

2 The Camera Obscura and Its Subject

This kind of knowledge seems to be the truest, the most authentic, for it has the object before itself in its entirety and completeness. This bare fact of certainty, however, is really and admittedly the abstractest and the poorest kind of truth.

—G. W. F. Hegel

A prevalent tendency in methodological discussion is to approach problems of knowledge sub specie aeternitatis, as it were. Statements are compared with each other without regard to their history and without considering that they might belong to different historical strata.

—Paul Feyerabend

Most attempts to theorize vision and visuality are wedded to models that emphasize a continuous and overarching Western visual tradition. Clearly it is often strategically necessary to map the outlines of a dominant Western speculative or scopic tradition of vision in some sense continuous, for instance, from Plato to the present, or from the quattrocento into the late nine-

teenth century. My concern is not so much to argue against these models, which have their usefulness, but rather to insist that there are some important discontinuities such monolithic constructions have obscured. Again, the specific account that interests me here, one that has become almost ubiquitous and continues to be developed in a variety of forms, is that the emergence of photography and cinema in the nineteenth century is the fulfillment of a long unfolding of technological and/or ideological development in the West whereby the camera obscura evolves into the photographic camera. Such a schema implies that at each step in this evolution the same essential presuppositions about an observer's relation to the world are in place. One could name several dozen books on the history of film or photography in whose first chapter appears the obligatory seventeenth-century engraving depicting a camera obscura, as a kind of inaugural or incipient form on a long evolutionary ladder.

These models of continuity have been used by historians of divergent and even antithetical political positions. Conservatives tend to pose an account of ever-increasing progress toward verisimilitude in representation, in which Renaissance perspective and photography are part of the same quest for a fully objective equivalent of a "natural vision." In these histories of science or culture, the camera obscura is made part of the development of the sciences of observation in Europe during the seventeenth and eighteenth centuries. The accumulation of knowledge about light, lenses, and the eye becomes part of a progressive sequence of discoveries and achievements that lead to increasingly accurate investigation and representation of the physical world. Privileged events in such a sequence usually also include the invention of linear perspective in the fifteenth century, the career of Galileo, the inductive work of Newton, and the emergence of British empiricism.

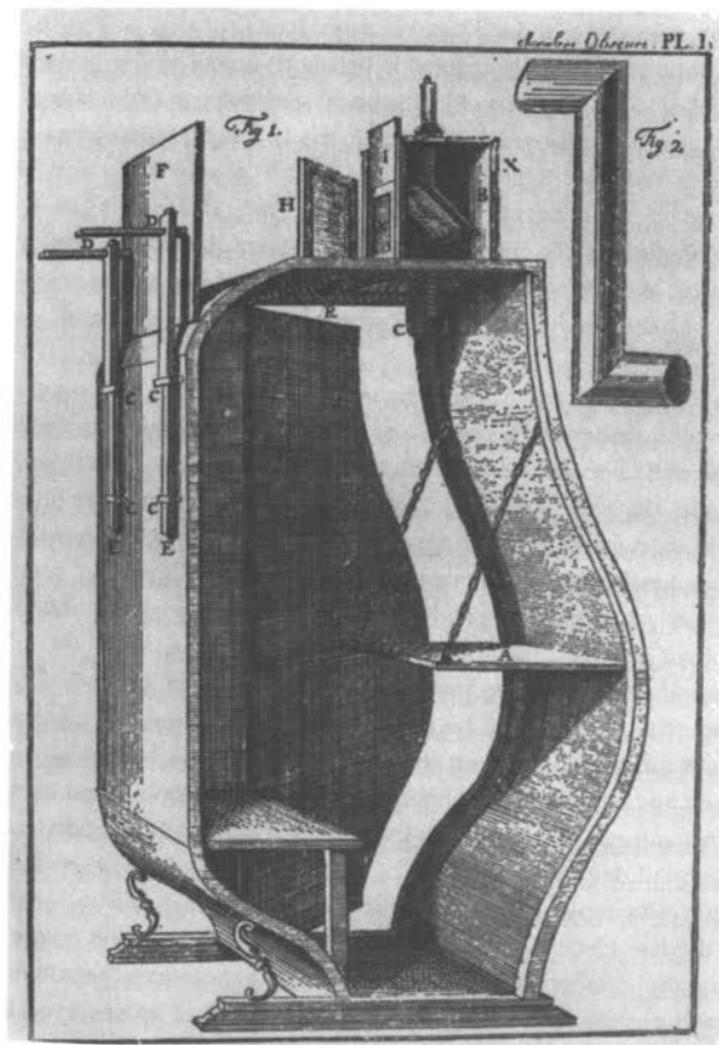
Radical historians, however, usually see the camera obscura and cinema as bound up in a single enduring apparatus of political and social power, elaborated over several centuries, that continues to discipline and regulate the status of an observer. The camera is thus seen by some as an exemplary indication of the ideological nature of representation, embodying the epistemological presumptions of "bourgeois humanism." It is often argued that the cinematic apparatus, emerging in the late nineteenth and early twentieth

centuries, perpetuates, albeit in increasingly differentiated forms, the same ideology of representation and the same transcendental subject.

What I hope to do in this chapter is briefly to articulate the camera obscura model of vision in terms of its historical specificity, in order subsequently to suggest how this model collapsed in the 1820s and 1830s, when it was displaced by radically different notions of what an observer was, and of what constituted vision. If, later in the nineteenth century, cinema or photography seem to invite formal comparisons with the camera obscura, it is within a social, cultural, and scientific milieu where there had already been a profound break with the conditions of vision presupposed by this device.

It has been known for at least two thousand years that when light passes through a small hole into a dark, enclosed interior, an inverted image will appear on the wall opposite the hole. Thinkers as remote from each other as Euclid, Aristotle, Alhazen, Roger Bacon, Leonardo, and Kepler noted this phenomenon and speculated in various ways how it might or might not be analogous to the functioning of human vision. The long history of such observations has yet to be written and is far removed from the aims and limited scope of this chapter.

It is important, however, to make a distinction between the enduring empirical fact that an image can be produced in this way and the camera obscura as a historically constructed artifact. For the camera obscura was not simply an inert and neutral piece of equipment or a set of technical premises to be tinkered with and improved over the years; rather, it was embedded in a much larger and denser organization of knowledge and of the observing subject. Historically speaking, we must recognize how for nearly two hundred years, from the late 1500s to the end of the 1700s, the structural and optical principles of the camera obscura coalesced into a dominant paradigm through which was described the status and possibilities of an observer. I emphasize that this paradigm was dominant though obviously not exclusive. During the seventeenth and eighteenth centuries the camera obscura was without question the most widely used model for explaining human vision, and for representing the relation of a perceiver and the position of a knowing subject to an external world. This highly problematic object was far more than



Portable camera obscura. Mid-eighteenth century.

simply an optical device. For over two hundred years it subsisted as a philosophical metaphor, a model in the science of physical optics, *and* was also a technical apparatus used in a large range of cultural activities.¹ For two centuries it stood as model, in both rationalist and empiricist thought, of how observation leads to truthful inferences about the world; at the same time the physical incarnation of that model was a widely used means of observing the visible world, an instrument of popular entertainment, of scientific inquiry, and of artistic practice. The formal operation of a camera obscura as an abstract diagram may remain constant, but the function of the device or metaphor within an actual social or discursive field has fluctuated decisively. The fate of the camera obscura paradigm in the nineteenth century is a case in point.² In the texts of Marx, Bergson, Freud, and others the very apparatus that a century earlier was the site of truth becomes a model for procedures and forces that conceal, invert, and mystify truth.³

1. The extensive literature on the camera obscura is summarized in Aaron Scharf, *Art and Photography* (Harmondsworth, 1974), and in Lawrence Gowing, *Vermeer* (New York, 1952). General studies not mentioned in those works are Moritz von Rohr, *Zur Entwicklung der dunkeln Kammer* (Berlin, 1925), and John J. Hammond, *The Camera Obscura: A Chronicle* (Bristol, 1981). For valuable information on the uses of the camera obscura in the eighteenth century, see Helmuth Fritzsche, *Bernardo Belotto genannt Canaletto* (Magdeburg, 1936) pp. 158–194, and Decio Gioseffi, *Canaletto; Il quaderno delle Gallerie Veneziane e l'impiego della camera ottica* (Trieste, 1959). Works on the artistic use of the camera obscura in the seventeenth century include Charles Seymour, Jr., "Dark Chamber and Light-Filled room: Vermeer and the Camera Obscura," *Art Bulletin* 46, no. 3 (September 1964), pp. 323–331; Daniel A. Fink, "Vermeer's Use of the Camera Obscura: A Comparative Study," *Art Bulletin* 53, no. 4 (December 1971), pp. 493–505; A. Hyatt Mayor, "The Photographic Eye," *Metropolitan Museum of Art Bulletin* 5, no. 1 (Summer 1946), pp. 15–26; Heinrich Schwarz, "Vermeer and the Camera Obscura," *Pantheon* 24 (May–June 1966), pp. 170–180; Arthur K. Wheelock, *Perspective, Optics, and Delft Artists Around 1650* (New York, 1977); and Joel Snyder, "Picturing Vision," *Critical Inquiry* 6 (Spring 1980), pp. 499–526.

2. Cf. Colin Murray Turbayne, *The Myth of Metaphor* (New Haven, 1962), esp. pp. 154–158, 203–208, which poses the camera obscura as a completely ahistorical concept linked with representative or copy theories of perception from antiquity to the present. An equally ahistorical discussion of the structure of modern photography and of the Cartesian camera obscura is Arthur Danto, "The Representational Character of Ideas and the Problem of the External World," in *Descartes: Critical and Interpretative Essays*, ed. Michael Hooker (Baltimore, 1978), pp. 287–298.

3. Karl Marx, *The German Ideology*, ed. C. J. Arthur (New York, 1970), p. 47; Henri Bergson, *Matter and Memory* [1896] trans. N. M. Paul and W. S. Palmer (New York, 1988), pp. 37–39; Sigmund Freud, *The Interpretation of Dreams*, trans. James Strachey (New York,

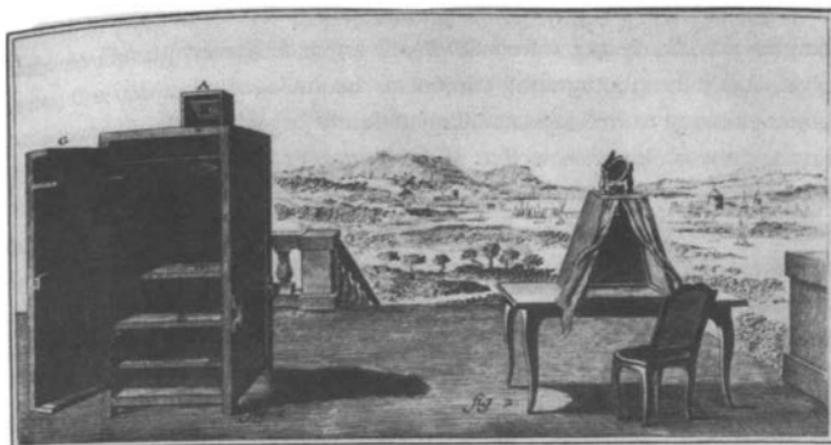
What then allows me to suggest that there is a common coherence to the status of the camera obscura in the seventeenth and eighteenth centuries, to pose this broad expanse of time as a unity? Clearly the physical and operational makeup of the camera obscura underwent continual modification during this period.⁴ For example, the first portable devices were in use by 1650, and into the late 1700s models became increasingly small. And obviously the wide range of social and representational practices associated with the instrument mutated considerably over two centuries. Yet despite the multiplicity of its local manifestations, what is extraordinary is the consistency with which certain primary features of the camera obscura are repeated throughout this period. There is a *regularity* and uniformity with which the formal relations constituted by the camera are *stated* again and again, no matter how heterogeneous or unrelated the locations of those statements.

I am hardly suggesting, however, that the camera obscura had simply a discursive identity. If we can designate it in terms of statements, every one of those statements is necessarily linked to subjects, practices, and institutions. Perhaps the most important obstacle to an understanding of the camera obscura, or of any optical apparatus, is the idea that optical device and observer are two distinct entities, that the identity of observer exists independently from the optical device that is a physical piece of technical equipment. For what constitutes the camera obscura is precisely its multiple identity, its "mixed" status as an epistemological figure within a discursive order *and* an object within an arrangement of cultural practices.⁵ The camera obscura is what Gilles Deleuze would call an *assemblage*, something that is

1955), pp. 574–575. Hegel's notion of "the inverted world" (*verkehrte Welt*) is crucial for subsequent repudiations of the camera obscura model; see *Phenomenology of Mind*, trans. J. B. Baillie (New York, 1967), pp. 203–207. See also Sarah Kofman, *Camera obscura de l'idéologie* (Paris, 1973); Constance Penley, Janet Bergstrom et al., "Critical Approaches," *Camera Obscura* no. 1 (Fall 1976), pp. 3–10; and W. J. T. Mitchell, *Iconology: Image, Text, Ideology* (Chicago, 1986), pp. 160–208.

4. For details on various models during this period, see, for example, Gioseffi, *Canaletto*, pp. 13–22.

5. "The distinctions with which the materialist method, discriminative from the outset, starts are distinctions within this highly mixed object, and it cannot present this object as mixed or uncritical enough." Walter Benjamin, *Charles Baudelaire: A Lyric Poet in the Era of High Capitalism*, trans. Harry Zohn (London, 1973), p. 103.



Camera obscuras. Mid-eighteenth century.

"simultaneously and inseparably a machinic assemblage and an assemblage of enunciation," an object about which something is said and at the same time an object that is used.⁶ It is a site at which a discursive formation intersects with material practices. The camera obscura, then, cannot be reduced either to a technological or a discursive object: it was a complex social amalgam in which its existence as a textual figure was never separable from its machinic uses.

What this implies is that the camera obscura must be extricated from the evolutionary logic of a technological determinism, central to influential historical surveys, which position it as a precursor or an inaugural event in a genealogy leading to the birth of photography.⁷ To cite Deleuze again, "Machines are social before being technical."⁸ Obviously photography had

6. Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizo-phenia*, trans. Brian Massumi (Minneapolis, 1987), p. 504.

7. Overwhelmingly, the starting point of histories of photography is the camera obscura as a photographic camera in embryo. The birth of photography is then "explained" as the fortuitous encounter of this optical device with new discoveries in photochemistry. See, for example, Helmut Gernsheim, *A Concise History of Photography* (New York, 1965), pp. 9–15; Beaumont Newhall, *The History of Photography* (New York, 1964), pp. 11–13; Josef Maria Eder, *History of Photography*, trans. Edward Epstein (New York, 1945) pp. 36–52; and Heinrich Schwarz, *Art and Photography: Forerunners and Influences* (Chicago, 1985), pp. 97–117.

8. Gilles Deleuze, *Foucault*, trans. Seán Hand (Minneapolis, 1988), p. 13.

technical and material underpinnings, and the structural principles of the two devices are clearly not unrelated. I will argue, however, that the camera obscura and the photographic camera, as assemblages, practices, and social objects, belong to two fundamentally different organizations of representation and the observer, as well as of the observer's relation to the-visible. By the beginning of the nineteenth century the camera obscura is no longer synonymous with the production of truth and with an observer positioned to see truthfully. The regularity of such statements ends abruptly; the assemblage constituted by the camera breaks down and the photographic camera becomes an essentially dissimilar object, lodged amidst a radically different network of statements and practices.

Art historians, predictably, tend to be interested in art objects, and most of them have thus considered the camera obscura for how it may have determined the formal structure of paintings or prints. Many accounts of the camera obscura, particularly those dealing with the eighteenth century, tend to consider it exclusively in terms of its use by artists for copying, and as an aid in the making of paintings. There is often a presumption that artists were making do with an inadequate substitute for what they really wanted, and which would soon appear—that is, a photographic camera.⁹ Such an emphasis imposes a set of twentieth-century assumptions, in particular a productivist logic, onto a device whose primary function was *not* to generate pictures. Copying with the camera obscura—that is, the tracing and making permanent of its image—was only one of its many uses, and even by the mid-eighteenth century was de-emphasized in a number of important accounts. The article on “camera obscura” in the *Encyclopédie*, for example, lists its uses in this order:

9. Arthur K. Wheelock proposes that the “verisimilitude” of the camera obscura satisfied the naturalistic urges of seventeenth-century Dutch painters who found perspective too mechanical and abstract. “For Dutch artists, intent on exploring the world about them, the camera obscura offered a unique means for judging what a truly natural painting should look like.” “Constantijn Huygens and Early Attitudes Towards the Camera Obscura,” *History of Photography* 1, no. 2 (April 1977), pp. 93–101. As well as proposing the highly questionable notion of a “truly natural” painting, Wheelock assumes that the device allowed a neutral, unproblematic presentation of visual “reality.” He outlines a process of stylistic change, apparently following Gombrich, in which the use of the camera obscura interacted with traditional practices and schemas to yield more lifelike images. See *Perspective, Optics, and Delft Artists*, pp. 165–184. Svetlana Alpers, *The Art of Describing* (Chicago, 1983), pp. 32–33, also asserts that the camera obscura implied a more truthful image.

"It throws great light on the nature of vision; it provides a very diverting spectacle, in that it presents images perfectly resembling their objects; it represents the colors and movements of objects better than any other sort of representation is able to do." Only belatedly does it note that "by means of this instrument someone who does not know how to draw is able nevertheless to draw with extreme accuracy."¹⁰ Noninstrumental descriptions of the camera obscura are pervasive, emphasizing it as a self-sufficient demonstration of its own activity and by analogy of human vision. For those who understood its optical underpinnings it offered the spectacle of representation operating completely transparently, and for those ignorant of its principles it afforded the pleasures of illusion. Just as perspective contained within it the disruptive possibilities of anamorphoses, however, so the veracity of the camera was haunted by its proximity to techniques of conjuration and illusion. The magic lantern that developed alongside the camera obscura had the capacity to appropriate the setup of the latter and subvert its operation by infusing its interior with reflected and projected images using artificial light.¹¹ However, this counter-deployment of the camera obscura never occupied an effective discursive or social position from which to challenge the dominant model I have been outlining here.

10. *Encyclopédie ou dictionnaire des sciences, des arts et des métiers*, vol. 3 (Paris, 1753), pp. 62–64. Earlier in the century John Harris does not mention its use by artists or the possibility of recording the projected images. Instead he emphasizes its status as a popular entertainment and a didactic illustration of the principles of vision. See his *Lexicon Technicum: or a Universal English Dictionary of Arts and Sciences* (London, 1704), pp. 264–273. William Molyneux is also silent about any artistic use of the device but closely associates it with the magic lantern and peep-shows in his *Dioptrica nova: A Treatise of dioptricks in two parts* (London, 1692), pp. 36–41. For a typical handbook on artists' use of the camera obscura see Charles-Antoine Jombert, *Méthode pour apprendre le dessein* (Paris, 1755), pp. 137–156.

11. The work of the Jesuit priest Athanasius Kircher (1602–1680) and his legendary magic-lantern technology is a crucial counter-use of classical optical systems. See his *Ars magna lucis et umbrae* (Rome, 1646), pp. 173–184. In place of the transparent access of observer to exterior, Kircher devised techniques for flooding the inside of the camera with a visionary brilliance, using various artificial light sources, mirrors, projected images, and sometimes translucent gems in place of a lens to simulate divine illumination. In contrast to the Counter-Reformation background of Kircher's practices, it's possible to make a very general association of the camera obscura with the inwardness of a modernized and Protestant subjectivity.

At the same time one must be wary of conflating the meanings and effects of the camera obscura with techniques of linear perspective. Obviously the two are related, but it must be stressed that the camera obscura defines the position of an interiorized observer to an exterior world, not just to a two-dimensional representation, as is the case with perspective. Thus the camera obscura is synonymous with a much broader kind of subject-effect; it is about far more than the relation of an observer to a certain procedure of picture making. Many contemporary accounts of the camera obscura single out as its most impressive feature its representation of movement. Observers frequently spoke with astonishment of the flickering images within the camera of pedestrians in motion or branches moving in the wind as being more life-like than the original objects.¹² Thus the phenomenological differences between the experience of a perspectival construction and the projection of the camera obscura are not even comparable. What is crucial about the camera obscura is its relation of the observer to the undemarcated, undifferentiated expanse of the world outside, and how its apparatus makes an orderly cut or delimitation of that field allowing it to be viewed, without sacrificing the vitality of its being. But the movement and temporality so evident in the camera obscura were always prior to the act of representation; movement and time could be seen and experienced, but never represented.¹³

Another key misconception about the camera obscura is that it is somehow intrinsically a "Northern" model of visibility.¹⁴ Svetlana Alpers, in particular, has developed this position in her insistence that the essential

12. See, for example, Robert Smith, *Compleat System of Opticks* (Cambridge, 1738), p. 384, and John Harris, *Lexicon Technicum*, p. 40.

13. Classical science in the seventeenth and eighteenth centuries extracted "individual realities from the complex continuum which nourished them and gave them shape, made them manageable, even intelligible, but always transformed them in essence. Cut off from those precarious aspects of phenomena that can only be called their "becoming," that is, their aleatory and transformative adventure *in time* including their often extreme sensitivity to secondary, tertiary, stochastic, or merely invisible processes, and cut off as well from their effective capacities to affect or determine in their turn effects at the heart of these same processes—the science of nature has excluded time and rendered itself incapable of thinking change or novelty in and for itself." Sanford Kwinter, *Immanence and Event* (forthcoming).

14. Much speculation about the history of the camera obscura assumes its origins are Mediterranean—that it was accidentally "discovered" when bright sunlight would enter through a small aperture in shuttered windows.

characteristics of seventeenth-century Dutch painting are inseparable from the experience in the North of the camera obscura.¹⁵ Missing, however, from her discussion is a sense of how the metaphor of the camera obscura as a figure for human vision pervaded all of Europe during the seventeenth century. She refers to her "Northern descriptive mode" as the "Keplerian mode," based on Kepler's important statements about the camera obscura and the retinal image. But Kepler (whose optical studies were done in the eclectic and hardly Northern visual culture of the Prague court of Rudolf II) was merely one of a number of major seventeenth-century thinkers in whose work the camera obscura holds a central position, including Leibniz, Descartes, Newton, and Locke.¹⁶ Over and above the question of the meanings of Dutch art, it is important to acknowledge the *transnational* character of intellectual and scientific life in Europe during this period, and more specifically the fundamental similarities linking accounts of the camera obscura, whether by rationalists or empiricists, from diverse parts of Europe.¹⁷

Although she addresses a traditional art historical problem (the style of Northern versus Italian painting), in the course of her argument Alpers makes some broad speculations about the historical role of the camera obscura. While her argument cannot be fully summarized here, she outlines a "descriptive" and empirical mode of seeing, coincident with the experience of the

15. Svetlana Alpers, *The Art of Describing: Dutch Art in the Seventeenth Century* (Chicago, 1983), pp. 27–33.

16. Alpers's omission of Descartes's account of vision and the camera obscura in *La dioptrique* (1637) is notable, given that Descartes lived in Holland for over twenty years, from 1628 to 1649, and that his optical theory was so closely related to Kepler's. The similarity of a Keplerian and a Cartesian observer tends to undermine the notion of distinct regional epistemes. On Descartes and Holland see, for example, C. Louise Thijssen, "Le cartésianisme aux Pays-Bas," in E. J. Dijksterhuis, ed., *Descartes et le cartésianisme hollandais: Etudes et documents* (Paris, 1950), pp. 183–260. Gérard Simon insists that Descartes's *La dioptrique* "only confirmed and made more precise" all the important features of Kepler's optics, including the theory of the retinal image, in "A propos de la théorie de la perception visuelle chez Kepler et Descartes," in *Proceedings of XIIIth International Congress of the History of Science*, vol. 6 (Moscow, 1974), pp. 237–245.

17. In a related problem, Erwin Panofsky noted the different uses of perspective in the North and the South, but he leaves no doubt that what these uses have in common as system and technique is far more important than regional idiosyncracies. See "Die Perspective als 'Symbolische Form,'" in *Vorträge der Bibliothek Warburg* (1924–25), pp. 258–330. (English trans. by Christopher S. Wood forthcoming from Zone Books, New York.)

camera obscura, as a permanent "artistic option" in Western art. "It is an option or pictorial mode that has been taken up at different times for different reasons and it remains unclear to what extent it should be considered to constitute, in and of itself, a historical development."¹⁸ She asserts that "the ultimate origins of photography do not lie in the fifteenth-century invention of perspective, but rather in the alternative mode of the North. Seen this way, one might say that the photographic image, the Dutch art of describing, and . . . Impressionist painting are all examples of this constant artistic option in the art of the West."¹⁹ My aim, on the contrary, is to suggest that what *separates* photography from both perspective and the camera obscura is far more significant than what they have in common.

While my discussion of the camera obscura is founded on notions of *discontinuity* and *difference*, Alpers, like many others, poses notions of both *continuity* in her lineage of the origins of photography and *identity* in her idea of an a priori observer who has perpetual access to these free-floating and transhistorical options of seeing.²⁰ If these options are "constant," the observer in question becomes removed from the specific material and historical conditions of vision. Such an argument, in its re-clothing of familiar stylistic polarities, runs the risk of becoming a kind of neo-Wölfflinism.

Standard accounts of the camera obscura routinely give some special mention of the Neapolitan savant Giovanni Battista della Porta, often identified as one of its inventors.²¹ Such details we will never know for sure, but we do have his description of a camera obscura in the widely read *Magia Naturalis* of 1558, in which he explains the use of a concave speculum to insure that the projected image will not be inverted. In the second edition of 1589, della Porta details how a concave lens can be placed in the aperture of the camera to produce a much more finely resolved image. But della Porta's significance concerns the intellectual threshold that he straddles, and how his camera obscura

18. Svetlana Alpers, *The Art of Describing*, p. 244, n37.

19. Alpers, *The Art of Describing*, p. 244, n37.

20. For an important discussion of identity and difference in historical explanation, see Fredric Jameson, "Marxism and Historicism," in *The Ideologies of Theory: Essays 1971-1986*, vol. 2 (Minneapolis, 1988), pp. 148-177.

21. See Mario Gliozzi, "L'invenzione della camera oscura," *Archivio di Storia Della Scienza* xiv (April-June 1932), pp. 221-229.

inaugurates an organization of knowledge and seeing that will undermine the Renaissance science that most of his work exemplifies.²²

The natural magic of della Porta was a conception of the world in its fundamental unity *and* a means of observing this unity: "We are persuaded that the knowledge of secret things depends upon the contemplation and the view of the whole world, namely the motion, style and fashion thereof."²³ Elsewhere della Porta insists that "one must watch the phenomena with the eyes of a lynx so that, when observation is complete, one can begin to manipulate them."²⁴ The observer here is ultimately seeking insight into a universal language of symbols and analogies that might be employed in the directing and harnessing of the forces of nature. But according to Michel Foucault, della Porta envisioned a world in which all things were adjacent to each other, linked together in a chain:

In the vast syntax of the world, the different beings adjust themselves to one another, the plant communicates with the animal, the earth with the sea, man with everything around him. . . . The relation of emulation enables things to imitate one another from one end of the universe to the other . . . by duplicating itself in a mirror the world abolishes the distance proper to it; in this way it overcomes the place allotted to each thing. But which of these images coursing through space are the original images? Which is the reality and which is the projection?²⁵

This interlacing of nature and its representation, this indistinction between reality and its projection will be abolished by the camera obscura, and instead it will institute an optical regime that will a priori separate and distinguish image from object.²⁶ In fact della Porta's account of the camera obscura was

22. Della Porta is identified as a "pre-modern" in Robert Lenoble, *Histoire de l'idée de nature* (Paris, 1969), p. 27.

23. Giovanni Battista della Porta, *Natural Magick* (London, 1658), p. 15.

24. Cited in Eugenio Garin, *Italian Humanism: Philosophy and Civic Life in the Renaissance*, trans. Peter Munz (New York, 1965), p. 190.

25. Michel Foucault, *The Order of Things*, pp. 18–19.

26. We should note della Porta's indifference to the real or illusory status of what the camera obscura makes visible: "Nothing can be more pleasant for great men and Scholars, and ingenious persons to behold; That in a dark Chamber by white sheets objected, one may see as clearly and perspicuously, as if they were before his eyes, Huntings, Banquets,

a key element in Kepler's theoretical formulation of the retinal image.²⁷ Ernst Cassirer places della Porta within the Renaissance tradition of magic, in which to contemplate an object

means to become one with it. But this unity is only possible if the subject and the object, the knower and the known, are of the same nature; they must be members and parts of one and the same vital complex. Every sensory perception is an act of fusion and reunification.²⁸

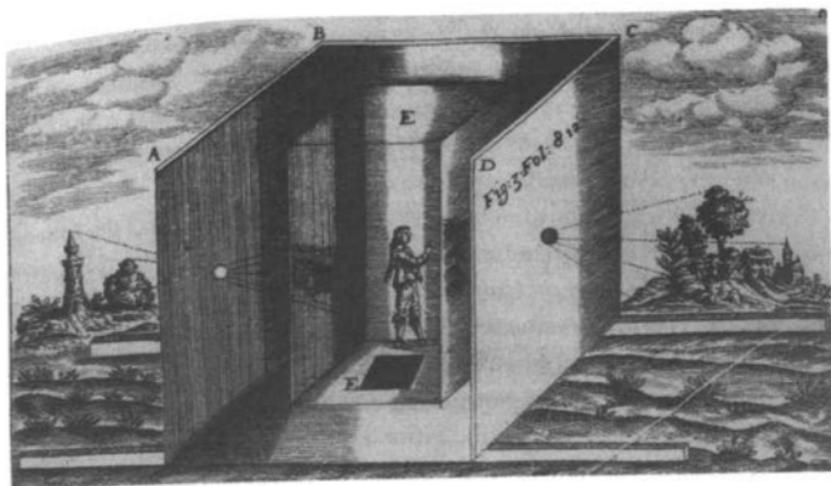
For della Porta's natural magic, the use of the camera obscura was simply one of a number of methods that allowed an observer to become more fully concentrated on a particular object; it had no exclusive priority as the site or mode of observation. But to readers of della Porta several decades later, the camera obscura seemed to promise an unrivaled and privileged means of observation that was attained finally at the cost of shattering the Renaissance adjacency of knower and known.

Beginning in the late 1500s the figure of the camera obscura begins to assume a preeminent importance in delimiting and defining the relations between observer and world. Within several decades the camera obscura is no longer one of many instruments or visual options but instead the compulsory site from which vision can be conceived or represented. Above all it indicates the appearance of a new model of subjectivity, the hegemony of a new subject-effect. First of all the camera obscura performs an operation of

Armies of Enemies, Plays and all things else that one desireth. Let there be over against that Chamber, where you desire to represent these things, some spacious Plain, where the sun can freely shine: upon that you shall set trees in Order, also Woods, Mountains, Rivers and Animals that are really so, or made by Art, of Wood, or some other matter . . . those that are in the Chamber shall see Trees, Animals, Hunters, Faces, and all the rest so plainly, that they cannot tell whether they be true or delusions: Swords drawn will glisten in at the hole." Giovanni Battista della Porta, *Natural Magick*, pp. 364–365.

27. For the influence of della Porta on Kepler, see David C. Lindberg, *Theories of Vision from Al-Kindi to Kepler* (Chicago, 1976), pp. 182–206.

28. Ernst Cassirer, *The Individual and the Cosmos in Renaissance Philosophy*, trans. Mario Domandi (Philadelphia, 1972), p. 148. For more on della Porta, see Miller H. Riensstra, *Giovanni Battista della Porta and Renaissance Science* (Ph.D. diss., University of Michigan, 1963).



Camera obscura. 1646.

individuation; that is, it necessarily defines an observer as isolated, enclosed, and autonomous within its dark confines. It impels a kind of *askesis*, or withdrawal from the world, in order to regulate and purify one's relation to the manifold contents of the now "exterior" world. Thus the camera obscura is inseparable from a certain metaphysic of interiority: it is a figure for both the observer who is nominally a free sovereign individual and a privatized subject confined in a quasi-domestic space, cut off from a public exterior world.²⁹ (Jacques Lacan has noted that Bishop Berkeley and others wrote about visual representations as if they were private property.)³⁰ At the same time, another related and equally decisive function of the camera was to sunder the act of seeing from the physical body of the observer, to decorporealize vision. The monadic viewpoint of the individual is authenticated and legitimized by the camera obscura, but the observer's physical and sensory experience is supplanted by the relations between a mechanical apparatus and a pre-given

29. Georg Lukács describes this type of artificially isolated individual in *History and Class Consciousness*, pp. 135–138. See also the excellent discussion of inwardness and sexual privatization in the seventeenth century in Francis Barker, *The Tremulous Private Body: Essays on Subjection* (London, 1984), pp. 9–69.

30. Jacques Lacan, *The Four Fundamental Concepts of Psycho-Analysis*, trans. Alan Sheridan (New York, 1978), p. 81.

world of objective truth. Nietzsche summarizes this kind of thought: "The senses deceive, reason corrects the errors; consequently, one concluded, reason is the road to the constant; the least sensual ideas must be closest to the 'true world.'—It is from the senses that most misfortunes come—they are deceivers, deluders, destroyers."³¹

Among the well-known texts in which we find the image of the camera obscura and of its interiorized and disembodied subject are Newton's *Opticks* (1704) and Locke's *Essay on Human Understanding* (1690). What they jointly demonstrate is how the camera obscura was a model simultaneously for the observation of empirical phenomena *and* for reflective introspection and self-observation. The site of Newton's inductive procedures throughout his text is the camera obscura; it is the ground on which his knowledge is made possible. Near the beginning of the *Opticks* he recounts:

In a very dark Chamber, at a round hole, about one third Part of an Inch, broad, made in the shut of a window, I placed a glass prism, whereby the Beam of the Sun's Light, which came in at that Hole, might be refracted upwards toward the opposite wall of the chamber, and there form a coloured image of the Sun.³²

The physical activity that Newton describes with the first person pronoun refers not to the operation of his own vision but rather to his deployment of a transparent, refractive means of representation. Newton is less the observer than he is the organizer, the stager of an apparatus from whose actual functioning he is physically distinct. Although the apparatus in question is not strictly a camera obscura (a prism is substituted for a plane lens or pinhole), its structure is fundamentally the same: the representation of an exterior phenomenon occurs within the rectilinear confines of a darkened room, a chamber, or, in Locke's words, an "empty cabinet."³³ The two-dimensional plane on which the image of an exterior presents itself subsists only in its specific rela-

31. Friedrich Nietzsche, *The Will to Power*, p. 317.

32. Sir Isaac Newton, *Opticks, or a Treatise of the Reflections, Refractions, Inflections and Colours of Light*, 4th ed. (1730; rpt. New York, 1952), p. 26.

33. John Locke, *An Essay Concerning Human Understanding*, ed. Alexander Campbell Fraser (New York, 1959), I,ii, 15. On some of the epistemological implications of Newton's work, see Stephen Toulmin, "The Inwardness of Mental Life," *Critical Inquiry* (Autumn 1979), pp. 1–16.

tion of distance to an aperture in the wall opposite it. But between these two locations (a point and a plane) is an indeterminate extensive space in which an observer is ambiguously situated. Unlike a perspectival construction, which also presumed to represent an objectively ordered representation, the camera obscura did not dictate a restricted site or area from which the image presents its full coherence and consistency.³⁴ On one hand the observer is disjunct from the pure operation of the device and is there as a disembodied witness to a mechanical and transcendental re-presentation of the objectivity of the world. On the other hand, however, his or her presence in the camera implies a spatial and temporal simultaneity of human subjectivity and objective apparatus. Thus the spectator is a more free-floating inhabitant of the darkness, a marginal supplementary presence independent of the machinery of representation. As Foucault demonstrated in his analysis of Velasquez's *Las Meninas*, it is a question of a subject incapable of self-representation as both subject and object.³⁵ The camera obscura *a priori* prevents the observer from seeing his or her position as part of the representation. The body then is a problem the camera could never solve except by marginalizing it into a phantom in order to establish a space of reason.³⁶ In a sense, the camera obscura is a precarious figurative resolution of what Edmund Husserl defined as the major philosophical problem of the seventeenth century: "How a philosophizing which seeks its ultimate foundations in the subjective . . . can claim an objectively 'true' and metaphysically transcendent validity."³⁷

Perhaps the most famous image of the camera obscura is in Locke's *Essay Concerning Human Understanding* (1690):

External and internal sensations are the only passages that I can find of knowledge to the understanding. These alone, as far as I can

34. Hubert Damisch has stressed that late quattrocento perspectival constructions allowed a viewer a limited field of mobility from within which the consistency of the painting was maintained, rather than from the immobility of a fixed and single point. See his *L'origine de la perspective* (Paris, 1988). See also Jacques Aumont, "Le point de vue," *Communications* 38, 1983, pp. 3–29.

35. Foucault, *The Order of Things*, pp. 3–16. See also Hubert Dreyfus and Paul Rabinow, *Michel Foucault: Beyond Structuralism and Hermeneutics* (Chicago, 1982), p. 25.

36. On Galileo, Descartes, and "the occultation of the enunciating subject in discursive activity," see Timothy J. Reiss, *The Discourse of Modernism* (Ithaca, 1982), pp. 38–43.

37. Edmund Husserl, *The Crisis of European Science and Transcendental Phenomenology*, trans. David Carr (Evanston, Ill., 1970), p. 81.

discover, are the windows by which light is let into this *dark room*. For, methinks, the understanding is not much unlike a closet wholly shut from light, with only some little opening left . . . to let in external visible resemblances, or some idea of things without; would the pictures coming into such a dark room but stay there and lie so orderly as to be found upon occasion it would very much resemble the understanding of a man.³⁸

An important feature of Locke's text here is how the metaphor of the dark room effectively distances us from the apparatus he describes. As part of his general project of introspection Locke proposes a means of visualizing spatially the operations of the intellect. He makes explicit what was implied in Newton's account of his activity in his dark chamber: the eye of the observer is completely separate from the apparatus that allows the entrance and formation of "pictures" or "resemblances." Hume also insisted on a similar relation of distance: "The operations of the mind . . . must be apprehended in an instant by a *superior* penetration, derived from nature and improved by habit and reflection."³⁹

Elsewhere in Locke's text another meaning is given to the idea of the room, of what it literally meant in seventeenth-century England to be *in camera*, that is, within the chambers of a judge or person of title. Locke writes that sensations are conveyed "from without to their audience in the brain—the mind's presence room, as I may so call it."⁴⁰ In addition to structuring the act of observation as the process by which something is observed by a subject, Locke also gives a new juridical role to the observer within the camera obscura. Thus he modifies the receptive and neutral function of the apparatus by specifying a more self-legislative and authoritative function: the camera obscura allows the subject to guarantee and police the correspondence

38. Locke, *An Essay Concerning Human Understanding*, II, xi, 17.

39. David Hume, *An Inquiry Concerning Human Understanding* (1748; New York, 1955), p. 16 (emphasis mine). A similar setup is noted in Descartes by Maurice Merleau-Ponty, where space is a "network of relations between objects such as would be seen by a witness to my vision or by a geometer looking over it and reconstructing it from the outside." "Eye and Mind," *The Primacy of Perception*, ed. James M. Edie (Evanston, Ill., 1964), p. 178. Jacques Lacan discusses Cartesian thought in terms of the formula "I see myself seeing myself," in *Four Fundamental Concepts of Psycho-Analysis*, pp. 80–81.

40. Locke, *An Essay Concerning Human Understanding*, II,iii,1.

between exterior world and interior representation and to exclude anything disorderly or unruly. Reflective introspection overlaps with a regime of self-discipline.

It is in this context that Richard Rorty asserts that Locke and Descartes describe an observer fundamentally different from anything in Greek and medieval thought. For Rorty, the achievement of these two thinkers was "the conception of the human mind as an inner space in which both pains and clear and distinct ideas passed in review before an Inner Eye. . . . The novelty was the notion of a single inner space in which bodily and perceptual sensations . . . were objects of quasi-observation."⁴¹

In this sense Locke can be linked with Descartes. In the *Second Meditation*, Descartes asserts that "perception, or the action by which we perceive, is not a vision . . . but is solely an inspection by the mind."⁴² He goes on to challenge the notion that one knows the world by means of eyesight: "It is possible that I do not even have eyes with which to see anything."⁴³ For Descartes, one knows the world "uniquely by perception of the mind," and the secure positioning of the self within an empty interior space is a precondition for knowing the outer world. The space of the camera obscura, its enclosedness, its darkness, its separation from an exterior, incarnate Descartes's "I will now shut my eyes, I shall stop my ears, I shall disregard my senses."⁴⁴ The orderly and calculable penetration of light rays through the single opening of the camera corresponds to the flooding of the mind by the light of reason, not the potentially dangerous dazzlement of the senses by the light of the sun.

There are two paintings by Vermeer in which the paradigm of the Cartesian camera obscura is lucidly represented.⁴⁵ Consider *The Geographer*

41. Richard Rorty, *Philosophy and the Mirror of Nature* (Princeton, 1979), pp. 49–50. For an opposing view, see John W. Yolton, *Perceptual Acquaintance from Descartes to Reid* (Minneapolis, 1984), pp. 222–223.

42. René Descartes, *The Philosophical Writings of Descartes*, 2 vols., trans. John Cottingham, Robert Stoothoff, and Dugald Murdoch (Cambridge, 1984), vol. 2, p. 21.

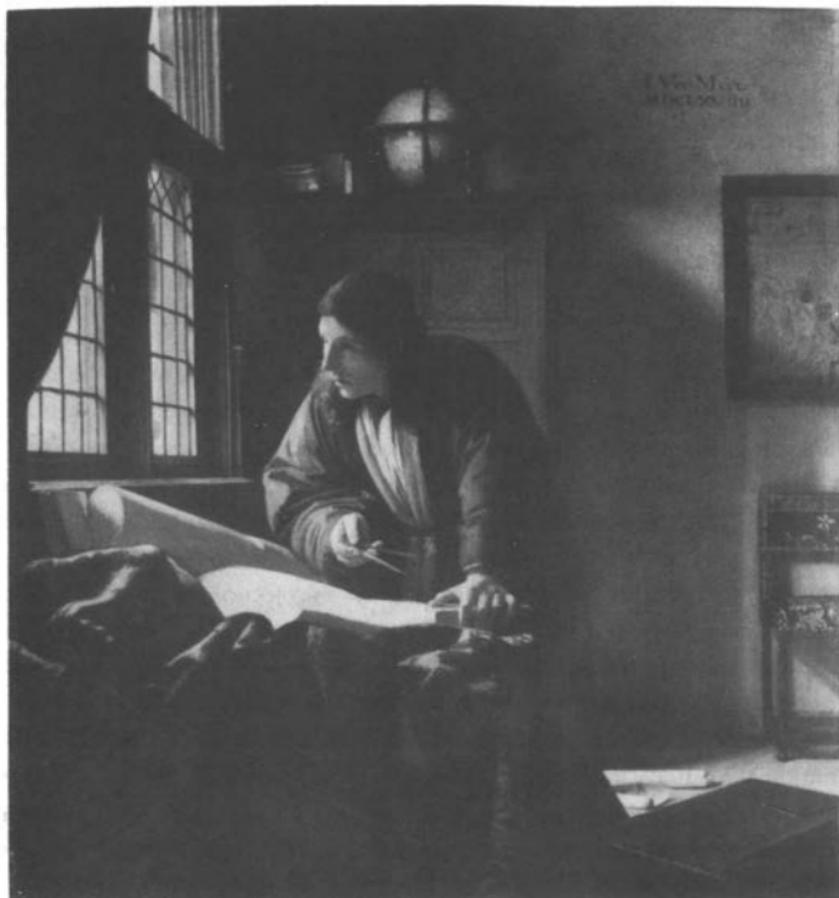
43. Descartes, *Philosophical Writings*, vol. 2, p. 21.

44. Descartes, *Philosophical Writings*, vol. 2, p. 24.

45. My discussion of Vermeer clearly does not engage any of the extensive art historical speculation about his possible use of the camera obscura in the making of his pictures (see references in footnote 1). Did he in fact use one, and if so, how did it affect the makeup of his paintings? While these are interesting questions for specialists, I am not concerned here with the answers one way or the other. Such investigations tend to reduce the prob-



Vermeer. The Astronomer. 1668.



Vermeer: *The Geographer*. c. 1668–69.

and *The Astronomer*, both painted around 1668. Each image depicts a solitary male figure absorbed in learned pursuits within the rectangular confines of a shadowy interior, an interior punctured apparently by only a single window. The astronomer studies a celestial globe, mapped out with the constellations; the geographer has before him a nautical map. Each has his eyes averted from the aperture that opens onto the outside. The exterior world is known not by direct sensory examination but through a mental survey of its “clear and distinct” representation within the room. The somber isolation of these meditative scholars within their walled interiors is not in the least an obstacle to apprehending the world outside, for the division between interiorized subject and exterior world is a pre-given condition of knowledge about the latter. The paintings then are a consummate demonstration of the reconciling function of the camera obscura: its interior is the interface between Descartes’s absolutely dissimilar *res cogitans* and *res extensa*, between observer and world.⁴⁶ The camera, or room, is the site within which an orderly projection of the world, of extended substance, is made available for inspection by the mind. The production of the camera is always a projection onto a two-dimensional surface—here maps, globes, charts, and images. Each of the thinkers, in a rapt stillness, ponders that crucial feature of the world, its extension, so mysteriously unlike the unextended immediacy of their own thoughts yet rendered intelligible to mind by the clarity of these representations, by their magnitudinal relations. Rather than opposed by the objects of their study, the earth and the heavens, the geographer and the astronomer engage in a common enterprise of observing aspects of a single indivisible exterior.⁴⁷ Both of them

lem of the camera obscura to one of optical effects and ultimately painterly style. I contend that the camera obscura must be understood in terms of how it defined the position and possibilities of an observing subject; it was *not* simply a pictorial or stylistic option, one choice among others for a neutral and ahistorical subject. Even if Vermeer never touched the mechanical apparatus of the camera obscura and other factors explain his halation of highlights and accentuated perspective, his paintings are nonetheless profoundly embedded in the larger epistemological model of the camera.

46. The affinity between Vermeer and Cartesian thought is discussed in Michel Serres, *La Traduction* (Paris, 1974), pp. 189–196.

47. Descartes rejected the scholastic distinction between a sublunary or terrestrial world and a qualitatively different celestial realm in his *Principles of Philosophy*, first pub-

(and it may well be the same man in each painting) are figures for a primal and sovereign inwardness, for the autonomous individual ego that has appropriated to itself the capacity for intellectually mastering the infinite existence of bodies in space.

Descartes's description of the camera obscura in his *La dioptrique* (1637) contains some unusual features. Initially he makes a conventional analogy between the eye and the camera obscura:

Suppose a chamber is shut up apart from a single hole, and a glass lens is placed in front of this hole with a white sheet stretched at a certain distance behind it so the light coming from objects outside forms images on the sheet. Now it is said that the room represents the eye; the hole the pupil; the lens the crystalline humour. . . .⁴⁸

But before proceeding further, Descartes advises his reader to conduct a demonstration involving "taking the dead eye of a newly dead person (or, failing that, the eye of an ox or some other large animal)" and using the extracted eye as the lens in the pinhole of a camera obscura. Thus for Descartes the images observed within the camera obscura are formed by means of a disembodied cyclopean eye, detached from the observer, possibly not even a human eye. Additionally, Descartes specifies that one

cut away the three surrounding membranes at the back so as to expose a large part of the humour without spilling any. . . . No light must enter this room except what comes through this eye, all of whose parts you know to be entirely transparent. Having done this, if you look at the white sheet you will see there, not perhaps without pleasure and wonder, a picture representing in natural perspective all the objects outside.⁴⁹

lished in Holland in 1644. "Similarly, the earth and the heavens are composed of one and the same matter; and there cannot be a plurality of worlds." *The Philosophical Writings of Descartes*, vol. 1, p. 232. Cf. Arthur K. Wheelock, *Vermeer* (New York, 1988), Abrams, p. 108.

48. Descartes, *The Philosophical Writings of Descartes*, vol. 1, p. 166; *Oeuvres philosophiques*, vol. 1, pp. 686–687.

49. Descartes, *The Philosophical Writings*, vol. 1, p. 166.

By this radical disjunction of eye from observer and its installation in this formal apparatus of objective representation, the dead, perhaps even bovine eye undergoes a kind of apotheosis and rises to an incorporeal status.⁵⁰ If at the core of Descartes's method was the need to escape the uncertainties of mere human vision and the confusions of the senses, the camera obscura is congruent with his quest to found human knowledge on a purely objective view of the world. The aperture of the camera obscura corresponds to a single, mathematically definable point, from which the world can be logically deduced by a progressive accumulation and combination of signs. It is a device embodying man's position between God and the world. Founded on laws of nature (optics) but extrapolated to a plane outside of nature, the camera obscura provides a vantage point onto the world analogous to the eye of God.⁵¹ It is an infallible metaphysical eye more than it is a "mechanical" eye.⁵² Sensory evidence was rejected in favor of the representations of the monocular apparatus, whose authenticity was beyond doubt.⁵³ Binocular disparity is bound up in the physiological operation of human vision, and a monocular device precludes having to theoretically reconcile the dissimilar, and thus

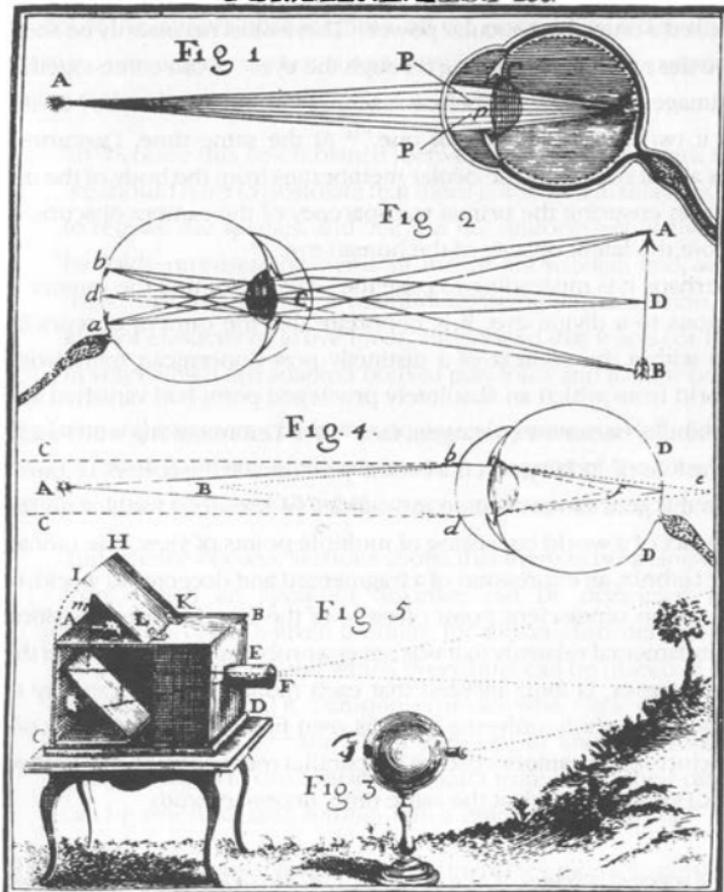
50. See the chapter "L'oeil de boeuf: Descartes et l'après-coup idéologique," in Sarah Kofman, *Camera obscura de l'idéologie*, pp. 71–76.

51. Classical science privileges a description as objective "to the extent that the observer is excluded and the description is made from a point lying de jure outside the world, that is, from the divine viewpoint to which the human soul, created as it was in God's image, had access at the beginning. Thus classical science still aims at discovering the unique truth about the world, the one language that will decipher the whole of nature." Ilya Prigogine and Isabelle Stengers, *Order Out of Chaos: Man's New Dialogue with Nature* (New York, 1984), p. 52.

52. On Descartes's fear of the distorting power of perspective, see Karsten Harries, "Descartes, Perspective, and the Angelic Eye," *Yale French Studies* no. 49 (1973), pp. 28–42. See also Paul Ricoeur, "The Question of the Subject: The Challenge of Semiology," in his *The Conflict of Interpretations*, trans. Don Ihde (Evanston, Ill., 1974), pp. 236–266. Cartesian thought, for Ricoeur, "is contemporaneous with a vision of the world in which the whole of objectivity is spread out like a spectacle on which the *cogito* casts its sovereign gaze" (p. 236).

53. The theological dimension of monocularly is suggested in Daniel Defoe, *The Consolidator: or, Memoirs of sundry transactions from the world in the moon* (London, 1705), p. 57: "A generation have risen up, who to solve the difficulties of supernatural systems, imagine a mighty vast something who has no form but what represents him to them as one Great Eye. This infinite Optik they imagine to be Natura Naturans . . . the soul of man therefore, in the opinion of these naturalists, is one vast Optik Power . . . From hence they resolve all Beings to Eyes."

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Comparison of eye and camera obscura. Early eighteenth century.

provisional, images presented to each eye. Descartes assumed that the pineal gland exercised a crucial monocular power: "There must necessarily be some place where the two images coming through the eyes . . . can come together in a single image or impression before reaching the soul, so that they do not present to it two objects instead of one."⁵⁴ At the same time, Descartes's instructions about removing the ocular membranes from the body of the eye is an operation ensuring the primal transparency of the camera obscura, of escaping from the latent opacity of the human eye.

But perhaps it is misleading to pose the vantage point of the camera as fully analogous to a divine eye. It is important that the camera obscura be understood within the context of a distinctly post-Copernican framework, within a world from which an absolutely privileged point had vanished and in which "visibility became a contingent fact."⁵⁵ It is Leibniz, along with Pascal, for whom the loss of such a point is a central problem. At the core of Leibniz's thought was the goal of reconciling the validity of universal truths with the inescapable fact of a world consisting of multiple points of view. The monad became, for Leibniz, an expression of a fragmented and decentered world, of the absence of an omniscient point of view, of the fact that every position implied a fundamental relativity that was never a problem for Descartes. At the same time, however, Leibniz insisted that each monad had the capacity to reflect in itself the whole universe from its own finite viewpoint. The conceptual structure of the camera obscura is a parallel reconciliation of a limited (or monadic) viewpoint and, at the same time, necessary truth.

54. *The Philosophical Writings of Descartes*, vol. 1, p. 340. For Jean-François Lyotard, monocularly is one of the many Western codes and procedures through which reality is constituted according to organized constants. He outlines a visual world that is subjected to continual "correction," "flattening," and elimination of irregularities in order for a unified space to emerge. See *Discours, Figure* (Paris, 1971), esp. pp. 155–160.

55. Hans Blumenberg, *The Legitimacy of the Modern Age*, trans. Robert M. Wallace (Cambridge, Mass., 1983), p. 371. "The Copernican revolution is based on the idea of an alliance between God and man, an idea characteristic of Renaissance Neoplatonism. . . . The fact that man has been expelled from the center of the universe in no way impedes faith in this alliance. *De revolutionibus* never speaks of this as a humiliation, and later Kepler never stopped praising the decentering of the earth: its orbit was for him the best possible vantage point for viewing the universe." Fernand Hallyn, *The Poetic Structure of the World: Copernicus and Kepler*, trans. Donald Leslie (New York, 1990), p. 282.

Leibniz, writing around 1703, seems generally to have accepted Locke's model of the camera obscura, but with the pivotal distinction that it is not a passive, receiving device but is endowed with an inherent capacity for structuring the ideas it receives:

To increase this resemblance [between observer and dark room] we should have to postulate that there is a screen in this dark room to receive the species, and that it is not uniform but is diversified by folds representing items of innate knowledge; and, what is more, that this screen or membrane, being under tension, has a kind of elasticity or active force, and indeed that it acts (or reacts) in ways which are adapted both to past folds and to new ones.⁵⁶

For Leibniz the camera obscura as an optical system was defined by its functional relation to a cone of vision, in which the point of the cone defined the monadic point of view. As Michel Serres has demonstrated at length:

The science of conic sections shows that there exists a single point from which an apparent disorder can be organized into a harmony. . . . For a given plurality, for a given disorder there only exists one point around which everything can be placed in order; this point exists and it is unique. From anywhere else disorder and indetermination remain. From then on, to know a plurality of things consists in discovering the point from which their disorder can be resolved, *uno intuito*, into a unique law of order.⁵⁷

The relation to a cone of rays is what distinguishes monadic perception from the divine point of view, which would be more properly a cylinder of rays. For Leibniz, "The difference between the appearance of a body for us and for God is the difference between scenography and ichnography" (that is, between

56. G. W. Leibniz, *New Essays on Human Understanding* (1765), trans. Peter Remnant and Jonathan Bennett (Cambridge, 1981), p. 144. Gilles Deleuze discusses the camera obscura in relation to baroque architecture: "The monad is the autonomy of the interior, an interior without exterior." In *Le pli: Leibniz et le Baroque* (Paris, 1988), p. 39.

57. Michel Serres, *Le Système de Leibniz et ses modèles mathématiques* (Paris, 1968), vol. 1, p. 244.

perspective and a bird's-eye view).⁵⁸ One of the most vivid examples of this scenographic perspective is in the *Monadology*:

Just as the same city regarded from different sides offers quite different aspects, and thus appears multiplied by the perspective, so it also happens that the infinite multitude of simple substances creates the appearance of as many different universes. Yet they are but perspectives of a single universe, varied according to the points of view, which differ in each monad.⁵⁹

One could consider two essentially different approaches to the representation of a city as models of Leibniz's distinction between scenography and ichnography. On one hand, Jacopo de' Barbari's *View of Venice* from 1500 exemplifies a pre-Copernican, synoptic and totalizing apprehension of the city as a unified entity.⁶⁰ It is a view completely outside the epistemological and technological conditions of the camera obscura. On the other hand, the mid-eighteenth century views of Venice by Canaletto, for example, disclose a field occupied by a monadic observer, within a city that is knowable only as the accumulation of multiple and diverse points of view.⁶¹ The career of Canaletto was bound up in a discipline of the scenographic; he was trained as a stage designer, was preoccupied with the theatricality of the city, and made use of the camera obscura.⁶² Whether it is a question of the stage, urban design, or visual imagery, the intelligibility of a given site depends on a precisely spec-

58. Letter to des Bosses, Feb. 5, 1712, quoted in Serres, *Le Système de Leibniz*, vol. 1, p. 153. Louis Marin discusses the relation between ichnographic representation and royal power in *Portrait of the King*, trans. Martha Houle (Minneapolis, 1988), pp. 169–179.

59. G. W. Leibniz, *Monadology and Other Philosophical Essays*, trans. Paul Schrecker (Indianapolis, 1965), p. 157.

60. For an important discussion of this image see Juergen Schulz, "Jacopo de' Barbari's View of Venice: Map Making, City Views, and Moralized Geography Before the Year 1500," *Art Bulletin* 60 (1978), pp. 425–474.

61. "The baroque city, on the contrary, presents itself as an open texture without reference to a privileged signifier that gives it orientation and meaning." Severo Sarduy, *Barroco* (Paris, 1975), pp. 63–64.

62. For Canaletto's use of the camera obscura, see Terisio Pignatti, *Il quaderno di disegni del Canaletto alle Gallerie di Venezia* (Milan, 1958), pp. 20–22; André Corboz, *Canaletto: una Venezia immaginaria*, vol. 1 (Milan, 1985), pp. 143–154; and W. G. Constable and J. G. Links, *Canaletto*, vol. 1 (Oxford, 1976), pp. 161–163.



Jacopo de' Barbari. View of Venice (detail). 1500.

ified relation between a delimited point of view and a tableau.⁶³ The camera obscura, with its monocular aperture, became a more perfect terminus for a cone of vision, a more perfect incarnation of a single point than the awkward binocular body of the human subject. The camera, in a sense, was a metaphor for the most rational possibilities of a perceiver within the increasingly dynamic disorder of the world.

63. Hélène Leclerc insists that by the mid-seventeenth century, beginning with the career of Bernini, a related concept of scenography traverses theatre, urban design, architecture, and visual imagery, in "La Scène d'illusion et l'hégémonie du théâtre à l'italienne," in *Histoire des Spectacles*, ed. Guy Dumur (Paris, 1965), pp. 581–624.



Antonio Canaletto. *Piazza San Marco, looking east from the northwest corner. c. 1755.*

Although Bishop Berkeley's work on vision does not discuss the camera obscura, his model of perception coincides with that presupposed by the camera. In *The Theory of Vision Vindicated* (1732), he demonstrates his familiarity with contemporary treatises on perspective:

We may suppose a diaphanous plain erected near the eye, perpendicular to the horizon, and divided into small equal squares. A straight line from the eye to the utmost limit of the horizon, passing through this diaphanous plain, as projected or represented in the perpendicular plain, would rise. The eye sees all the parts and objects in the horizontal plain through certain corresponding squares of the perpendicular diaphanous phrase. . . . It is true this diaphanous plain, and the images supposed to be projected thereon, are altogether of a tangible nature: But then there are pictures relative to those images: and those pictures have an order among themselves.⁶⁴

Even though the architectural enclosure of the camera obscura is absent, the observer here is still one who observes a projection onto a field exterior to himself, and Berkeley explicitly describes the ordered surface of this field as a grid on which the universal grammar, "the language of the Author of nature," could be known. But whether it is Berkeley's divine signs of God arrayed on a diaphanous plane, Locke's sensations "imprinted" on a white page, or Leibniz's elastic screen, the eighteenth-century observer confronts a unified space of order, unmodified by his or her own sensory and physiological apparatus, on which the contents of the world can be studied and compared, known in terms of a multitude of relationships. In Rorty's words, "It is as if the *tabula rasa* were perpetually under the gaze of the unblinking Eye of the Mind . . . it becomes obvious that the imprinting is of less interest than the observation of the imprint—all the knowing gets done, so to speak, by the Eye which observes the imprinted tablet, rather than by the tablet itself."⁶⁵

For Heidegger, Descartes's work inaugurates "the age of the world picture," but the picture to which Heidegger refers does not imply a new priority

64. George Berkeley, *The Theory of Vision Vindicated*, in *The Works of George Berkeley Bishop of Cloyne*, ed. A. A. Luce and T. E. Jessop (London, 1948–1957), vol. 1, pp. 270–271.

65. Rorty, *Philosophy and the Mirror of Nature*, pp. 143–144.

given to the sense of vision. Rather, "what belongs to the essence of the picture is standing-together, system . . . a unity that develops out of the projection of the objectivity of whatever is."⁶⁶ This is the same unity of the camera obscura, a field of projection corresponding to the space of Descartes's *mathesis universalis*, in which all objects of thought, "irrespective of subject matter," can be ordered and compared: "Our project being, not to inspect the isolated natures of things, but to compare them with each other so that some may be known on the basis of others."⁶⁷

The unity of this ground on which everything may be arranged in common finds one of its fullest expressions in the pages of the *Encyclopédie*. According to Michel Foucault, the great project of this thought is an exhaustive ordering of the world characterized by "discovery of simple elements and their progressive combination; and at their center they form a table on which knowledge is displayed contemporary with itself. The center of knowledge in the seventeenth and eighteenth centuries is the *table*."⁶⁸ Ernst Cassirer's reading of the Enlightenment, though unfashionable now, more than echoes certain parts of Foucault's construction of "classical thought." While much Anglo-American intellectual history tends to pose an atomization of cognition in this period, Cassirer sees a Leibnizian underpinning to eighteenth-century thought:

With the advent of the eighteenth-century the absolutism of the unity principle seems to lose its grip and to accept some limitations or concessions. But these modifications do not touch the core of the thought itself. For the function of unification continues to be recognized as the basic role of reason. Rational order and control of the data of experience are not possible without strict unification. To "know" a manifold of experience is to place its component parts in such a relationship to one another that, starting from a given point, we can run through them according to a constant and gen-

66. Martin Heidegger, "The Age of the World Picture," in *The Question Concerning Technology and Other Essays*, trans. William Lovitt (New York, 1977), pp. 115–54.

67. Descartes, "Rules for the Direction of the Mind," in *Philosophical Writings*, pp. 19, 21.

68. Michel Foucault, *The Order of Things* (New York, 1970), pp. 74–75. On Leibniz and the table, see Gilles Deleuze, *Le pli*, p. 38.

eral rule . . . the unknown and the known participate in a "common nature."⁶⁹

Cassirer might well have agreed with Foucault that observation in the seventeenth and eighteenth centuries is "a perceptible knowledge."⁷⁰ But it is hardly a knowledge that is organized exclusively around visibility. Although the dominance of the camera obscura paradigm does in fact imply a privilege given to vision, it is a vision that is *a priori* in the service of a nonsensory faculty of understanding that alone gives a true conception of the world. It would be completely misleading to pose the camera obscura as an early stage in an ongoing autonomization and specialization of vision that continues into the nineteenth and twentieth centuries. Vision can be privileged at different historical moments in ways that simply are not continuous with one another. Situating subjectivity within a monolithic Western tradition of scopic or specular power effaces and subsumes the singular and incommensurable procedures and regimes through which an observer has been constituted.⁷¹

For example, Berkeley's theory of perception is based on the essential dissimilarity of the senses of vision and touch, but this insistence on the heterogeneity of the senses is remote from nineteenth-century notions of the autonomy of vision and the separation of the senses.⁷² Berkeley is hardly alone

69. Ernst Cassirer, *The Philosophy of the Enlightenment*, trans. Fritz Koelln and James P. Pettegrove (Princeton, 1951), p. 23. An alternative continental reading of this aspect of eighteenth-century thought is Max Horkheimer and Theodor Adorno, *Dialectic of Enlightenment*, trans. John Cumming (New York, 1979). For them, the quantitative "unity" of Enlightenment thought was continuous with and a precondition for the technocratic domination of the twentieth century. "In advance, the Enlightenment recognized as being and occurrence only what can be apprehended in unity: its ideal is the system from which all and everything follows. Its rationalist and empiricist versions do not part company on that point. Even though the individual schools may interpret the axioms differently, the structure of scientific unity has always been the same. . . . The multiplicity of forms is reduced to position and arrangement, history to fact, things to matter" (p. 7).

70. Foucault, *The Order of Things*, p. 132. On the problem of perception in Condillac and Diderot, see Suzanne Gearhart, *Open Boundary of Fiction and History: A Critical Approach to the French Enlightenment* (Princeton, 1984), pp. 161–199.

71. See Martin Jay, "Scopic Regimes of Modernity," in *Vision and Visuality*, ed. Hal Foster (Seattle, 1988), pp. 3–27.

72. Anglo-American criticism often tends to posit a continuous development of eighteenth-century thought into nineteenth-century empiricism and associationism. A typical account is Maurice Mandelbaum, *History, Man and Reason: A Study in Nineteenth Century Thought* (Baltimore, 1971, especially pp. 147–162. After insisting on a continuity between

in the eighteenth century in his concern with achieving a fundamental harmonization of the senses, in which a key model for visual perception is the sense of touch. The Molyneux problem, which so preoccupied the thought of the eighteenth century, poses the case of a perceiver who is ignorant of one of the languages of the senses, namely sight. The best known formulation of the problem is Locke's:

Suppose a man born blind, and now adult, and taught by his touch to distinguish between a cube and a sphere of the same metal, and nighly of the same bigness, so as to tell, when he felt one and the other, which is the cube, which the sphere. Suppose then the cube and sphere placed on a table, and the blind man be made to see: *quaere*, whether *by his sight before he touched them*, he could now distinguish and tell which is the globe, which the cube?⁷³

But regardless of how the problem was ultimately answered, whether the claim was nativist or empiricist, the testimony of the senses constituted for the eighteenth century a common surface of order.⁷⁴ The problem quite simply was how the passage from one order of sense perception to another took

the thought of Locke, Condillac, and Hartley and nineteenth-century associationism, Mandelbaum concedes, "Thus, in its origins, associationism was not what James Mill and Alexander Bain later sought to make of it, a full-blown psychological system, serving to classify and relate all aspects of mental life; it was, rather, a principle used to connect a general epistemological position with more specific issues of intellectual and practical concern. Among these issues, questions concerning the foundations of morality and the relations of morality to religion had an especially important place" (p. 156). However, what Mandelbaum terms "a general epistemological position" is precisely the relative unity of Enlightenment knowledge onto which he imposes the separations and categories of the thought of his own time. Religion, morality and epistemology did not exist as discrete and separate domains.

73. John Locke, *An Essay Concerning Human Understanding*, II, ix, 8.

74. For example, see Thomas Reid, *Essays on the Powers of the Human Mind* [1785] (Edinburgh, 1819), vol. 2, pp. 115–116: "If any thing more were necessary to be said on a point so evident, we might observe, that if the faculty of seeing were in the eye, that of hearing in the ear, and so of the other senses, the necessary consequence of this would be, that the thinking principle, which I call myself, is not one but many. But this is contrary to the irresistible conviction of every man. When I say, I see, I hear, I feel, I remember, this implies that it is one and the same self that performs all these operations."

place.⁷⁵ Or for Condillac, in his famed discussion of the senses coming to life one by one in his statue, the problem was how the senses could “reconvene,” that is, come together in the perceiver.⁷⁶

But for those whose answers to Molyneux were, in one way or another, negative—a blind man suddenly restored with sight would *not* immediately recognize the objects before him—and these included Locke, Berkeley, Diderot, Condillac, and others, they share little with the physiologists and psychologists of the nineteenth century who were also, with greater scientific authority, to answer the question negatively. By insisting that knowledge, and specifically knowledge of space and depth, is built up out of an orderly accumulation and cross-referencing of perceptions on a plane independent of the viewer, eighteenth-century thought could know nothing of the ideas of pure visibility to arise in the nineteenth century. Nothing could be more removed from Berkeley’s theory of how distance is perceived than the science of the stereoscope. This quintessentially nineteenth-century device, with which tangibility (or relief) is constructed solely through an organization of *optical* cues (and the amalgamation of the observer into a component of the apparatus), eradicates the very field on which eighteenth-century knowledge arranged itself.

From Descartes to Berkeley to Diderot, vision is conceived in terms of analogies to the senses of touch.⁷⁷ Diderot’s work will be misunderstood if we do not see at the outset how deeply ambivalent he was toward vision, and how he resisted treating any phenomenon in terms of a single sense.⁷⁸ His *Letters on the Blind* (1749), in its account of Nicholas Saunderson, a blind mathematician, asserts the possibility of a tactile geometry, and that touch as well as sight carries with it the capacity for apprehending universally valid truths. The

75. See Cassirer, *The Philosophy of the Enlightenment*, p. 108. For recent discussions of the problem, see M. J. Morgan, *Molyneux’s Question: Vision, Touch and the Philosophy of Perception* (Cambridge, 1977); and Francine Markovits, “Mériam, Diderot et l’aveugle,” in J.-B. Mérian, *Sur le problème de Molyneux* (Paris, 1984), pp. 193–282.

76. Etienne de Condillac, “Traité des sensations” (1754), in *Oeuvres philosophiques de Condillac*, vol. 1, ed. Georges Le Roy (Paris, 1947–1951).

77. See Michel Serres, *Hermès ou la communication* (Paris, 1968), pp. 124–125; and Maurice Merleau-Ponty, *The Primacy of Perception*, ed. James M. Edie (Evanston, Ill., 1964), pp. 169–172.

78. On Diderot’s attitude toward the senses, see Elisabeth de Fontenay, *Diderot: Reason and Resonance*, trans. Jeffrey Mehlman (New York, 1982), pp. 157–169.

essay is not so much a depreciation of the sense of vision as it is a refutation of its exclusivity. Diderot details Saunderson's devices for calculation and demonstration, rectangular wooden boards with built-in grids marked out by raised pins. by connecting the pins with silk threads Saunderson's fingers could trace out and read an infinity of figures and their relations, all calculable by their location on the demarcated grid. Here the Cartesian table appears in another form, but its underlying status is the same. The certainty of knowledge did not depend solely on the eye but on a more general relation of a unified human sensorium to a delimited space of order on which positions could be known and compared.⁷⁹ In a sighted person the senses are dissimilar, but through what Diderot calls "reciprocal assistance" they provide knowledge about the world.

Yet despite this discourse on the senses and sensation, we are still within the same epistemological field occupied by the camera obscura and its overriding of the immediate subjective evidence of the body. Even in Diderot, a so-called materialist, the senses are conceived more as adjuncts of a rational mind and less as physiological organs. Each sense operates according to an immutable semantic logic that transcends its mere physical mode of functioning. Thus the significance of the image discussed in Diderot's *Letters on the Blind*: a blindfolded man in an outdoor space steps forward, tentatively holding a stick in each hand, extended to feel the objects and area before him. But paradoxically this is *not* an image of a man literally blind; rather it is an abstract diagram of a fully sighted observer, in which vision operates like the sense of touch. Just as the eyes are not finally what see, however, so the carnal organs of touch are also disengaged from contact with an exterior world. Of this blind and prosthesis-equipped figure that illustrated Descartes's *La dioptrique* Diderot remarks, "Neither Descartes nor those who have followed him have been able to give a clearer conception of vision."⁸⁰ This anti-optical

79. On the persistence of Cartesianism in Enlightenment thought, see Aram Vartanian, *Diderot and Descartes: A Study of Scientific Naturalism in the Enlightenment* (Princeton: 1953).

80. Diderot asserts that the person most capable of theorizing on vision and the senses would be "a philosopher who had profoundly meditated on the subject in the dark, or to adopt the language of the poets, one who had put out his eyes in order to be better acquainted with vision." *Lettres sur les aveugles*, in *Oeuvres philosophiques*, p. 87.



Illustration from 1724 edition of Descartes's La dioptrique.

notion of sight pervaded the work of other thinkers during both the seventeenth and eighteenth centuries: for Berkeley there is no such thing as visual perception of depth, and Condillac's statue effectively masters space with the help of movement and touch. The notion of vision as touch is adequate to a field of knowledge whose contents are organized as stable positions within an extensive terrain. But in the nineteenth century such a notion became incompatible with a field organized around exchange and flux, in which a knowledge bound up in touch would have been irreconcilable with the centrality of mobile signs and commodities whose identity is exclusively optical. The stereoscope, as I will show, became a crucial indication of the remapping and subsumption of the tactile within the optical.

The paintings of J.-B. Chardin are lodged within these same questions of knowledge and perception. His still lifes, especially, are a last great presentation of the classical object in all its plenitude, before it is sundered irrevocably into exchangeable and ungrounded signifiers or into the painterly traces of an autonomous vision. The slow-burning glow of Chardin's late work, an effulgence inseparable from use values, is a light soon to be eclipsed in the nineteenth century, either by the synthetic aura of the commodity or by the radiance of an artwork whose very survival demanded a denial of its mere objectivity. In his still-lifes, with their shallow, stage-like ledges populated with forms, to know something was not to behold the optical singularity of an object but to apprehend its fuller phenomenal identity simultaneously with its position on an ordered field. The aesthetic imperative by which Chardin systematizes the simple forms of everyday use and of sensory experience is close to Diderot's insistence on representing nature in its variability and flux, while at the same time deriving from that shifting knowledge universally valid ideas.⁸¹

Take, for example, Chardin's *Basket of Wild Strawberries* from around 1761. His superb cone of stacked strawberries is a sign of how rational knowledge of geometrical form can coincide with a perceptual intuition of the multiplicity and perishability of life. For Chardin, sensory knowledge and rational knowledge are inseparable. His work is both the product of empirical knowl-

81. See Diderot, *Le Rêve de D'Alembert*, in *Oeuvres philosophiques*, pp. 299–313.



J.-B. Chardin. Basket of Wild Strawberries. 1761.

edge about the contingent specificity of forms, their position within a world of social meanings, and at the same time an ideal structure founded on a deductive rational clarity. But the immediacy of sense experience is transposed to a scenic space within which the relation of one object to another has less to do with sheer optical appearances than with knowledge of isomorphisms and positions on a unified terrain. It is in the context of the Cartesian table that we should read Chardin's enumerative clarity, his groupings of objects into sets and subsets. These formal analogies are not about a surface design, but rather a permanent space across which are distributed "the non-quantitative identities and differences that separated and united things."⁸²

82. Foucault, *The Order of Things*, p. 218.

Chardin's painting is also part of the eighteenth-century preoccupation with ensuring transparency over opacity. Newtonian and Cartesian physics, notwithstanding the large divide between them, both sought to confirm the unity of a single homogeneous field in spite of the diversity of media and possibilities of refraction within it. Dioptrics (science of refraction) was of greater interest to the eighteenth century than catoptrics (reflection), and this predilection is most obviously evident in Newton's *Opticks*.⁸³ It was crucial that the distorting power of a medium, whether a lens, air, or liquid, be neutralized, and this could be done if the properties of that medium were mastered intellectually and thus rendered effectively transparent through the exercise of reason. In Chardin's *Boy Blowing Bubbles*, from around 1739, a glass filled with dull soapy liquid stands at one side of a shallow ledge, while a youth with a straw transforms that formless liquid opacity into the transparent sphere of a soap bubble situated symmetrically over the rectilinear ledge. This depicted act of effortless mastery, in which vision and touch work cooperatively (and this occurs in many of his images), is paradigmatic of Chardin's own activity as an artist. His apprehension of the coidentity of idea and matter and their finely set positions within a unified field discloses a thought for which haptic and optic are not autonomous terms but together constitute an indivisible mode of knowledge.

Thus the flickering heaviness of the atmosphere in Chardin's mature work is a medium in which vision performs like the sense of touch, passing through a space of which no fraction is empty.⁸⁴ Far from being an airless Newtonian realm, the world of Chardin's art is adjacent to a Cartesian science of a corpuscular, matter-filled reality in which there is no void, no action at a distance. And if the apocryphal stories of Chardin painting with his fingers are to be put to use, it should not be in the service of privileging timeless "painterly"

83. On the modernity of dioptrics, see Molyneux, *Dioptrica nova*, pp. 251–252. "No one denies the ancients the knowledge of Catoptricks . . . yet certainly Optick-Glasses are a modern invention."

84. See Diderot, *Oeuvres esthétiques*, ed. Paul Vernière (Paris, 1968), p. 484. See also Joseph Addison, *The Spectator*, ed. Donald F. Bond (Oxford, 1965), no. 411, June 21, 1712: "Our sight . . . may be considered as a more delicate and diffusive Kind of Touch, that spreads its self over an infinite Multitude of Bodies."



J.-B. Chardin. Boy Blowing Bubbles. 1739.

values but rather to underscore the primacy of a vision, belonging to a specific historical moment, in which tactility was fully embedded.⁸⁵

Chardin is at a vast remove from an artist like Cézanne. If Chardin is understandable in the context of the Molyneux problem and the coordination of sensory languages, Cézanne implies not just the possibility of achieving the state of a blind man suddenly restored to sight, but more importantly of retaining this “innocence” permanently. In the seventeenth and eighteenth centuries this kind of “primordial” vision simply could not be thought, even as a hypothetical possibility. In all the speculation surrounding the 1728 case of the Chesleden boy, no one was ever to suggest that a blind person restored to sight would initially see a luminous and somehow self-sufficient revelation of colored patches.⁸⁶ Instead, that inaugural moment of vision was a void that could not be spoken of or represented, because it was empty of discourse and thus of meaning. Vision for the newly sighted person took shape when words, uses, and locations could be assigned to objects. If Cézanne, Ruskin, Monet, or any other artist of the nineteenth century is able to conceive of an “innocence of the eye,” it is only because of a major reconfiguration of the observer earlier in that century.

85. See the discussion of Chardin's technique in Norman Bryson, *Word and Image: French Painting of the Ancien Regime* (Cambridge, 1981), pp. 118–119. On the relation between Rembrandt's touch and Cartesian optics, see Svetlana Alpers, *Rembrandt's Enterprise: The Studio and the Market* (Chicago, 1988), pp. 22–24. My reading of a cooperative, reciprocal relation between vision and touch in Chardin as a model of sensory attentiveness can be related to Michael Fried's notion of absorption articulated in his groundbreaking *Absorption and Theatricality: Painting and Beholder in the Age of Diderot* (Berkeley, 1980).

86. In 1728 the surgeon Cheselden performed a successful cataract operation on a fourteen-year-old boy blind from birth. See Diderot, *Lettres sur les aveugles*, p. 319; and Berkeley, *Theory of Vision Vindicated*, sec. 71. See also Jeffrey Mehlman, *Cataract: A Study in Diderot* (Middletown, Conn., 1979).