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## “Hobbes, Definitions, and Simplest Conceptions”<sup>†</sup>

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### Abstract

Several recent commentators argue that Thomas Hobbes's account of the nature of science is conventionalist. Engaging in scientific practice on a conventionalist account is more a matter of making sure one connects one term to another properly rather than checking one's claims, e.g., by experiment. In this paper, I argue that the conventionalist interpretation of Hobbesian science accords neither with Hobbes's theoretical account in *De corpore* and *Leviathan* nor with Hobbes's scientific practice in *De homine* and elsewhere. Closely tied to the conventionalist interpretation is the deductivist interpretation, on which it is claimed that Hobbes believed sciences such as optics are deduced from geometry. I argue that Hobbesian science places simplest conceptions as the foundation for geometry and the sciences in which we use geometry, which provides strong evidence against both the conventionalist and deductivist interpretations.

### Introduction

Thomas Hobbes is perhaps best known for his civil philosophy as represented in the *Leviathan* (1651) and *De cive* (1642), but he was also interested in the natural philosophy practiced in his day. As a result, Hobbes was conversant in the natural philosophical literature and in the dedicatory epistle to *De corpore* (1655) he mentions by name the likes of Harvey, Galileo, and others.<sup>1</sup> Hobbes was not only interested in the natural philosophy practiced in his

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<sup>1</sup> EW II, viii-ix. I will cite T. Hobbes, *The English works of Thomas Hobbes*, seven volumes, facsimile of 1839 Gulielmi Molesworth edition, Elibron Classics (New York: Adament Media, 2005) and T. Hobbes, *Thomae Hobbes malmesburiensis opera philosophica*, five volumes, Gulielmi Molesworth (London: John Bohn, 1839) as EW and OL, respectively.

day, though. He also engaged in it by doing work, for example, in the study of optics, and he considered his work in optics to rival his work in civil philosophy:

But if it be found true doctrine [...] I shall deserve the reputation of having been ye first to lay the grounds of two sciences; this of *Optiques*, ye most curious, and ye other of *Natural Justice*, which I have done in my book *De cive*, ye most profitable of all other.<sup>2</sup>

Hobbes presents his optics in *Tractatus Opticus* (1644), “A Minute or First Draught of the Optiques” (1646), and *De homine* (1658). In *De homine*, Hobbes not only works with optics generally but also discusses specific issues related to the microscope and telescope.<sup>3</sup> In *Tractatus Opticus*, Hobbes recounts testing with an airgun Descartes’ theory of refraction in *Dioptrics*.<sup>4</sup>

Several recent commentators argue that Hobbes’s account of the nature of science is conventionalist, according to which “determining scientific truth is purely a logico-linguistic matter.”<sup>5</sup> Engaging in scientific practice on such an account is more a matter of making sure one connects one term to another properly rather than checking or testing one’s claims, e.g., by experiment. In this paper, I argue that the conventionalist interpretation of Hobbesian science accords neither with Hobbes’s theoretical account in *De corpore* and *Leviathan* nor with Hobbes’s scientific practice in *De homine* and elsewhere.

First, I discuss the optics in *De homine* chapter 2 where Hobbes applies geometrical principles from *De corpore*. Second, I outline David Gauthier’s non-conventionalist account.<sup>6</sup> I then augment Gauthier’s account by arguing that simplest conceptions provide the foundation for geometry and the sciences in which we use geometry. Third, I criticize two conventionalist

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<sup>2</sup> EW VII, 471.

<sup>3</sup> See OL II, ch. 9

<sup>4</sup> See N. Malcolm, “Hobbes and the Royal Society,” in N. Malcolm (ed.), *Aspects of Hobbes* (Oxford: Oxford University Press), 317-335, here 320. Hobbes describes “putting to the test” Descartes’ conclusion and details expelling a leaden ball (*pilam plumbeam*) out of a gun (*sclopetto*); see F. Alessio (ed.), “Thomas Hobbes: *Tractatus Opticus*,” *Rivista Critica di Storia della Filosofia*, 18 (1963), 147-228, here 164. Hobbes also describes the airgun (*sclopetum pneumaticum*) in *De corpore* 30.11 (hereafter *De corpore* is abbreviated in footnotes as *DCo*) when discussing the possible cause of a bullet’s ejection (OL I, 421).

<sup>5</sup> A.P. Martinich, *Thomas Hobbes* (New York: St. Martin’s Press, 1997), 98.

<sup>6</sup> D. Gauthier, “Hobbes on Demonstration and Construction,” *Journal of the History of Philosophy*, 35 (1997), 509-521.

interpretations.<sup>7</sup> Closely tied to the conventionalist interpretation is the deductivist view, on which it is claimed that Hobbes believed that sciences such as optics are deduced from geometry. I discuss this view as it is relevant to the conventionalist interpretation.

## 1. A Case Study from Hobbesian Optics in *De homine 2*

Hobbes discusses two topics in *De homine 2*: the visual line and the perception of motion (*de linea visuali, et perceptione motus*). Hobbes desires to explain why an object appears sometimes smaller and other times larger and to explain why that object also appears sometimes one shape and other times different shapes (I also discuss below Hobbes's explanation for why objects appear in different locations). Hobbes notes that many individuals before him have tried to explain these phenomena, but no one to his knowledge has done so successfully because not one of them suspects that light and color are not striking our senses from the object; rather, he says, light and color are our phantasms (*phantasmata nostra esse*; see *De homine 2.1* for these details).<sup>8</sup> Having noted that the subject matter of the science of optics is phantasms rather than the objects themselves, Hobbes proceeds to explain the phenomena relating to the appearances of objects.<sup>9</sup>

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<sup>7</sup> Martinich, *Thomas Hobbes*; A.P. Martinich, *Hobbes* (New York: Routledge, 2005); and F.S. McNeilly, *The Anatomy of Leviathan* (New York: Macmillan, 1968). Other conventionalist interpretations include the following: T.H. Miller, "Thomas Hobbes and the Constraints that Enable the Imitation of God," *Inquiry*, 42 (1999), 149-176, here 157-58; F.C. Copleston, *A History of Philosophy*, Vol. V (London: Continuum, 2003), 20-21; E.H. Madden, "Thomas Hobbes and the Rationalist Ideal," In E. H. Madden (ed.), *Theories of Scientific Method: The Renaissance through the Nineteenth Century* (Seattle: University of Washington Press, 1960), 104-118, here 110ff; and W. Kneale and M. Kneale, *The Development of Logic* (Oxford: Oxford University Press, 1984), 311-312.

<sup>8</sup> OL II, 7.

<sup>9</sup> Alan Shapiro discusses Hobbesian optics at length ("Kinematic Optics: A Study of the Wave Theory of Light in the Seventeenth Century," *Archive for the History of the Exact Sciences*, 11 [1973], 134-266). That we work with phantasms, or images, is an essential point of Hobbes's mechanical optics (Shapiro, "Kinematic Optics," 148). Hobbes's optical theory, most completely outlined in his *Tractatus Opticus* (1644), was known to all key individuals working in 17th century optics (e.g., Descartes, Hooke, Huygens, Newton, and others), and many viewed Hobbes's account as the primary alternative to Descartes's (Shapiro, "Kinematic Optics," 143). Hobbes's optics is similar to the Cartesian account since it is mechanical (i.e., with no "species" or "spheres of activity"), and it is a continuum theory and not an emission theory, to use Shapiro's terms (Shapiro, "Kinematic Optics," 148; though, note that prior

Hobbes's two goals in *De homine* 2 are interconnected. He first establishes the visual line and then uses his argument for the visual line to explain how humans perceive motion. Before discussing the visual line, it is important first to discuss Hobbes's account of the perception of motion since the two are integrally related. Hobbes explains how we perceive motion as follows. Since all vision which occurs outside of the optic axis is confused and feeble (*extra axem opticum omnem visionem esse confusam et debilem*), to have complete vision of a moving object we must move our eye to follow it or, if the object is close and moving, we must move our head (*itaque ad perfectam rerum motarum visionem, oportet semper converti oculum, aliquando etiam, si objecta prope sint et mota velociter, totum caput*). Moving the eye or head keeps the moving object in the line of the optic axis, thus allowing clear vision. In the concluding section of "A Minute or First Draught on Optics," Hobbes argues that his theory of the optical line contradicts previous theories of vision which claimed that there were "other visuall lines by which wee see distinctly besides ye optique axis"; however, Alhazen's theory of vision also emphasizes that clear vision occurs at the perpendicular (i.e., the optic axis), arguing that refraction occurs so that rays are bent closer to the perpendicular.<sup>10</sup>

For the proofs relating to the visual line to work, Hobbes must make reference at two crucial points in the first proof relating to figure 1 (see below) to geometrical principles established in *De corpore*, part III. At *De corpore* 24.2, Hobbes argues that "[i]f a body pass, or there be generation of motion from one medium to another of different density, in a line perpendicular to the separating superficies, there will be no refraction."<sup>11</sup> Hobbes takes this

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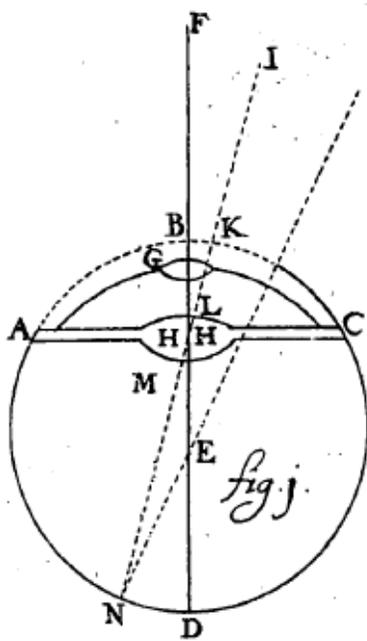
to 1636 Hobbes held to an emission theory, as Shapiro notes [Shapiro, "Kinematic Optics," 165]. Two key points of difference between Hobbesian and Cartesian optics are that the former viewed endeavor as real, insensible motion while the latter viewed endeavor as an "inclination to motion without an actual motion" and that the former held that all physical phenomena involved motion (Shapiro, "Kinematic Optics," 148, 155ff).

<sup>10</sup> EW VII, 470. For discussion of Alhazen, see D.C. Lindberg, *Theories of Vision from Al-Kindi to Kepler* (Chicago: University of Chicago Press, 1976), 73-74.

<sup>11</sup> EW I, 376.

principle about refraction from *De corpore* 24.2, which is within the section on geometry.<sup>12</sup>

Using this principle at *De homine* 2.2, he argues that the ray from visual point F in figure 1 will not be refracted (*irrefractus*) because it strikes the eye perpendicularly at point B, and thus will cross through the center of the eye and strike the retina at point D.<sup>13</sup>



*Figure 1* Diagram from *De homine* Appendix

At *De homine* 2.2, Hobbes appeals to a second geometrical principle from *De corpore*, part III when explaining why a ray from point I which strikes the eye obliquely will, having been refracted, strike the retina at point N, which is to the left of the center of the retina. After the ray from I strikes the retina at N, Hobbes argues that it strikes the center of the eye at point E, which causes point I to appear in a different location, N-E, (*punctum visum I apparebit alicubi in N E*

<sup>12</sup> It may seem strange to refer to *DCo*, part III as geometry given some of the subjects it addresses (e.g., motion and endeavor), but Hobbes explicitly notes that he is not interested in recapitulating previous geometrical work by Euclid and others. So Hobbes tells the reader that, before reading *DCo* any further, he should “take into his hands the works of Euclid, Archimedes, and other as well ancient as modern writers” (EW I, 204). As a result, Hobbes states that in part III he includes only the geometry that “...is new, and conducing to natural philosophy” (EW I, 204).

<sup>13</sup> OL II, 8.

*producta*) than it would have if the ray from point I had struck the eye through the line of vision, i.e., perpendicularly. To support his claim that the ray will strike the center of the eye at E, Hobbes uses a geometrical principle from *De corpore* 22.6 which states that when a body presses against another body without penetrating it that body will “recede in a straight line perpendicular to its superficies in that point in which it was pressed.”<sup>14</sup> This principle explains why the ray from I will appear somewhere in N-E, unlike the ray from F which will appear somewhere in D-F (*apparebitque punctum F alicubi in D F*).

Hobbes’s use of geometrical principles from *De corpore* to provide explanations of optical phenomena is the most relevant aspect of *De homine 2* for the present discussion. The first principle supports the claim that there is no refraction through the optic axis, and the second principle explains why the ray from I strikes the center of the eye at E and appears somewhere on N-E. Nowhere in *De homine 2* does Hobbes state that he has deduced his optics from geometry; rather, Hobbes uses geometrical principles in optics just like he uses definitions from *prima philosophia*, such as ‘place’, in geometry. From this case study, and elsewhere in his optical work, Hobbes treats optics as a subalternate, or “mixed,” science, wherein one uses mathematical principles in explanations of empirical phenomena, but the subalternate science is neither deduced from nor reduced to geometry.<sup>15</sup> Although Hobbes recognized that in optics he was

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<sup>14</sup> EW I, 336.

<sup>15</sup> Hobbes notes in *De homine* 2.1 (abbreviated as *DH* hereafter in footnotes) that those working in optics are seeking the “true causes of things” (*veras rerum causas*), so he sees the work in *De homine 2* as getting at true causes in the world. For discussion of Galileo and subalternate sciences, see P. Machamer, “Galileo and the Causes,” in R. Butts & J. Pitt (eds.), *New Perspectives on Galileo* (Dordrecht: Kluwer Academic, 1978); and James G. Lennox, “Aristotle, Galileo, and the ‘Mixed Sciences,’” in W. Wallace (ed.), *Reinterpreting Galileo* (Washington, DC: Catholic University of America Press, 1986). One might object to this construal of the Hobbesian scientific program by highlighting that in *Leviathan* (see EW III, 73-73) Hobbes places optics under physics rather than under geometry. As a result, one might see Hobbes as breaking from the subalternate sciences tradition (e.g., Antoni Malet, “The Power of Images: Mathematics and Metaphysics in Hobbes’s Optics,” *Studies in the History and Philosophy of Science* 32.2 [2001]: 303-333, here 317). But I do not think that Hobbes’s placing optics under physics weighs decisively against the claim that Hobbes treats optics as a subalternate science, for even Aristotle grants a distinction between mathematical optics and unqualified optics (i.e., optics ἀπλωδς). One such example is his discussion in *Posterior Analytics* I.13 where he distinguishes the disciplines of geometry, mathematical optics,

providing only the “possibility of some production or generation” (cf. *De corpore* 25.1),<sup>16</sup> he believed that he was providing explanations of empirical phenomena, and he did so by using geometrical principles.

## 2. Hobbes as Non-conventionalist

### 2.1 Gauthier against Conventionalism

F.S. McNeilly (1968) argues that in *De corpore* Hobbes holds what he calls a “self-evidence” theory. According to this view, “[m]athematics ... is derived from a set of first principles which state certain elementary truths about the world which are ‘known by themselves’.”<sup>17</sup> McNeilly argues that Hobbes did not have much to say about exactly how such principles are “known by themselves.” Gauthier agrees in part with McNeilly’s “self-evidence” reading of *De corpore*, but he disagrees with McNeilly’s opinion that Hobbes does not say much about how these principles are known.<sup>18</sup>

Gauthier focuses on Hobbes’s account of the principles of geometry. He argues that what Hobbes says should prevent one from interpreting Hobbes as “treating the truth of the definitional starting-points of geometry either as merely conventional or as self-evident.”<sup>19</sup>

Gauthier then examines the account of definitions in *De corpore* 6.13 where Hobbes distinguishes between two types: first, definitions “about words which signify things of which

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and optics ἄπλωσις. One way of reading Aristotle is to suggest that unqualified optics includes both mathematical and physical explanations (as Lennox 1986). Hobbes may think that there are simply more instances of physical explanation in optics than there are geometrical, which is why he places optics under physics; nonetheless, given his practice of optics he would grant that there are times in optics when one must look to geometry for the reason why. Malet argues (2001, 317, fn. 28) that elsewhere (e.g., in *De corpore*) Hobbes characterizes optics as a physical rather than a mathematical science, but this misses that fact that Hobbes appeals to geometrical principles as part of his explanations of geometrical phenomena.

<sup>16</sup> EW I, 388. Unlike instances of maker’s knowledge, wherein we have knowledge of causes, in natural philosophy we have only the “possibility of some production or generation.”

<sup>17</sup> McNeilly, *The Anatomy of Leviathan*, 63.

<sup>18</sup> Gauthier, “Hobbes on Demonstration and Construction,” 513.

<sup>19</sup> Gauthier, “Hobbes on Demonstration and Construction,” 513.

some causes can be understood”; and second, definitions “about words which signify things of which no cause can be understood.”<sup>20</sup>

Regarding the first type of definition, Gauthier argues that Hobbes “takes the truth of geometrical definitions to be established by our power to generate the *definiendum* by the process set out in the *definiens*.”<sup>21</sup> Rather than being based upon definitions which are true simply by convention, definitions of this sort must include “such names as express the cause or manner of their generation.”<sup>22</sup> Hobbes’s definition of a circle at *De corpore* 6.13 illustrates this: “...we define a circle to be a figure made by the circumduction of a straight line in a plane.”<sup>23</sup> These definitions must include the way in which figures such as circles can be generated by anyone who understands how to construct them. And Gauthier’s view is that such an account, which permits only generative definitions as the basis of scientific demonstrations (i.e., maker’s knowledge), frees Hobbes from the charge that geometry and other sciences are based only on definitions that are true merely by convention.

Regarding the second type of definition, Gauthier agrees with McNeilly’s view regarding self-evidence, though he demurs on whether we should characterize these definitions as “self-evident.”<sup>24</sup> That is, McNeilly argues that Hobbes holds that definitions for things of which we cannot conceive a cause, e.g., ‘body’ or ‘motion’, are simply self-evident to us. For Gauthier’s primary goal, which is to argue against a conventionalist interpretation such as Martinich’s, it is sufficient to discuss only generative definitions. As a result, Gauthier can remain non-committal regarding the status of definitions of things of which we cannot conceive a cause. In the next

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<sup>20</sup> Gauthier, “Hobbes on Demonstration and Construction,” 513-514.

<sup>21</sup> Gauthier, “Hobbes on Demonstration and Construction,” 514.

<sup>22</sup> EW I, 81.

<sup>23</sup> EW I, 81-82. Gauthier notes that with such a definition of a circle “we must assume that generative definitions of straight line and plane have already been given” (Gauthier, “Hobbes on Demonstration and Construction,” 514).

<sup>24</sup> Gauthier, “Hobbes on Demonstration and Construction,” 514.

section, I will discuss these definitions and argue that Hobbes's account of these also provides significant evidence against the conventionalist interpretation.

## *2.2 Hobbes and Simplest Conceptions*

Though Gauthier grants that definitions for things of which we cannot conceive a cause may be self-evident, it does not seem that Hobbes could agree with this construal. First, in his discussions of such definitions Hobbes does not make use of the concept 'self-evident'. Second, characterizing these definitions as self-evident makes it seem as if Hobbes were making a point about words, i.e., that these definitions need no further evidence than what they possess in themselves as words and are thus justified or warranted (or some other epistemic concept). But Hobbes does not seem to be interested in these definitions as words; rather, his focus is on the source of these definitions, which I will argue is simplest conceptions that we possess as a result of our experience of the world.

### 2.2.1 Hobbes's Account in *De corpore*

Hobbes describes *De corpore*, parts I-III as providing demonstrations from definitions. In the epistle to the reader, he notes that "in the three former parts of this book all that I have said is sufficiently demonstrated from definitions; and all in the fourth part from suppositions not absurd."<sup>25</sup> The three former parts are on logic, first philosophy, and geometry, respectively, and part IV is on physics (including sensation and sense experience). In *De corpore* 6 (part I), Hobbes is concerned with methodology, and there Hobbes describes the definitions we use when constructing geometrical figures.

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<sup>25</sup> EW I, ix.

In *De corpore* 6.6, Hobbes sketches how “the part of philosophy ... called geometry” came into existence.<sup>26</sup> He claims that definitions explicated from our “simplest conceptions” provide the basis for definitions in geometry, which contain causes or generations in them:

By the knowledge therefore of universals, and of their causes (which are the first principles by which we know the *dióti* of things) we have in the first place their definitions, (which are nothing but the explication of our simplest conceptions).<sup>27</sup>

Hobbes supplies two examples of this sort of definition, the sort of definition which he says is “nothing but the explication of our simplest conceptions” (*conceptuum*).<sup>28</sup> The definition of ‘place’ is the first example. Hobbes says that “he who has a true conception” of it “cannot be ignorant of this definition, place is that space which is possessed or filled adequately by some body.”<sup>29</sup>

The definition of ‘motion’ is the second example. Later in *De corpore* 6.13, Hobbes provides a criterion for when such a definition is satisfactory and mentions ‘motion’ again. He notes that definitions of ‘place’ and ‘motion’ are well defined when “we raise in the mind of the hearer perfect and clear ideas or conceptions of the things named (*clarae et perfectae ideae, sive conceptus in animo*), as when we define motion to be the leaving of one place, and the acquiring of another continually” (*si motum definiamus esse loci unius derelictionem, et alterius acquisitionem continuam*).<sup>30</sup> The definition of ‘motion’ will not include a particular thing moving nor provide a cause (or possible generation) in the definition (*nam etsi neque movens ullum neque causa motus in definitione illa reperiatur*), but Hobbes argues that even still “at the

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<sup>26</sup> EW I, 71.

<sup>27</sup> EW I, 70.

<sup>28</sup> The etymological meaning of explication (*explicationes*) relates to “unfolding” or “opening up (what is wrapped up)” (Oxford English Dictionary, OED Online 2nd ed. [Oxford: Oxford University Press, 1989], s.v. “explicate”).

<sup>29</sup> EW I, 71. Hobbes’s earlier discussion of ‘place’ occurs in *DCo* part II (*DCo* 7) in his discussion of first philosophy and depends on the definition of ‘space’, and his earlier discussion of ‘motion’ occurs in *DCo* part III in his discussion of geometry (beginning at *DCo* XV, EW I, 203ff). Notice that the definition of ‘motion’ in his chapters on geometry uses the definition of ‘place’. Though Hobbes uses the definition of ‘place’ from first philosophy in his geometry to define ‘motion’, nowhere does he indicate that the latter is somehow derived from the former.

<sup>30</sup> EW I, 81; OL I, 71-72.

hearing of that speech, there will come into the mind of the hearer an idea of motion clear enough” (*idea motus animo satis clare obversabitur*)<sup>31</sup> because the hearer possesses this idea from sense experience. Hobbes does not elaborate about why we cannot conceive of a cause in the case of ‘motion’ or other simplest conceptions, but one reason is that when we consider the definition of ‘motion’ we are not considering any particular thing as being in motion. When we construct a line, we must consider a particular point in motion, but when we consider the definition of ‘motion’ we do not call to mind a particular thing moving and, as a result, cannot conceive of a cause.

*De corpore* 6.6 continues with two additional points: first, Hobbes describes how one might use these definitions, e.g., ‘place’, in definitions of geometrical objects that incorporate “generations or descriptions”, such as the definition of ‘line’; and second, Hobbes details how we investigate what sort of motion has certain effects (e.g., “...what motion makes a straight line”).<sup>32</sup> These two additional steps are beyond the focus of the present paper, though the first will be discussed briefly below; what is vital to notice is the importance Hobbes gives to conceptions.

Definitions for things of which we cannot conceive a cause (e.g., ‘place’) are what Hobbes calls “explications” of our simplest conceptions that arise in sense experience. As Hobbes outlines in *De corpore* 7, the man who remained after the annihilation of the world would still have the conceptions or “ideas of the world,”<sup>33</sup> but the only way he would have had these conceptions in the first place is from the sense experiences he had before the annihilation of the world. We possess these simplest conceptions because they are ubiquitous in sense experience. Bodies, of course, do *cause* us to have these simplest conceptions, but this does not

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<sup>31</sup> EW I, 81; OL I, 71-72.

<sup>32</sup> See EW I, 70-71.

<sup>33</sup> EW I, 92. Hobbes often uses ‘conception’ and ‘idea’ as synonyms (e.g., EW I, 4, 81).

contradict Hobbes's view that we cannot *conceive* a cause of simplest conceptions like 'motion'. We are unable to conceive of a cause because when we consider their definitions they do not include causes nor do they include particular things, e.g., particular things moving.

We possess a given simplest conception, which we explicate in a definition as 'place', because that simplest conception is something we encounter in all sense experiences of bodies. For Hobbes only bodies cause our sense experience and all bodies fill a place, so anyone with any sense experience will have the simplest conception 'place'.<sup>34</sup> However, some conceptions which we form in sensory experience are caused by our own body and by not a body outside of us. For example, we do not form some of the conceptions that we associate with sensory experience, such as conceptions of colors, because the bodies outside of us are described by them. At *De corpore* 25.10, Hobbes distinguishes between conceptions we form from objects outside us and accidents not from objects outside us by arguing that "light and colour, being phantasms of the sentient, cannot be accidents of the object."<sup>35</sup>

Hobbes makes both ontological and epistemic claims about color. Regarding their ontology, colors are not properties of objects but "properties of our own bodies."<sup>36</sup> Color is nothing more than "perturbed light"<sup>37</sup> that occurs when light rays meet resistance, e.g., from prisms.<sup>38</sup> Shining light through a prism causes light rays to be refracted and "diverge from the

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<sup>34</sup> For Hobbes, the conception 'place' does not function as a proto-Kantian condition for the possibility of experience (more on this below).

<sup>35</sup> EW I, 404; also see *De homine* 2.1, OL II, 7. Hobbes's evidence is as follows: "Which is manifest enough from this, that visible objects appear oftentimes in places in which we know assuredly they are not, and that in different places they are of different colour, and may at one and the same time appear in divers places" (EW I, 404). The key term here is 'appear'. In calling them "phantasms of the sentient" and in highlighting that change of color depends upon change of place, Hobbes shows that such phantasms are consequents of *our* relation to the object (i.e., dependent upon the light rays hitting our retinæ at particular angles) and thus, color cannot be a property of objects (hence, the issue is how objects *appear* to us, not how they are).

<sup>36</sup> EW III, 26.

<sup>37</sup> *DCo* 25.10, EW I, 404.

<sup>38</sup> *DCo* 27.13, EW I, 459.

perpendicular.”<sup>39</sup> This perturbs the light and creates “four divers motions” each with a corresponding color.<sup>40</sup> So particular colors that we perceive are the result of the light rays having been perturbed by refraction either by the atmosphere, which provides a “possible cause” for the moon sometimes appearing red,<sup>41</sup> or by any other refraction, such as when rays enter the eye. Apart from location, the moon itself does not change, so the color cannot be a property of it; rather, the color is merely the perturbation of the light rays by whatever resisting media lie between the moon and us.<sup>42</sup>

The physical explanations Hobbes provides for color by appealing, e.g., to prisms, do not contradict his view that color is a phantasm of the sentient. On Hobbes’s account of the organs of sense, which he provides in *De corpore* 25.4, action is propagated through some nerve to the brain after the action of an object makes contact with the sentient’s body. This motion is further propagated between the brain and the heart, which motion is the beginning of all sense, so that if damage occurs to the pathway between them the motion will no longer be propagated and sensation will not occur.<sup>43</sup> The physical explanations Hobbes provides, then, explain why an object will appear one color sometimes and another color at other times. The difference in this action that makes contact with our body is what causes the difference in color. So when we perceive an object as one particular color we do so because the light has been perturbed in a certain way, but when the light is perturbed in a different way we perceive that same object as a different color.

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<sup>39</sup> EW I, 460.

<sup>40</sup> EW I, 461.

<sup>41</sup> *DCo* 27.14, EW I, 462-463.

<sup>42</sup> Hobbes holds this view as early as 1636, expressing in correspondence to William Cavendish that color is not “pure light” but merely “light mingled” and that we perceive color because of “motion in ye medium” and that “light and colour are but the effects of that motion in ye brayne” (N. Malcolm, *Thomas Hobbes: The Correspondence*, Vol. I [Oxford: Clarendon Press, 1994], 37-38).

<sup>43</sup> OL I, 319-320.

Hobbes also makes an epistemic claim about color. Properties such as “motion, rest, magnitude, and figure” are properties of objects, which we know because they are detected by more than one sense (i.e., sight and touch), but color is not so detected and as a result we know that it is only an appearance.<sup>44</sup> The appearance of color is produced by the object “working upon the senses,”<sup>45</sup> for without our perception of the object we would have no sensation of any particular color, but the *particular* color we perceive, as well as the apparent “place of the image”, depends “upon the fabric itself of the eye.”<sup>46</sup> Thus, Hobbes believes that we form simple conceptions from our sense experiences and these give us properties of bodies, and they are that out of which we explicate definitions such as ‘place’. Hobbes does not detail how exactly experience provides us with these conceptions, but his example of the annihilation of the world makes it clear that they arise in experience because the man who survives can think only of “what is past”<sup>47</sup> (*Leviathan* 1 relates as well, which is discussed below).

After discussing the definitions of ‘place’ and ‘motion’ in *De corpore* 6.6, Hobbes argues that we use these conceptions when constructing geometrical figures such as a line. Hobbes does not mention it here, but another definition necessary to make the transition to geometrical figures would be the definition of ‘point’, the definition of which Hobbes would arguably believe that we get from our simplest conceptions just like we get ‘place’.<sup>48</sup> With these definitions of ‘place’, ‘motion’, and ‘point’, we can then form the definition of ‘line’. Hobbes defines ‘line’ as follows:

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<sup>44</sup> EW I, 404-405. Hobbes does not describe this as a distinction between primary and secondary qualities, and though he does not discuss this topic much in *DCo*, the important point is that he identifies particular colors only with perturbed light and not at all as properties of bodies.

<sup>45</sup> EW I, 405.

<sup>46</sup> EW I, 406. Here Hobbes is not using ‘place’ as the simple conception ‘place’ but merely in the sense of the object’s location.

<sup>47</sup> EW I, 92.

<sup>48</sup> Hobbes thinks that a point is “not to be understood [as] that which has no quantity, or which cannot by any means be divided” (EW I, 206). Hobbes does not think points are indivisible; rather, they are simply “undivided.”

“a line is made by the motion of a point.”<sup>49</sup> A superficies, he says, is made “by the motion of a line.”<sup>50</sup>

Gauthier (1997) highlights these latter definitions and by appeal to these he argues Hobbes cannot be a conventionalist. But Gauthier does not notice that these definitions that contain the cause or manner of generation depend upon *already* having other definitions in place. These definitions already established depend upon our simplest conceptions that we receive from experience, and they constrain what can be constructed in geometry. These definitions are so basic to experience that no person with sense experience can be mistaken about them. This is another piece of evidence that Hobbes is not a conventionalist. That is, the definitions upon which the science of geometry depends do not come from mere convention; rather, they are explications of the simplest conceptions that we have from experience of the world. The only part left up to our will is what we do with these definitions. What we do with them is construct particular geometrical figures, and we apply names so that they may become general.

It is unsurprising that Hobbes places simplest conceptions at the foundation of the science of geometry. Hobbes’s definition of philosophy at *De corpore* 6 shows that whether one begins with effects or with the possible production or generation of effects one still starts with conceptions:

Philosophy is the knowledge (*cognitio*) we acquire, by true ratiocination, of appearances, or apparent effects, from the knowledge (*concepta*) of some possible production or generation of the same; and of such production, as has been or may be, from the knowledge (*concepto*) we have of the effects.<sup>51</sup>

To explicate these simplest conceptions and arrive at definitions we need language. In *De corpore* 1.3, Hobbes argues that we can reason at the level of conceptions without language, and

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<sup>49</sup> EW I, 70.

<sup>50</sup> EW I, 70.

<sup>51</sup> EW I, 65-66; cf. OL I, 58. I have included the Molesworth translation and highlighted the confusion Molesworth introduces by blurring over the distinction between *cognitio* and *conceptus*, both of which he translates as ‘knowledge’.

he provides an example of seeing something in the distance and adding and subtracting conceptions “without the use of words.”<sup>52</sup> To move beyond the level of the particular, we impose names on our conceptions, which serve as “signs of our conceptions” (*conceptuum*).<sup>53</sup> Hobbes believes that he can apply geometrical principles to problems in optics because the source of the definitions used in geometry is our simplest conceptions. One reason Hobbes believes he can do this is because the simplest conceptions he uses to develop these possible explanations of optical phenomena are from sense experience. On a conventionalist reading of Hobbes, however, it would be complete luck if the principles of geometry, which would have no reference to the world (see fn. 105), turned out to be applicable in the science of optics.

In the next section, I argue that in *Leviathan* Hobbes also argues that we begin with simplest conceptions that we receive in experience. However, since *Leviathan* is a text about civil philosophy the focus is different. Hobbes’s goal in *Leviathan* is not to give a complete account of science; rather, he discusses only what is germane to the science of politics or the citizen.<sup>54</sup>

### 2.2.2 Hobbes’s Account in *Leviathan*

In *Leviathan* 1, Hobbes argues that our knowledge depends upon conceptions formed from sense experience. There he argues that “the original of them all, is that which we call sense, for there is no conception in a man’s mind, which hath not at first, totally, or by parts, been

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<sup>52</sup> EW I, 3-4. We can ratiocinate “without the use of words” like when “a man see[s] something afar off and obscurely although no appellation had yet been given to anything he will notwithstanding have the same idea (*ideam*) of that thing for which now by imposing a name on it we call it body” (EW I, 3-4). To this, the man adds new ideas like ‘animated’ when he sees the thing better. Hobbes often uses ‘idea’ as a synonym for ‘conception’ (see fn. 32).

<sup>53</sup> EW I, 17.

<sup>54</sup> For example, Hobbes does not discuss everything relating to the “natural cause of sense” because it “is not very necessary to the business now in hand” (EW III, 1).

begotten upon the organs of sense.”<sup>55</sup> Since we form conceptions only from what we receive through the senses, it is impossible for us to have a conception of the infinite.<sup>56</sup> Thus, we are unable to have a conception of God, so God’s name is used not as a sign that will raise a conception in another’s mind; rather, it is used only “that we may honor him.”<sup>57</sup> Following this discussion of God’s name in *Leviathan* 3, Hobbes reiterates that “whatsoever ... we conceive, has been perceived first by sense, either all at once, or by parts.”<sup>58</sup>

Hobbes provides examples of the conceptions we receive from experience, which are similar to those he discusses in *De corpore*. He notes that “[n]o man therefore can conceive any thing, but he must conceive it in some place; and indued with some determinate magnitude; and which may be divided into parts...”<sup>59</sup> It is crucial to note that ‘place’ does not function as some sort of proto-Kantian condition for the possibility of experience; rather, for Hobbes given the experiences that we have we can conceive of bodies only in some place because this is the only way in which we ever encounter bodies. Bodies are always somewhere. Likewise, for Hobbes we are unable to conceive of things that we do not encounter in experience such as that “two, or more things can be in one, and the same place at once.”<sup>60</sup> (Note that this claim differs from the one discussed at fn. 35 since there the issue is the *same* object appearing at “divers” places; here Hobbes claims that we cannot conceive of two or more objects being in the same place.)<sup>61</sup>

Hobbes discusses speech in *Leviathan* 4, focusing on the importance of using good definitions in demonstrations. Since definitions are placed “at the beginning of ...reckoning” it is

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<sup>55</sup> EW III, 1.

<sup>56</sup> EW III, 17.

<sup>57</sup> EW III, 17.

<sup>58</sup> EW III, 17.

<sup>59</sup> EW III, 17.

<sup>60</sup> EW III, 17.

<sup>61</sup> It seems Hobbes would also say that we always experience objects with some color or other, but the *particular* colors we perceive are not properties of any given object because they are created by varying perturbations of light rays; light, of course, is physically only motion. So ‘colored’ might be a property of objects, but no particular color would be.

necessary “for any man that aspires to true knowledge, to examine the definitions of former authors.”<sup>62</sup> He outlines what he calls the “first use of speech” in the following quotation:

...in the right definition of names lies the first use of speech; which is the acquisition of science: and in wrong, or no definitions, lies the first abuse; from which proceed all false and senseless tenets; which make those men that take their instruction from the authority of books, and not from their own meditation.<sup>63</sup>

Paying attention to one’s own “meditation” is crucial when determining whether a definition is correct. Hobbes uses ‘meditation’ elsewhere in *Leviathan* to describe the activity by which humans examine the conceptions they have from sense experience.<sup>64</sup> For example, in *Leviathan* 4 Hobbes notes that the person born without speech may “by meditation” examine a triangle and discover “that the three angles of that triangle, are equal to those two right angles that stand by it.”<sup>65</sup>

In *Leviathan* 12, Hobbes argues that those who pay attention to their own conceptions “by their own meditation, arrive to the acknowledgment of one infinite, omnipotent, and eternal God, chose rather to confess he is incomprehensible...”<sup>66</sup> When we meditate on our conceptions we find that we do not possess any for an infinite, omnipotent, and eternal God, and as a result, we should come to believe that the idea of God is, literally, incomprehensible. Those who think that they have a conception of such a God have not undergone proper meditation. In *Leviathan* 26, when discussing what makes a good judge, Hobbes notes that a chief characteristic of such an individual is “a right understanding of that principle law of nature called equity.”<sup>67</sup> Not everyone has such an understanding; rather, it depends “on the goodness of a man’s own natural

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<sup>62</sup> EW III, 24.

<sup>63</sup> EW III, 24.

<sup>64</sup> Hobbes does not use ‘meditate’ like Descartes uses it, i.e., looking to the meditative genre of texts like Ignatius of Loyola’s spiritual exercises and others (see A. O. Rorty, “Experiments in Philosophic Genre: Descartes’ *Meditations*,” *Critical Inquiry*, 9 [1983], 545-564). Instead, Hobbes uses it to refer to the process of examining the conceptions we possess from experience of the world. Meditation is a different activity from adding and subtracting without words (*DCo* 1.3) because the latter is an activity in which we engage when observing bodies in the world.

<sup>65</sup> EW III, 22.

<sup>66</sup> EW III, 96-97.

<sup>67</sup> EW III, 269.

reason, and meditation.”<sup>68</sup> Meditating on one’s conceptions when evaluating definitions, rather than relying on others’ definitions, is preferred because these conceptions come from sense experience, and “natural sense and imagination are not subject to absurdity.”<sup>69</sup> The person qualified to be a judge, then, is one who mediates on the conceptions given by sense experience rather than relying on others’ potentially absurd definitions. Thus, language and definitions can be a double-edged sword since “as men abound in copiousness of language, so they become more wise, or more mad than ordinary.”<sup>70</sup>

In meditating we determine whether the definition being evaluated matches up with our conceptions. Names that “have a signification also of the nature, disposition, and interest of the speaker” such as such as ‘fear’ or ‘cruelty’ can “never be true grounds of any ratiocination”<sup>71</sup> so we must avoid using them in our reasoning. Such names will never result in demonstrations ending in truth because they do not match with conceptions from our experience of the external world; rather, the conceptions signified by these terms differ according to the speaker’s nature and desires (note that this differs from ‘equity’; cf. fn. 68).

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<sup>68</sup> EW III, 269. One might argue that we construct equity just like we construct figures in geometry, which would threaten the reading I have provided of ‘meditate’. From his discussions in *Leviathan*, Hobbes thinks that equity is more fundamental than this, i.e., that it exists apart from our construction. In *Leviathan* 15, he notes that inequity in judgment is against the fundamental law of nature because it leads to war (EW III, 142). This equity, arguably, stems from the equality that exists in the state of nature that Hobbes discusses in *Leviathan* 13. There Hobbes describes this equality as the equal ability to kill any other person (EW III, 110). Furthermore, in *Leviathan* 30 Hobbes argues that the “safety of the people” depends on the sovereign providing justice with equality, to those that are both “rich and mighty” as well as those who are “poor and obscure.” Equity, he says, is “...a precept of the law of nature, [to which] *a sovereign is as much subject as any of the meanest of his people*” (EW III, 332; emphasis added). Arguing this point fully is beyond the scope of the present paper, but it seems one could argue that we receive our conception ‘equity’ in experience and, in a way similar to simple conceptions, we use it in constructing the Commonwealth.

<sup>69</sup> EW III, 25.

<sup>70</sup> EW III, 25.

<sup>71</sup> EW III, 28-29. Hobbes defines fear in *Leviathan* 6, but there he is simply discussing it within his explanation of various passions (cf. EW III, 43).

In *Leviathan* 5, Hobbes denies that a group of people agreeing about something makes it certain,<sup>72</sup> which seems to be as clear a denial of conventionalism as one could hope to find. Here Hobbes reiterates the importance of terms having a conception to which they refer, and he provides examples of inconceivable things such as round quadrangles or immaterial substances. With such terms we “conceive nothing but the sound.”<sup>73</sup> Hobbes then explains why one finds absurdity in previous philosophy:

...that there can be nothing so absurd, but may be found in the books of philosophers. [...] For there is not one of them that begins his ratiocination from the definitions, or explications of the names they are to use; which is a method that hath been used only in geometry; whose conclusions have thereby been made indisputable.<sup>74</sup>

The crucial term here is ‘explication’, since Hobbes uses it elsewhere to describe the definitions based upon our simplest conceptions. Apart from where already discussed (*De corpore* 6.6), Hobbes uses ‘explication’ to describe how the names in a definition work at *De corpore* 6.14, i.e., they function by raising an idea, or conception, in the mind.<sup>75</sup> The problem with other philosophers is that the definitions with which they begin their ratiocinations cannot raise conceptions because the hearer can have had no such experience (e.g., of immaterial substance).

Having detailed specific reasons for absurd conclusions in *Leviathan* 5,<sup>76</sup> Hobbes discusses science. Science is not something “born with us” or simply “gotten by experience.”<sup>77</sup> Instead, science is “attained by industry; first in apt imposing of names; and secondly by getting

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<sup>72</sup> “...no one man's reason nor the reason of any one number of men makes the certainty no more than an account is therefore well cast up because a great many men have unanimously approved it” (EW III, 31).

<sup>73</sup> EW III, 32.

<sup>74</sup> EW III, 33.

<sup>75</sup> “Now, seeing definitions (as I have said) are principles, or primary propositions ...and seeing they are used for the raising of an *idea* of some thing in the mind of the learner, whensoever that thing has a name, the definition of it can be nothing but the explication of that name by speech” (EW I, 83). When one says the name ‘line’, it will raise in the mind of the hearer a particular conception, or idea, of a constructed line.

<sup>76</sup> EW III, 33-35.

<sup>77</sup> EW III, 35.

a good and orderly method...”<sup>78</sup> This “apt imposing of names” is making sure a name has at least one conception to which it corresponds. Names, however, are general, and they refer to groups of particular conceptions. We will have numerous particular conceptions, e.g., of particular dogs, and the name ‘dog’ will refer to this group of conceptions.<sup>79</sup> If a name refers to at least one conception then we can use it in reasoning, but if not, it is absurd like ‘round quadrangle’ and any reasoning following from it will be false.

Thus in both *Leviathan* and *De corpore*, Hobbes’s account of good definitions is that they must link up through names with conceptions that we receive from experience of the world. Far from being an example of conventionalism, this account places sense experience as the basis for any scientific knowledge, whether in geometry or in civil philosophy. Thus, there are two components to refuting the conventionalist interpretation: first, as Gauthier (1997) argues, Hobbes’s requirement that definitions in geometry include their cause or generation prevents geometry from being merely conventional; and second, Hobbes’s account of simplest conceptions formed from sense experience prevents such definitions being merely based upon conventions. Though colors are not properties of bodies, they are also not based merely on our conventions. Simplest conceptions come from experience of bodies in the world, but colors are properties of “our bodies” that change relative to various perturbations of light rays. Both colors and simplest conceptions differ from names reflecting our own interests such as ‘fear’. The latter are subjective and we should never use them in reasoning.

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<sup>78</sup> EW III, 35. Prudence provides a contrast to science since it is “gotten by experience only” (EW III, 35); “it is not prudence that distinguisheth man from beast,” since prudence is merely a “presumption of the future, contracted from experience of time past” (EW III, 16). To have science, we must have language and impose words upon our conceptions so that they become general; our memory is enabled by our own marks (EW III, 14), as well, and is a condition for improving our own and others’ scientific knowledge when our marks become signs (EW III, 15). As a result, children do not have reason and cannot engage in science (EW III, 35-36).

<sup>79</sup> As mentioned already, simple conceptions like ‘place’ differ do not raise a particular thing in the hearer’s mind, so they differ from conceptions like ‘dog’.

### 3. 'Arbitrary' and Conventionalism

#### 3.1 'Arbitrary' in *Leviathan* and *De corpore*

Various commentators have nevertheless interpreted Hobbes as a conventionalist (see fn. 7), and some of this misunderstanding seems due to Hobbes's frequent use of the term 'arbitrary' when discussing names.<sup>80</sup> For example, immediately following the definition of 'name' (*De corpore* 2.4), Hobbes states, "...it is for brevity's sake that I suppose the original of names to be arbitrary..."<sup>81</sup> The translation in the Molesworth edition misrepresents the Latin, which reads that names originated "from the choice of humans" (*ab arbitrio hominum*).<sup>82</sup> I will now show that Hobbes uses 'arbitrary' to describe two activities: first, imposing one name instead of another on a conception; and second, constructing geometrical figures. Neither of these uses supports the conventionalist account.

The term *arbitrium* provides a connection to maker's knowledge. For example, at *De homine* 10.5 Hobbes uses the same term when discussing geometry's status, arguing that we have maker's knowledge of the figures we construct in geometry because we ourselves draw the lines and because the generation of the figures depends upon our will (*generationesque figurarum ex nostro dependeant arbitrio*).<sup>83</sup> Given this connection to Hobbes's statements about

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<sup>80</sup> For example, Martinich (*Thomas Hobbes*, 98) cites *DCo* 3.7-8 to support the conventionalist interpretation. There Hobbes claims: "the first truths were arbitrarily made by those that first of all imposed names upon things or received them from the imposition of others. For it is true for example that man is a living creature but it is for this reason that it pleased men to impose both those names on the same thing" (EW I, 36).

<sup>81</sup> EW I, 16.

<sup>82</sup> At *DCo* 2.2, Hobbes states that some signs are arbitrary, using same root (*arbitraria*). When defining marks, Hobbes also notes that marks (*notas*) are "...sensible things having been employed by our will (*res sensibiles arbitrio nostro adhibitas*)" (*DCo* 2.1; OL I, 12).

<sup>83</sup> OL 2, 93.

geometry, I suggest that ‘arbitrary’ here is connected with human will and choice alone and not with later connotations such as that an arbitrary choice is one that is “capricious” or “uncertain.”<sup>84</sup> Understanding the assigning of names as arbitrary in this sense provides a connection to the earlier discussion of conceptions as the source of scientific knowledge (*scientia*). We have these conceptions from experience, we impose names on them (e.g., as in *Leviathan* 4), and with them we construct figures (e.g., as in *De corpore* 6). We also use names when constructing the Commonwealth.

What then is to be made of Hobbes’s frequent references to definitions and names being arbitrary? For Hobbes the particular name chosen is arbitrary but nothing else. As Douglas Jesseph notes, “it is not a matter of linguistic convention . . . whether cyanide causes death in humans, although it is a matter of convention that the English words ‘cyanide’ and ‘human’ refer to the things they do.”<sup>85</sup> While Hobbes would agree with Jesseph’s point, the present account’s focus on the source of definitions provides what else Hobbes thinks is arbitrary—the construction of geometrical figures. In *De corpore* we form simplest conceptions from sense experience and then using names, which we impose on them, and definitions, which are explications of these simplest conceptions, we construct geometrical figures. This is why at *De homine* 10.5, Hobbes says these figures depend upon our will. The construction of such figures is an intentional, will-dependent act. The choice of one name over another and, importantly, the construction of these figures in experience do depend upon our will, but the conceptions we use

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<sup>84</sup> The OED defines ‘arbitrary’ as “to be decided by one’s liking; dependent upon will or pleasure” (Oxford English Dictionary, s.v. “arbitrary”), which is represented as early as 1574 and in *Blackstone’s* 1768 common law commentary.

<sup>85</sup> D. Jesseph, “*Scientia* in Hobbes,” in T. Sorrell, J. Kraye, and J. Rogers (eds.), *Scientia in Early Modern Philosophy* (Dordrecht: Springer, 2009), 117-128, here 124.

to construct these figures do not depend upon our will; rather, they are simplest conceptions that we receive in sense experience.<sup>86</sup>

In *Leviathan* 5, Hobbes argues that we must be sure that each name we use in a demonstration has at least one conception to which it corresponds. If a name does not have such a corresponding conception, as in the case of ‘immaterial substance’, then it is absurd. Thus, in *Leviathan* the arbitrary part is that which depends upon our will, i.e., the particular name we choose. The conceptions themselves do not depend upon our will, only the choice of a name for a conception does. In both *De corpore* and *Leviathan*, Hobbes uses ‘arbitrary’ to refer not only to the choice of one name over another but also to what we do, or how we act, with the conceptions that we form from sense experience. This latter component is what the present account highlights. In both texts, we choose the names but we also construct. We have discussed at length how we construct geometrical figures, but Hobbes also discusses in *Leviathan* how we construct the Commonwealth. Thus, on both accounts the definitions with which we begin a demonstration, whether in geometry or in civil philosophy, are not merely conventional but can be traced back to simplest conceptions that we form from experience of the world.

### 3.2 *The Conventionalist Interpretation*

A.P. Martinich argues that Hobbesian science is conventionalist. Although Martinich does not use the term ‘conventionalist’ in the quotation below, he certainly believes Hobbes espouses a conventionalism of a sort:

We now need to step back and consider a tension or contradiction in Hobbes’s conception of science. On the one hand, he holds that scientific propositions are necessarily true by virtue of their meanings, and there does not need to be anything constructive in such propositions. [...] On the other hand, he holds that science holds how things come to be.<sup>87</sup>

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<sup>86</sup> Nor does the particular color we perceive depend upon our will.

<sup>87</sup> Martinich, *Hobbes*, 165. By ‘constructive’, Martinich seems to mean that there need not be anything in the proposition telling us how to make or construct the thing defined. Note, also, that Martinich does use the term

Martinich cites various sections of *De corpore* to support this view of Hobbes's conception of science according to which Hobbes believes that propositions in science are true by their meanings alone. Martinich thinks that Hobbes's overall account in *De corpore*, part I can be described as follows: "[s]cience consists of a certain kind of sentence or proposition and the truth of those propositions is guaranteed by the meanings of the terms in those propositions, not in some relation to the world."<sup>88</sup> The conventionalist interpretation, Martinich argues, explains why there is no "science" in the state of nature (cf. *Leviathan* 13.9).<sup>89</sup> Martinich interprets this claim to mean that "science requires a sovereign" to set the conventions. But it is far from clear that *Leviathan* 13.9 implies conventionalism, since there are plenty of other unrelated things (e.g., commodities imported by sea) that do not exist in the state of nature simply because there is "continual fear and danger of violent death."

Had Hobbes held such a view it would be difficult to see how he could view himself as seeking the true causes of things in optics (fn. 15). F.S. McNeilly (1968) also argues that Hobbes is a conventionalist, though he believes that Hobbes holds such a view not in *De corpore*, but rather in an earlier work entitled the *Elements of Law* (1640; hereafter *EL*) as well as prominently in *Leviathan*.<sup>90</sup> Although I will not discuss the text of *EL* in detail, since it is similar to Martinich's it will be useful to mention McNeilly's account briefly.

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'conventionalism' to describe Hobbes's account elsewhere (e.g., Martinich, *Thomas Hobbes*, 88). As will be discussed below, Martinich concludes that Hobbes is conflicted between two accounts: his conventionalism and his practice of science. Martinich argues that in addition to Hobbes's conventionalist views, Hobbes is what he calls a "term empiricist" (see *Hobbes*, 162). As a "term empiricist", Martinich argues that Hobbes terms such as 'rabbit' "hook up" with rabbits in the world. This account, I think, neglects that on Hobbes's account we possess conceptions from sense experience and it is to these conceptions that the names that we choose refer.

<sup>88</sup> Martinich, *Hobbes*, 161.

<sup>89</sup> Martinich, *Thomas Hobbes*, 88.

<sup>90</sup> McNeilly (*The Anatomy of Leviathan*) thinks that in addition to this conventionalist account there are three other independent, contradictory views of scientific method in Hobbes over several of his works (and even two distinct accounts within *DCo*).

McNeilly highlights Hobbes's discussion of the distinction between "two kinds of knowledge," one which is called "sense" or "knowledge original" and the other which is called "science" or the "knowledge of the truth of propositions." McNeilly focuses<sup>91</sup> on Hobbes's point that science is "experience men have from the proper use of names in language."<sup>92</sup> From these observations, McNeilly concludes the following:

What all this adds up to is something very much like a conventionalist account of science. The truth of scientific propositions is not established by appeal to observation, because "experience concludeth nothing universally" [citing *EL* I.IV.10], but depends on understanding—that is, on understanding the meaning of words.<sup>93</sup>

McNeilly makes similar claims about Hobbes's views in *Leviathan* 5, drawing on Hobbes's account of science there.<sup>94</sup> McNeilly takes Hobbes's definition of reason as "nothing but reckoning"<sup>95</sup> to support his conventionalist reading, and he thinks Hobbes's later discussion of science's focus on the consequences of names<sup>96</sup> shows that in *Leviathan* Hobbes advocates the conventionalist view with more "clarity and persistence" than anywhere else.<sup>97</sup> But Hobbes' focus on the consequences of names does not imply that this is *all* there is to science.

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<sup>91</sup> McNeilly, *The Anatomy of Leviathan*, 66.

<sup>92</sup> *EW* IV, 27.

<sup>93</sup> McNeilly, *The Anatomy of Leviathan*, 67.

<sup>94</sup> McNeilly, *The Anatomy of Leviathan*, 84-85.

<sup>95</sup> *EW* III, 30.

<sup>96</sup> *EW* III, 35.

<sup>97</sup> McNeilly, *The Anatomy of Leviathan*, 85. In addition to Hobbes's focus on the consequences of names, one might look to *De corpore* 6.15 as evidence of Hobbes's conventionalism, as A.P. Martinich suggests to me (personal correspondence). Here Hobbes argues that there "that it is not necessary to dispute whether definitions are to be admitted or no. For when a master is instructing a scholar, if the scholar understand all the parts of the thing defined, which are resolved in the definition, and yet will not admit of the definition, there needs no further controversy betwixt them, it being all one as if he refused to be taught. But if he understand nothing, then certainly the definition is faulty; for the nature of a definition consists in this, that it exhibit a clear idea of the thing defined [...]" (*EW* I, 84; emphasis added). I think that the key part of this discussion of the properties of definition in *De corpore* 6.15 is Hobbes's claim that the nature of a definition is exhibit a clear idea of the thing defined. This is reminiscent of Hobbes's claim, discussed above, that 'place' is well defined when we raise in the mind of the hearer a clear conception (*EW* I, 81). There will be no controversy between the scholar and the master, I suggest, because if the definition raises such a conception they will both agree. This interpretation, and not the conventionalist interpretation, makes sense of Hobbes's claim in this passage that if the scholar does not understand then there is something wrong with the definition itself and not something wrong, e.g., with the scholar's willingness to accept a conventional definition.

Both Martinich and McNeilly hold that Hobbesian science is concerned only with knowing the meanings of words, so that being a good natural philosopher is more about knowing the meanings of words than it is about experimentation. Both argue that whether a scientific proposition is true has nothing to do with how things are in the world but only to do with the meaning of the terms. As a result, both McNeilly and Martinich see Hobbes as conflicted in holding to this conventionalist account science and making the claims he did when actually practicing science such as optics.<sup>98</sup> However, these conventionalist accounts neglect the foundation of Hobbesian natural philosophy—simplest conceptions. Hobbesian natural philosophy cannot be conventionalist in the way they suppose because it is grounded in simplest conceptions received from experience.

Those who interpret Hobbes as a conventionalist also often argue, like McNeilly does,<sup>99</sup> that Hobbes held to a form of “deductivism.” On the deductivist account, Hobbes believed that he had deduced sciences such as optics from geometry. The deductivist and conventionalist interpretations seem to complement each other. It makes sense that if one thinks Hobbes was a deductivist, then one would also think he was a conventionalist. For if one thinks that Hobbes sought certainty through deducing one science from another then one must ask what the starting

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<sup>98</sup> Noel Malcolm similarly claims that Hobbesian science is deeply conflicted: “Two different models jostle for position: the knowledge of causes, and the knowledge of definitions” (N. Malcolm, “A Summary Biography of Hobbes,” in T. Sorell [ed.], *The Cambridge Companion to Hobbes* [Cambridge: Cambridge University Press, 1996], 13-44, here 29). Also see N. Malcolm, “Hobbes’s Science of Politics,” In N. Malcolm (ed.), *Aspects of Hobbes* (Oxford: Oxford University Press, 2002), 146-155; Madden, “Thomas Hobbes and the Rationalist Ideal,” 111-112; Richard Peters, *Hobbes* (Baltimore: Penguin Books), 52ff; and J.W.N. Watkins, *Hobbes’s System of Ideas* (London: Hutchinson University Library, 1965), 106-107. Regarding Hobbes’s views on experiment, one might take Hobbes’s criticism of those engaging in experiments in “Considerations upon the Reputation, Loyalty, Manners, and Religion of Thomas Hobbes” as evidence that Hobbes eschewed experiments. After all Hobbes explicitly refers to optics, arguing that just because one hires “workmen to grind their glasses” and constructs telescopes, among other things, does not make one a philosophy (EW IV, 436). In optics and all other sciences, Hobbes argues that “not every one that brings from beyond seas a new gin, or other jaunty device, is therefore a philosophy” (EW IV, 437). Rather than reading these statements as Hobbes completely rejecting experimentation, a more charitable reading that is also consistent with his practice is that Hobbes thinks that engaging in experiment *alone* is not sufficient for philosophy.

<sup>99</sup> McNeilly, *The Anatomy of Leviathan*, 61.

point for that certainty is, and for those who hold this view of Hobbes, the certain starting point is claimed to be definitional conventions.

Steven Shapin and Simon Schaffer notoriously argue for both the deductivist and conventionalist interpretations.<sup>100</sup> Shapin and Schaffer think that Hobbes was not only a deductivist, describing Boyle's various defenses from Hobbes' criticisms as "protecting the proper procedures of experimental philosophy against the beast of deductivism,"<sup>101</sup> but moreover they argue that Hobbes saw certainty as the goal of true philosophy and that Hobbes believed that certainty was achievable only when we begin from conventions. On Shapin and Schaffer's view, only civil philosophy and geometry possess the sort of certainty required of philosophy because both begin with conventions.

Shapin and Schaffer argue that Hobbes shows that he is no empiricist, claiming that Hobbes is both a "rationalist" and "conventionalist."<sup>102</sup> They argue that Hobbes thought that even a key conception at the foundation of geometry, 'space', is "man-made."<sup>103</sup> Apart from the alliterative flourish with which they describe Boyle's rebuttal to the beast Hobbes, as described above, however, Shapin and Schaffer do not provide much to explain how exactly Hobbes is a "rationalist" and exactly what the source of these conventions may be. Merely using labels such as "rationalist," "empiricist," and so on misses a key point. Although Hobbes holds that we have certain knowledge of things that we make (i.e., maker's knowledge), the conceptions that we use (e.g., the conceptions 'place' and 'space') when making items such as geometrical figures do not depend upon any "man-made" conventions; rather, they are simplest conceptions that we possess, *contra* Shapin and Schaffer, from experience.

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<sup>100</sup> S. Shapin and S. Schaffer, *The Leviathan and the Air-pump*, (Princeton, NJ: Princeton University Press, 1985).

<sup>101</sup> Shapin and Schaffer, *The Leviathan and the Air-pump*, 176.

<sup>102</sup> Shapin and Schaffer, *The Leviathan and the Air-pump*, 150

<sup>103</sup> Shapin and Schaffer, *The Leviathan and the Air-pump*, 149.

Since Shapin and Schaffer wrongly attribute such a narrow scope to Hobbesian philosophy, i.e., only that about which we have certainty, natural philosophy's status for Hobbes also becomes an issue. They argue that natural philosophy does not hold the same level of certainty for Hobbes, and this is because "the causes of natural effects are not of our own construction..."<sup>104</sup> This view misses a key point in Hobbesian natural philosophy, namely, that one is able to apply geometrical principles when working in natural philosophy. It neglects the interaction between principles about which we can have certainty in geometry and claims about possible causes in natural philosophy. Although Hobbes repeatedly grants that he is providing only possible causes in natural philosophy, such possible causes are, in fact, "possible" because they are found by applying geometrical principles to effects.<sup>105</sup>

In contrast to the deductivist interpretation, the relationship between Hobbes's geometry and other sciences is similar to the relationship between first philosophy and geometry. Once one has arrived at the principles of geometry by employing definitions, e.g., of 'place', one may apply those geometrical truths in other contexts. Hobbes does not deduce the science of optics from geometry, but one may use geometrical principles, or definitions, within optics because these definitions are explications of simplest conceptions possessed from experience. The case study from *De homine 2* illustrates how Hobbes applies geometrical principles within his optical arguments. Hobbes neither does nor could deduce the conclusions of his optics from his work in geometry; nor would he want to do so.

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<sup>104</sup> Shapin and Schaffer, *The Leviathan and the Air-pump*, 150.

<sup>105</sup> For Hobbes we can use geometrical principles when providing possible explanations of phenomena because we possess those geometrical principles from experience of the real world. Hobbes distinguishes his geometry from Euclidean geometry by claiming that, as Alexander Bird argues, "Euclidean terms were not names but meaningless symbols" (A. Bird, "Squaring the Circle: Hobbes on Philosophy and Geometry," *Journal of the History of Ideas*, 57 (1996), 217-231, here 225). Bird notes that Hobbesian geometric terms, e.g., 'point', have an instantiation in the world, whereas Euclidean geometry has "no application" since none of its terms are instantiated in the world.

## Conclusion

I have argued against the conventionalist interpretation of Hobbes. The account I offer provides an interpretation of Hobbes that unifies his work in civil philosophy, his theorizing about the nature of science, and his practice of optics. With such unity, the putative tension between Hobbes's practice and theory disappears, *contra* Martinich.<sup>106</sup> Furthermore, Hobbes's contrast between what we receive in experience (simplest conceptions) and what we construct in experience (geometrical figures) prevents the conventionalist interpretation from getting off the ground.

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<sup>106</sup> Martinich, *Hobbes*, 165.