



**LIGHT IN A  
SOCIO-CULTURAL  
PERSPECTIVE**

**EDITED BY**

**Ruth Lubashevsky and Ronit Milano**

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## CHAPTER TWO

# CARTESIAN ILLUMINATIONS: TRANSFERS OF LIGHT BETWEEN THE PHYSICS AND PHILOSOPHY OF DESCARTES

STEPHAN GREGORY

### **Illumination, Divine and Profane**

The philosophical writings of Descartes are characterized by a vivid metaphorical exchange between the concepts of truth and certainty on the one hand, and the field of visual perception on the other. A metaphorological analysis as demonstrated by Hans Blumenberg in his seminal essay “Light as a Metaphor for Truth”<sup>1</sup> may show how notions originating from the field of sensual light experience migrate to theological and philosophical conceptions of truth, thus constituting a kind of “aesthetic subconscious” of the rational order of thought. Examining the processes of metaphorical intercommunication between the realm of everyday experience and philosophical reasoning can be especially instructive in the case of Descartes, since he is known for his attempt to free philosophical thinking from all that is metaphorical or ambiguous.

Being the most prominent of Cartesian light metaphors, the “natural light of reason” may be worth a closer look. Within the Cartesian epistemology, this *lumen naturale* acts as a sort of indicator light, a luminous index of truth, spreading out instantaneously once a true cognition has been attained. “A great light in the intellect,” Descartes notes in his *Meditations*, is “followed by a great inclination in the will”<sup>2</sup> to accept a judgement as true. The image of light is associated here with the idea of the immediacy, involuntariness, and irresistibility of truth. If we take such a metaphorical use of light as an act of translation from one sphere to another, this operation includes not only the transmission of an image, but also a transfer of power. Along with the apparition of light, the persuasive potentials inherent in the religious truth of revelation are

transferred to the field of subjective cognition and the power of illumination, which has always been above all reason, is now attributed to reason itself.

This kind of transaction naturally bears the danger of blasphemy. St. Augustine still counters the idea of man considering himself as light with a triple ban: “*lumen tibi esse non potes; non potes, non potes.*”<sup>3</sup> Therefore, in scholasticism the term *lumen naturale* is only used with caution. And still Descartes tries to reconcile the natural light of reason with theological doctrine by characterizing it as a God-given *facultas*. On the other hand, he grants it considerable autonomy. From Descartes on, it is no longer the light of divine illumination that guides the human practices of knowledge. What counts instead now is “the indubitable conception of a clear and attentive mind which proceeds solely from the light of reason.”<sup>4</sup>

Thus, the self-empowerment of reason can well be referred to as a change of light. It is described as such in Foucault’s *Folie et Déraison: Histoire de la folie à l’âge classique*: The rigorous division between reason and madness is accompanied by another division concerning the ways of being-in-the-light: “[Man] was to learn to dominate that great division, and bring it down to his own level; and make in himself the day and the night, and order the sun of the truth to the pale light of *his* truth.”<sup>5</sup> Foucault mentions not only a difference in light intensities (the dazzling, glistening light of Divine Revelation versus the “weak” light of the human mind), but also different types of light. The *lumen naturale* turns out to be precisely a non-natural, artificial light – one that allows man to switch arbitrarily between day and night. This conception of light as a regulated and, thus, artificial brightness corresponds to the widely-held view that pure light would leave things just as invisible as pure darkness. According to the optical *episteme* of the time, light can only serve as a medium of visibility if it is dimmed and mingled with shadows: “Just as darkness [*le tenebre*] stays invisible if it is not partially alleviated by light, pure light . . . is not visible to the human eye either.”<sup>6</sup>

Thus, the revolution in the order of truth, which began in the seventeenth century and has managed to place knowledge (in the shape of subjective certainty) above all other forms of cognition, may be referred to as a revolution of the order of light. To the extent that truth is no longer understood as something that appears by itself, but must be revealed and wrested from its concealment,<sup>7</sup> the character of light changes, too. The depreciation of the occurring, outer light (with all its dangers of deception) comes along with the empowerment of a man-made, controllable and (re)presentational light. The artificial and technical character of this new light can hardly be hidden by calling it *lumen naturale*.<sup>8</sup>

## Two-way Traffic

Beyond Blumenberg's approach, the metaphorical traffic between light and truth can also be analysed in the opposite direction. Instead of only asking how the sensual experience of light contaminates the conceptual definitions of truth and knowledge, we might also try to find out what happens to light when it is used as a metaphor and, thus, as a means of transport for truth. So the question is not only "How does truth adjust to light?" but also: "How does light adjust to truth?" To what extent are not only theories, but also the material usages and instruments of light affected by their involvement in different praxeologies of truth, dramaturgies of illumination, or scenarios of cognition?

As I would like to show, it is not light as such that serves as a metaphor for knowledge in the Early Modern Age. In fact, we are dealing with a very specific, technically configured form of light. In order to work as a metaphor for the new kind of truth, light first has to be configured and rectified in a particular way. This means, on the one hand, that those qualities of light that smoothly fit into the new order of certainty (for example, the linear spreading and the geometric calculability of light) have to be underlined and reinforced. On the other hand, there are some aspects of light, such as colour, gloss, diffraction, diffusion, and so on, that must be suppressed or discarded because they interfere with its usability as a metaphor for knowledge. In the following sections, this hypothesis will be tested on the basis of Descartes's physical theories of vision and light. To what extent can we find here a tendency to adjust vision and light to the requirements of Cartesian epistemology, to "format" them in such a way that they comply with the ideals of truth and certainty?

## Cartesian Vision

Descartes's *Dioptrique* (1637, English titles: *Optics* or *Dioptrics*) can be considered a mechanistic theory of vision. It represents the attempt to explain optical imaging and visual perception exclusively by the way in which matter interacts with motion.<sup>9</sup> With respect to anything happening before the retina, Descartes relies on the *camera obscura* model of vision known from Kepler's book *Ad Vitellionem Paralipomena* (1604).

As far as this external part of visual perception (illustrated as a geometric point-to-point-projection) is concerned, a "similitude" of representation can indeed be observed. Descartes emphasizes how perfectly the outside world is "depicted" on the back of the eye: "But you will be even more certain of this . . . taking the eye of a newly deceased man, or, for want of that, of an



ox or some other large animal . . . . Now . . . it will be easy for you to understand that if you are enclosed in the chamber P, and fix your eyes on the white body RST, you ought to see there the likeness of the objects V, X, Y.”<sup>10</sup> Descartes’s optical theory of vision ends with this description of the retinal image. All the rest of the process of vision, the further processing of images between retina and *res cogitans*, is subject to laws that have nothing to do with the idea of mimetic reproduction.

As Descartes emphasizes, mental images do not necessarily need to resemble the outside world in order for the mind to accept them as true representations. Quite the contrary is true; a representation is often more truthful if it is not completely similar to its object. Descartes illustrates this point with the example of copper plate engraving, a representational technique that seems especially suited to providing a useful, simple picture of reality precisely because of its low mimetic fidelity, i.e. due to its omissions and reductions.<sup>11</sup>

### Cartesian Light

Descartes’s *Dioptrique* (1637) (fig. 2.1) is not addressed to philosophers, but rather to craftsmen, lens-grinders and manufacturers of optical instruments. Its explicit aim is to help human perception overcome its natural limitations by means of technical enhancement.<sup>12</sup> In accordance with this pragmatic approach, Descartes does not even bother to question the nature of light. Instead he goes directly to the investigation of concrete optical phenomena, such as light refraction.<sup>13</sup> However, the explanation of these phenomena turns out to require at least the introduction of certain model-like assumptions about light.

The best-known of these models is probably the tennis analogy, in the context of which the reflection and the refraction of light are described according to the mechanical models of recoil effects and, respectively, surface penetration. Whereas here the comparison with tennis balls suggests a particle theory of light, Descartes elsewhere argues – this time by drawing an analogy with a blind man’s stick (fig. 2.2)– that it is not the particles that constitute light, but the motional impulse that runs through them.

The mechanical impact that occurs at the outer end of the cane is transmitted to the hand of the blind person without any temporal delay. In an analogous manner, it is suggested that the propagation of light should be pictured as an impulse of movement being passed on by mechanically coupled particles.

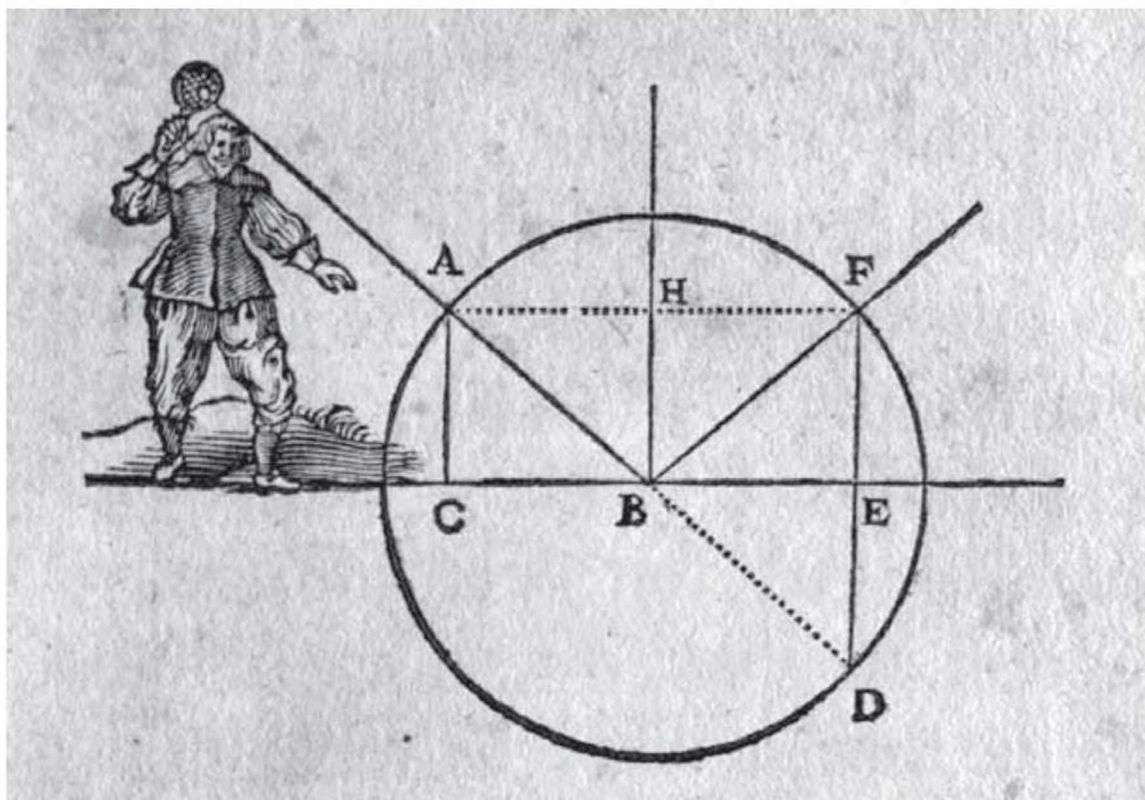


Fig. 2.1: The Tennis Ball Model, from René Descartes: *Discours de la méthode [...] plus la dioptrique*, Leyden, 1637.



Fig. 2.2: The Cane Analogy, from René Descartes: *Discours de la méthode [...] plus la dioptrique*, Leyden, 1637.

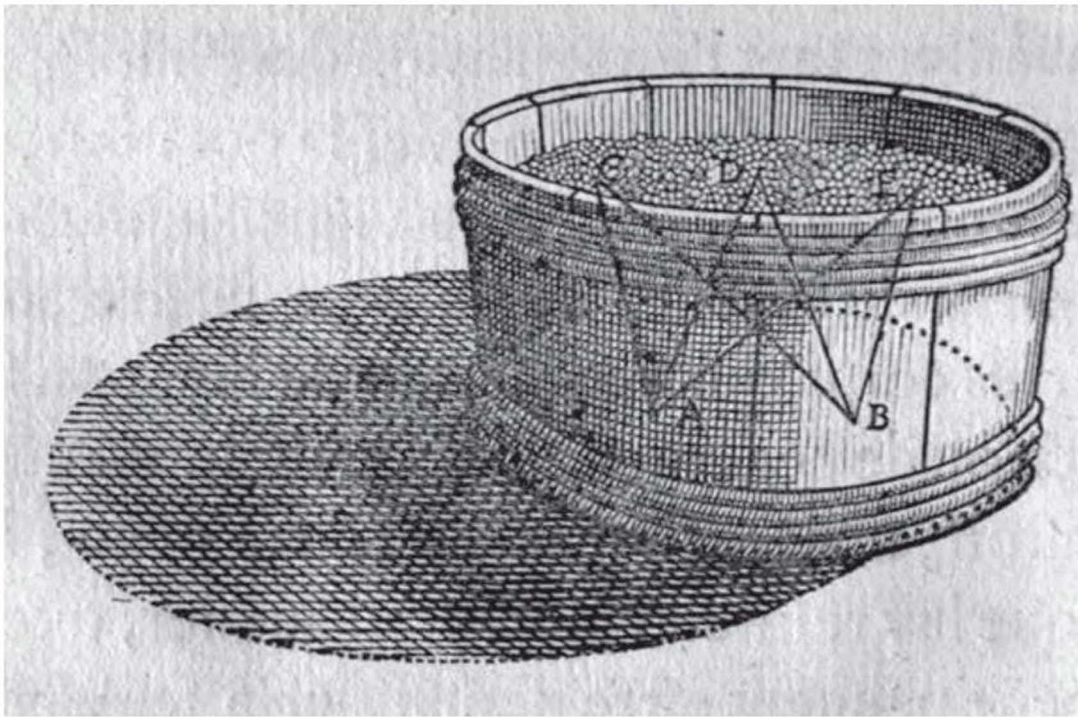


Fig. 2.3: A vat filled with grapes, from: René Descartes, *Discours de la méthode [...] plus la dioptrique*, Leyden, 1637.

A further illustration, a “vat at vintage time, completely full of half-pressed grapes,” (fig. 2.3)<sup>14</sup> also shows the deficiencies of the model. If the holes A and B in the bottom of the vat (which stand for the eyes of an observer) are opened, the grape and fluid particles will doubtlessly rush towards the openings. Yet, the resulting chaos of particles will hardly be suited to imparting the idea of a linear, instantaneous transmission of a motional impulse.

### The Idea of True Vision

The fact that Descartes’s conceptions of light and vision are modelled according to the epistemological ideal of certainty becomes especially obvious in the way Descartes distinguishes between optical qualities that imply a “clear and distinct” (and therefore truthful) perception and those qualities that do not imply such perceptions and are thus incapable of indicating truth.

As for visual cognition, this difference between optical qualities that do or do not imply truth becomes manifest in the opposition of shape and colour. The reason why the perception of shape is a superior form of cognition is that it follows “a natural geometry.”<sup>15</sup> Since, in this case, vision is considered a kind of scanning method that uses light beams as rulers, it becomes comparable with the triangulation methods of land

surveyors. Accordingly, Descartes stresses the basic substitutability of vision by the tactile sense; everything we can focus our eyes on could just as well be sensed with correspondingly extended sticks – which is also what guarantees the exactness of that form of cognition.<sup>16</sup>

Thus, shape recognition is not only superior to colour perception (which cannot be grasped by simple geometric deduction). It also has the advantage that it can be technically enhanced. Size perception, for instance, is imperfect, but its deficiencies can be compensated for artificially. All this results in a programme of technical vision designed to supplement or substitute for the deficient performance of the human senses with the reliable services of artificial organs.

### **The Truth of Light**

It now becomes evident that all the aspects of vision that are capable of truth, i.e. those that are perfectly determinable in geometric terms, are actually not of a specifically visual character. They could be replaced, for instance, by an enhanced tactile sense. So one could argue that the Cartesian epistemological programme pursues a “de-visualization of vision,” since Descartes seems to reduce the process of visual perception to a mechanism of localization that is indifferent to whether its means are eyes, sticks, or tensioned threads.<sup>17</sup> For the same reason, it would be legitimate to characterize Descartes’s notion of visual certainty in terms of a “seeing without light“, i.e., as a kind of vision that is precisely not determined by the medial specificities of light.

What could, after all, a “Cartesian image” look like? What are the concrete attributes of a visual representation that complies with the postulates of clarity and distinctness, and, therefore, is suited to show the truth? First, this representation would be colourless, for colour is only confusing, discloses nothing about objective reality, and distracts from the question of material extension, which is, after all, the only question that permits reliable judgements.<sup>18</sup> Second, the required form of depiction would grant higher priority to the exact geometric localization of an object than to capturing an impression of light. Thus, graphic techniques are to be preferred over paintings, given that the latter work with surfaces and shadings. Here it is instructive to take a second look at Descartes’ example of engravings. In contrast to, for instance, etching techniques, engravings only know black and white – only lines, no surfaces or dots. This is what determines that they will, more than any painting, capture definite contours and give quasi-geometric locational descriptions. In view of these considerations, the preliminary conclusion could be drawn here that in

spite of all the pictorial metaphors, Descartes represents an utterly unpainterly concept of vision.<sup>19</sup> Thus, following Wölfflin's famous distinction between "linear" and "painterly" images,<sup>20</sup> the Cartesian pictorial programme would have to be located on the side of the "linear."

Does this therefore mean that Descartes is the one who forever hinders the emergence of light by submitting it under the primacy of representation and forcing it into a pre-measured and pre-construed space of cognition?<sup>21</sup> Even though this notion would fit well into the widespread image according to which Descartes has to be made responsible for all the misadventures of modern subjectivity, we can plead for a pardon in this special case. On the one hand, Descartes's description of the visual process may indeed be called reductive, as it blinds out the characteristic mediality of light for the sake of geometric simplicity. Nevertheless, Descartes has also sketched a physics of light, which, inspired by models of hydromechanics, gains remarkable momentum of its own.

In the framework of the hydromechanical model, Descartes understands light as a motional impulse, induced by a rotating source of radiation and paving its way through a universe crammed with particles. The image of a vat filled with grapes, as it appears in Descartes' *Optics*, makes it difficult to imagine a linear propagation of this motional impulse.

Yet, it becomes downright impossible when we consider how Descartes imagines air particles mingling with ether particles, or when we look at the illustration of cosmic vortexes in his *Principia Philosophiae* (fig. 2.4). Considering this chaotic swarm of particles, how is the *actio*, i.e., the motional impulse of light, supposed to be passed on in a straight line?

As Descartes himself remarked, there is a noticeable divergence between the ideal geometric nature of light propagation and its medial reality. For instance, regarding the lines that indicate the direction of the motional impulse (which for Descartes are "in fact light rays"), "we should not stop thinking of them as perfectly straight."<sup>22</sup> At the same time, however, Descartes presumes that "the parts of the second element that serve to transmit this action . . . can almost never . . . make exactly straight lines."<sup>23</sup> Here, we might say that physics puts a spoke into the wheel of geometry. Descartes's theory of light propagation is meant to make light effects entirely predictable in mathematical terms, but the multiplicity of motions that come into play makes such a prediction seem practicably impossible.

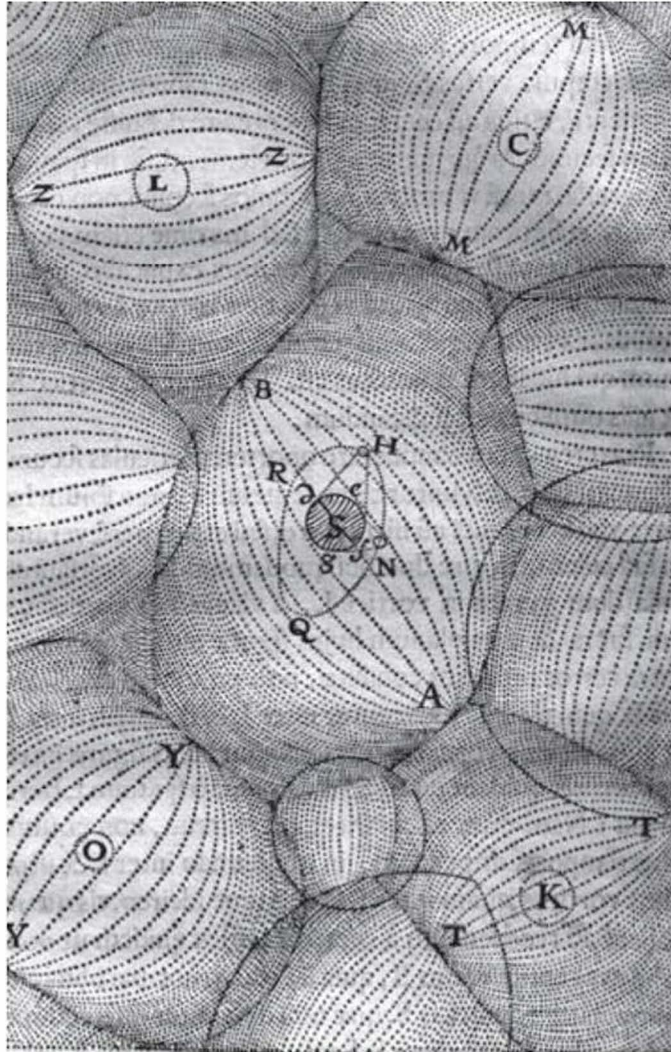


Fig 2.4: A Vortex in heavenly matter, from René Descartes, *Principia Philosophiae*, Amsterdam 1644.

Regarding his epistemological programme, Descartes is indeed an advocate of the “linear,” and can therefore be termed a “man of the Renaissance,” as Gilles Deleuze has done.<sup>24</sup> His physics of light, however, is best understood as the work of a thinker who, although involuntarily, shows a certain affinity to the “painterly,” i.e., to the Baroque. The luminous subversion of the geometric line in Descartes’ physics presents the opportunity to re-think the relationship between the Cartesian project and the pictorial programme of the Dutch painters.

Of course, a clear convergence can be observed between the “art of describing,”<sup>25</sup> which emerges in seventeenth-century Holland, and Descartes’s claim for a clear and distinct representation of external reality. It also seems plausible to establish a link between the experiments of Dutch landscape painters and the Cartesian theory of vision, especially with respect to Cartesian theory’s proposals regarding the technical

enhancement of the human eye.<sup>26</sup> Seventeenth-century Dutch painting and Descartes share the idea of artificially regulating vision for the sake of true representation.

There is, however, another point, which cannot quite as easily be reconciled with the programme of geometrical domestication. The Cartesian physics of light and the corresponding presumption of a swarm of particles being traversed by rotational and directional impulses is hardly compatible with the ideal of an exact geometric representation of the outside world. Yet, it is closely related to the practical intuitions of those artists who, living next-door to Descartes during his self-chosen Dutch exile, invented a new approach to light in painting.

Rembrandt's drawings and paintings in particular show a remarkable proximity to Descartes' conception of light. This is not only the case for the choice of subjects in some of Rembrandt's works;<sup>27</sup> it also becomes manifest in his treatment of light.

Instead of conceiving of light merely as "lighting," that is, as a source of visibility, Rembrandt appreciates the physical presence of light, making its mediality obtrude as a visual appearance of its own. As historian of science Alan E. Shapiro puts it, in Rembrandt's paintings "light seems to be a palpable presence, it exudes colour and does not merely reveal it, and surfaces glow, as if they were pushing outwards."<sup>28</sup>

In the present context, I am not so concerned with the question of whether it was philosophy that influenced painting, or painting that inspired the philosophical conceptions of light, in any case a question that could hardly be resolved. Perhaps it is enough to notice that in seventeenth-century Holland two very similar interactions between light and truth simultaneously took place on two different levels. It seems as if light itself had shown some kind of resistance against its epistemological domestication. While rational philosophers believed that light was an obedient instrument of representation, something else, something that lies beyond instrumental exploitability appeared on the horizon. Instead of being reduced to a medium of truth, light shows itself in its own truth, in the truth of its mediality.

## Notes

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<sup>1</sup> See Hans Blumenberg, "Licht als Metapher der Wahrheit," in *Ästhetische und metaphorologische Schriften*, ed. Anselm Haverkamp (Frankfurt am Main: Suhrkamp, 2001). The citations in this essay are taken from the English translation: Hans Blumenberg, "Light as a Metaphor for Truth: At the Preliminary Stage of

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Philosophical Concept Formation,” in *Modernity and the Hegemony of Vision*, ed. David M Levin (Berkeley: Univ. of California Press, 1993).

<sup>2</sup> René Descartes, *Meditations on First Philosophy: With Selections from the Objections and Replies*, ed. John Cottingham (Cambridge: Cambridge Univ. Press, 1996), 41.

<sup>3</sup> Augustinus, Sermo CLXXXII, quoted in Hans Blumenberg, “Light as a Metaphor for Truth,” 43.

<sup>4</sup> René Descartes, “Rules for the Direction of the Mind,” in *The Philosophical Writings: Translated by John Cottingham, Robert Stoothoff, and Dugald Murdoch* vol. 1 (Cambridge: Cambridge University Press, 1984), 14.

<sup>5</sup> Foucault, Michel. “Preface to the 1961 edition [of *Folie et déraison*],” in *History of madness*, ed. Jean Khalfa, (London: Routledge, 2006), xxxiv.

<sup>6</sup> Carlo Antonio Manzini, *L'occhiale all'occhio: Dioptrica pratica* (Bologna: per l'erede del Benacci, 1660), 41f. (my translation).

<sup>7</sup> See Hans Blumenberg, “Light as a Metaphor for Truth,” 52.

<sup>8</sup> Blumenberg indicated that, with the transition from God-given to man-made light, increasingly “technological figures come to invade the metaphors of light.” (ibid., 170)

<sup>9</sup> See Nancy L. Maull, “Cartesian Optics and the Geometrization of Nature,” *The Review of Metaphysics* 32, no. 2 (1978): 253.

<sup>10</sup> René Descartes, “Optics,” in *Discourse on Method, Optics, Geometry, and Meteorology.*, trans. Paul J. Olscamp, Rev. ed. (Indianapolis, IN: Hackett, 2001), 91, 94.

<sup>11</sup> See ibid., 90.

<sup>12</sup> See Neil M. Ribe, “Cartesian Optics and the Mastery of Nature,” *Isis* 88, no. 1 (1997): 44.

<sup>13</sup> See Claus Zittel, *Theatrum philosophicum: Erfahrungsmodi und Formen der Wissensrepräsentation bei Descartes* (Berlin: Akademie-Verlag, 2009), 280.

<sup>14</sup> Descartes, “Optics,” 69.

<sup>15</sup> Ibid., 106.

<sup>16</sup> See René Descartes, “Discourse on The Method for Rightly Directing One’s Reason and Searching for Truth in the Sciences,” in *Discourse on Method, Optics, Geometry, and Meteorology*, 67: “True, this sort of sensation is rather confused and obscure in those who do not have much practice with it, but consider it in those who, being born blind, have made use of it all their lives, and you will find it so perfect and so exact that one might almost say that they see with their hands . . .”

<sup>17</sup> See Dalia Judovitz, “Vision, Representation, and Technology in Descartes,” in Levin, *Modernity and the Hegemony of Vision*, 68.

<sup>18</sup> In fact, this is the aesthetic lesson French Classicism would learn from Descartes: priority of form over colour, as colour is considered a menace to truth. See Stephen Gaukroger, *Descartes: An Intellectual Biography* (Oxford, New York: Clarendon Press; Oxford University Press, 1995), 4.

<sup>19</sup> See Judovitz, “Vision, Representation, and Technology in Descartes,” 84.



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<sup>20</sup> See Heinrich Wölfflin, *Kunstgeschichtliche Grundbegriffe: Das Problem der Stilentwicklung in der neueren Kunst*, 5. Aufl. (München: Bruckmann, 1921).

<sup>21</sup> See Martin Heidegger, “Die Zeit des Weltbildes,” in *Holzwege* (Frankfurt am Main: Klostermann, 1980), 85.

<sup>22</sup> René Descartes, “Treatise on Light and Other Principal Objects of the Senses,” in *The World and Other Writings*, ed. Stephen Gaukroger (Cambridge: Cambridge Univ. Press, 1998), 64.

<sup>23</sup> Ibid.

<sup>24</sup> Gilles Deleuze, *The Fold: Leibniz and the Baroque* (Minneapolis: University of Minnesota Press, 2007), 32.

<sup>25</sup> See Svetlana Alpers, *The Art of Describing: Dutch Art in the Seventeenth Century* (Chicago: Univ. of Chicago Press., 1983).

<sup>26</sup> See Erik Larsen, “Descartes and the Rise of Naturalistic Landscape Painting in 17th Century Holland,” *Art Journal*, 24, no. 1, Autumn (1964): 12–17.

<sup>27</sup> See Cf. British Museum, „*Rembrandt – The Three Trees*“, print, (The British Museum, London) cCurator's comments, retrieved from [http://www.britishmuseum.org/research/collection\\_online/collection\\_object\\_details.aspx?objectId=756785&partId=1](http://www.britishmuseum.org/research/collection_online/collection_object_details.aspx?objectId=756785&partId=1) (accessed February 20, 2017). Here the assumption is made that the depiction of light, clouds, and rain in Rembrandt's *Three Trees* is inspired by an illustration in Descartes *Les Météores* (1637).

<sup>28</sup> Alan E. Shapiro, “In Search of Cartesian Painting: Descartes on the Nature of Light and Color,” in *Lichtgefüge des 17. Jahrhunderts: Rembrandt und Vermeer - Spinoza und Leibniz*, ed. Carolin Bohlmann, Thomas Fink, and Philipp Weiss (Paderborn, München: Fink, 2008), 39.