picture making. Making may or may not precede matching, but matching always proceeds by making.