What We Make for Ourselves: Interconnections of Geometry, Science, and Politics in Hobbes' System of Ideas

by

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Abstract:

This thesis is an attempt to locate Hobbes' civil philosophy in the context of his theory of science, which is a theory primarily about how to acquire the knowledge of causes and effects. By working through the reasons why Hobbes praises geometry, this thesis will explain why he believes that philosophy needs to begin with definitions, how the geometers' use of definitions has brought certainty to their subject, and what other subjects must do in order to have the same certainty. While the first chapter deals with the overt reasons why Hobbes praises geometry, we will see that the proper use of definitions alone is not enough to raise any subject, even geometry, to the rank of a 'science.' In the chapter following, I will show, in detail, how Hobbes' reconceptualization of geometry as the study of motion provides the starting point for his theory of science, which, on the deductive model of Euclidean geometry, aims to demonstrate 'universal rules about the properties of things' from the knowledge of their cause and generation—which is to say, from the motions by which they are produced (*DCo*, IV, 7). The exposition of Hobbes' geometry in the second chapter will be framed as an investigation into his belief that we can give scientific demonstrations only of subjects that we make for ourselves. The third and final chapter will provide an interpretation of how civil philosophy can be considered as a science within the scope of the motion-based theory of science presented in *De Corpore*. We will conclude that while Hobbes' civil philosophy cannot be considered to be a science apart from the idiosyncratic theory of *De Corpore*, the fittingness of the label does not affect the content of the theory, which, when mapped on to his theory of science, reveals a depth and complexity of thought of which any one of Hobbes' texts provides only a partial indication.

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Abbreviations

CTH *The Correspondence of Thomas Hobbes, Vol. 1: 1622–1659.* Edited by Noel Malcolm. Oxford: Clarendon Press, 1994.

DCo *De Corpore* (1655). All translations from chapters one to six come from *Part I of De Corpore*: *Computatio Sive Logica*. Edited by Isabel C. Hungerland and George R. Vick. Translated by Aloysius Martinich. New York: Abaris Books, 1981. Since alternative translations are not available for later chapters, all translations beyond chapter six come from the *Elements of Philosophy. The First Section, Concerning Body* in *The English Works of Thomas Hobbes of Malmesbury*, Vol. I. Edited by William Molesworth. London: 1839. Citations are always to article and chapter.

DCv *De Cive* (1642). Edited and translated by Richard Tuck and Michael Silverthorne. New York, NY: Cambridge University Press, 1998. Citations are to chapter and article.

De Mundo *Thomas White's De Mundo Examined* (1643, published 1973). *Thomas White's De Mundo Examined: The Latin Translated by Harold Whitmore Jones.* Translated by Harold Whitmore Jones. London: Bradford University Press, 1976. Citations are to page and then folio number.

DH *De Homine* (1658). Translated by Charles T. Wood, T.S.K. Scott-Craig, and Bernard Gert. In *Man and Citizen: Thomas Hobbes's De Homine*, edited by Bernard Gert. Indianapolis: Hackett Publishing, 1991. Citations are to chapter and article.

DP *Decameron Physiologicum* (1678). *The English Works of Thomas Hobbes of Malmesbury*, Vol. VII. Edited by William Molesworth. London: 1839. Citations are to work, volume, and page number.

E.W. *The English Works of Thomas Hobbes of Malmesbury, now First Collected and Edited by Sir William Molesworth.* London, 1839–1845.

HN *Human Nature: Or, The Fundamental Elements of Policy* (1640). *The English Works of Thomas Hobbes of Malmesbury*, Vol. IV. Edited by William Molesworth. London: 1839. Throughout when I refer either to the *Elements* or the *Elements of Law*, the reference is to *Human Nature*, which is the first part of the work. Citations are to chapter and article.

L *Leviathan* (1651). Edited by Edwin Curley. Indianapolis: Hackett, 1994. Citations are to chapter and paragraph number of this edition.

SL *Six Lessons to the Professors of the Mathematics* (1656). *The English Works of Thomas Hobbes of Malmesbury*, Vol. VII. Edited by William Molesworth. London: 1839. Citations are to work, volume, and page number.

All other citations, including other works by Hobbes, will be given without abbreviation and with bibliographical information in the appropriate place. Citations to chapter and article use roman numerals for chapter and arabic numerals for article or paragraph.

Introduction

Leviathan is a text with exceedingly strong claims. Hobbes argues not just that a commonwealth ordered on the plan of *Leviathan* is less likely to fall into civil war, but that it is actually immune from 'internal dissolution,' since "principles of reason [can] be found out, by industrious meditation, to make [a commonwealth's] constitution (excepting by external violence) everlasting" (*L*, XXX, 5). Hobbes makes a similar statement earlier in the work:

> though nothing can be immortal, which mortals make; yet, if men had the use of reason they pretend to, their commonwealths might be secured, at least from perishing by internal diseases. For by the nature of their institution, they are designed to live, as long as mankind, or as the laws of nature, or as justice itself, which gives them life. (*L*, XXIX, 1)

Stated here, at a substantial distance into the text, is a central thesis of *Leviathan*, that commonwealths can be made in such a way that civil violence can be avoided entirely. Were it not for external threats, a commonwealth could be everlasting, since internal security can, at least in principle, be maintained in perpetuity, as long as the sovereign follows the 'principles of reason' laid out in *Leviathan* (*L*, XXX, 5). Hobbes claims not only to have uncovered these principles, but to have demonstrated their truth with the same certainty as a geometric proof. By following the lead of geometry, Hobbes believes that he has raised civil philosophy to a 'science.' Over the course of this thesis I will elucidate the theory of science that Hobbes builds on geometry, why he believes that we can give scientific demonstrations only of the subjects that we make for ourselves (*SL*, E.W. 7, 184), and how civil science fits into his geometrized scheme of the sciences. By the end of this thesis, we will see why Hobbes believes that principles of proper institutional order can

be ‘scientifically’ demonstrated and what it means to conduct civil philosophy as a science, according to the elaborate theory of *De Corpore*.

In the first chapter, I will discuss why Hobbes believes that philosophy needs to begin with definitions, how the geometers’ use of definitions has brought certainty to their subject, and what other subjects must do in order to have the same certainty. While this expository chapter will explain the overt reasons why Hobbes praises geometry, we will see that the proper use of definitions alone is not enough to raise any subject, even geometry, to the rank of a ‘science.’ In the chapter following, I will show, in detail, how Hobbes’ reconceptualization of geometry as the study of motion provides the starting point for his theory of science, which, on the deductive model of Euclidean geometry, aims to demonstrate ‘universal rules about the properties of things’ from the knowledge of their cause and generation, i.e., from the motions by which they are produced (*DCo*, IV, 7). Our exposition of Hobbes’ geometry in the second chapter will be framed as an investigation into Hobbes’ belief that we can give scientific demonstrations only of subjects that we can make for ourselves, which is to say, of those subjects that we can generate from motions that are within our power. The third and final chapter will provide an interpretation of how civil philosophy can be considered as a science within the scope of the motion-based theory of science presented in *De Corpore*. We will conclude by showing that, while Hobbes’ civil philosophy cannot be considered to be a science apart from the idiosyncratic theory of *De Corpore*, the fittingness of the label does not affect the content of the theory, which, when mapped on to his theory of science, reveals a depth and complexity of thought of which any one of Hobbes’ texts provides only a partial indication.

1 Chapter One

At different points throughout his works, Hobbes says that philosophy is impoverished because it has no method (*DCo*, I, 1; *L*, LXVI, 11), that civil philosophy requires a method (*L*, XXX, 25), and that geometry supplies the method that all subjects should follow (*DCo*, VI, 6; *L*, XLVI, 11). When praising the method of geometry, Hobbes puts special emphasis on the fact that geometers begin by settling the significations of their words, which they call 'definitions' (*L*, IV, 12), and he suggests that other subjects could have the same certainty if they also began from definitions (*L*, IV, 12). In this chapter, I will suggest that Hobbes' exhortation to proceed by 'definitions' is multi-faceted: while 'definitions' are needed in order to avoid what he calls 'absurdities' and to ensure that our words and explanations are tied to sense, Hobbes believes that the certainty of geometry is a result of the fact that geometers proceed from their definitions in a certain way: namely, that they assert only what they can show deductively to follow from their definitions. When Hobbes says that other subjects need to emulate geometry by beginning from definitions, he means that subjects need to define their subject matter in terms that are 'conceivable,' that they need to clarify rigorously the meanings of their terms, so that equivocations are avoided, and that they need to construe their subjects as deduction from 'principles' whose terms have been clearly defined.

By unpacking what Hobbes means by 'definitions' and identifying the problems that proper 'definitions' are supposed to solve, this chapter will explain why beginning from definitions has made geometry 'indisputable' (*L*, V, 7). What we will see by the end of this chapter, however, is that the proper use of definitions is not enough for a subject to become a science, nor is geometry a science simply because it reasons from definitions in the appropriate way. In order to see the full

sense in which geometry is a science, we will need to explain, in the following chapter, how geometry, according to Hobbes' reconceptualization of the subject, is able to reason from definitions in a manner that ends in the knowledge of causes that he calls 'science.' By explaining thoroughly how geometry is able to use the method of definitions in a way that ends in 'science,' we will lay bare what Hobbes means by the term and in the process clarify why scientific knowledge is possible only in certain subjects. This will give us a foothold for the final chapter, where I will provide an interpretation of how civil science may, according to the theory of *De Corpore*, be considered to follow the method of definitions in a manner that ends in scientific knowledge.

To see why definitions are important for scientific reasoning and why Hobbes believes that their proper use has helped geometers avoid the disputes and arguments of other disciplines, we will begin by looking at how definitions can be used to avoid absurdity and ensure that our assertions are 'conceivable.' In order to see how this works, we will need to discuss what Hobbes means by 'conceptions' and how he believes that names can be imposed on conceptions in a manner that ends in what he calls 'truth.' While definitions alone cannot ensure soundness, the proper use of definitions can ensure the avoidance of what Hobbes calls 'absurdities,' which are words or combinations of words that are 'inconceivable,' such as 'accidents of bread in cheese' or 'incorporeal body' (*L*, V, 5; XXXIV, 2). The next use of definitions is that they avoid ambiguity and equivocation by attaching a single meaning to a word, which is necessary for the reason that words as we learn them from everyday speech do not come down to us as having precise definitions (*HN*, V, 7; *DCv*, XVIII, 4). The final use of 'definitions,' which is the central reason why the use of definitions has made geometry 'indisputable,' is that geometers use 'definitions' as premises

from which they reason deductively to determine what must necessarily be true in consequence. While Hobbes has a number of arguments for why philosophy must begin from clear definitions, the certainty and indisputability of geometry is a result principally of the fact that geometers assert only what they can prove. In order to cover adequately what a 'definition' is and why Hobbes is so concerned with providing them, we will need to begin by saying something of what it means for a word and its definition to be 'conceivable.'

1.1 Conceptions

There are many ways to flesh out Hobbes' belief, as he says in *Leviathan*, that "[c]oncerning the thoughts of man, […] *Singly*, they are every one a *representation* or *appearance*, of some quality or other accident, of a body without us, which is commonly called an *object*" (*L*, I, 1). According to the opening of *Leviathan*, all thoughts are 'images' or 'phantasms' of external bodies that are caused by motion on our senses and which appear to be 'about' the things that are their cause. While the mind without language contains only the 'images' or 'phantasms' caused by external things, humans are able to use words as signs for our 'conceptions' in order to facilitate memory, communication, and reasoning (*L*, IV, 3), where 'conception' is a maximally generic word for *mentalia* that includes 'images' and 'phantasms.' Before trying to say what a 'conception' is, we may usefully say something about what Hobbes means to accomplish by using this term and how it is used extensionally. By arguing that words are used properly only when they give rise in the mind to 'conceptions,' and that we cannot have any 'conceptions' that were not given wholly or in part in sense, Hobbes aims to disabuse philosophy of doctrines that he considers 'inconceivable.' When words (and the conceptions they denote) are combined in ways to which there can be no corresponding conception in the mind that was first given in sense, they are said

to be ‘inconceivable,’ and the propositions in which they appear are neither true nor false, but rather ‘absurd,’ ‘insignificant,’ and ‘non-sense’ (*L*, V, 5). Since sense itself, Hobbes says, is not subject to absurdity (*L*, IV, 13), the only way that ‘inconceivable’ thoughts can arise is by detaching language from sense, and illicitly combining signs in ways that cannot raise any conceptions in the mind. While the conceptions of ‘man’ and ‘horse’ can be ‘conceivably’ combined, and we can thus conceive of the fictional animal that we call a ‘centaur’ (*L*, II, 4), we cannot conceive of an ‘incorporeal body,’ which combines the predicates of ‘body’ and ‘not-body’ (*L*, IV, 21). The importance that definitions hold in Hobbes’ philosophical project, aside from clarifying terminology and eliminating disputes, is that they are supposed to ensure that when a word is read or heard, the appropriate conception is raised in the mind, and this is then supposed to ensure that those who begin their studies from the appropriate definitions can avoid inconceivable conclusions. The sheer level of importance that Hobbes places on definitions is reflected in his conception of *philosophia prima*, or first philosophy, as the project of setting down explicitly and conceivably the definitions of the most general ‘concepts’ in terms of which we give explanations, concepts such as ‘cause,’ ‘essence,’ ‘time,’ ‘motion,’ ‘place,’ ‘body,’ ‘quantity,’ and—as Hobbes abbreviates the list—all of the other subjects dealt with by Aristotle in his books on physics (*De Mundo*, 23–24, fol. 5–5v; 111–112, fol. 78–80). By requiring that all philosophy begin from clear definitions, Hobbes hopes to keep philosophy grounded in assertions and explanations that are ‘conceivable.’ Before turning later in this chapter to the specifically geometrical use of definitions, we will first explain how definitions are supposed to be given, and why Hobbes believes that definitions, geometrical or otherwise, are supposed to be explications of our ‘conceptions.’

While we can say with some clarity what Hobbes wants to accomplish by tying language to conception and conception to sense, the details of what counts as 'conceivable' or what exactly a 'conception' is are very sketchy. While it is not always clear in earlier writings whether Hobbes intends to distinguish between 'phantasms,' 'images,' 'conceptions,' 'ideas,' and other seemingly generic words for *mentalia*, these words are all used interchangeably by the time of *De Corpore*, as is indicated by his frequent apposition of one or more term with another.[1] Rather than try to define a relation of representation for Hobbes, or draw out to any length the details of how all of our thoughts are supposed to be the appearances of external things, we are simply going to assume the point that Hobbes wants to establish: that all thoughts arise from motion on our senses. Since Hobbes' empiricism is the starting point for the thoughts that we intend to trace, we will set aside the consideration of its finer details in order to give an account of the ideas that are built on this view. The reader should keep in mind, for any quotations that follow, that 'phantasm,' 'image,' 'idea,' and 'conception' are used by Hobbes interchangeably. We will use the word 'conception' for all of them, except for the occasional variance in accordance with a quotation, since 'conception' and its cognates are Hobbes' preferred terms when writing about language.

While Hobbes does not define 'conception' or its cognates clearly, we can see in some detail the sense in which he believes that our 'conceptions' can be separated into a series of 'simpler' conceptions. The ability to analyze a conception and separate it into 'simpler' conceptions is a basic ability of the mind that Hobbes calls 'resolution' or 'analysis.'[2] In *De*

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[1] E.g., *DCo*, I, 3; II, 9; V, 9; VII, 1.

[2] Since the following example shows that 'resolution' or 'analysis' can be done without language, this ability may not be specific to humans. Hobbes says in *De Mundo* that animals and humans alike have the abilities of 'synthesis' and 'analysis,' although the abilities are there treated as the progression of the mind from cause to effect or from effect to cause (*De Mundo*, 369, fol. 342).

Corpore I.3, Hobbes gives the following example of how the mind registers successively each of the 'conceptions' that are involved in our conception of the 'whole idea' of 'man.' When a man watches another walk towards him from the distance, he will separately register a series of conceptions, even if he does not have the use of words (*DCo*, I, 3). When the man first enters into sight, the observer will have the conception of what we (who have the use of words) call 'body.' As the man moves closer, the observer will see that the thing is moving, and then have additionally the idea or conception of what we now call 'animation.' When the man is close enough that they hear and see the signs of a rational mind, the observer will conceive the idea of what we now call 'rationality.' When the person is near and finally the observer "conceives the whole thing as one, fully and distinctly, the idea is [then] composed from the preceding ones, and in this way the mind compounds previously mentioned ideas" (*DCo*, I, 3).[3] Similarly, as the man retreats into the distance, the mind subtracts first the idea of rationality, and then successively the idea of animation, as the man's movements become lost to perception, and then finally the whole idea vanishes when the idea of body is subtracted. By means of reasoning, we can identify in the 'whole idea' of 'man' the separate conceptions of 'body,' 'animation,' and 'rationality' without the use of language (*DCo*, I, 3). This same act of mental subtraction can be used consciously to divide 'gold' into the

[3] All quotations from chapters 1–6 of *De Corpore* are taken from A.P. Martinich's 1976 translation of part one, *Computatio Sive Logica*. Unfortunately, this translation does not include the promised treatment of the analytics of the geometers, which Hobbes deferred from the sixth chapter until much later in the text. Since no other translation of the later sections is available, all references past the first six chapters will be taken from the Molesworth translation in the English Works.

conceptions (among others) of visibility and solidity (*DCo*, VI, 4), or the conception of a square into the 'simpler' conceptions of 'quadrilateral,' 'equilateral,' and 'rectangular' (*DCo*, I, 3).

When examining our conceptions, Hobbes believes that we can first resolve the 'whole idea' into conceptions that are more general than the conception as a whole, and then continue to resolve those conceptions into conceptions that are still more general than the previous conceptions, until we find conceptions that cannot be resolved further, at which point we are said to have reached the 'simplest' or 'most universal' conceptions involved (*DCo*, I, 3; VI, 4).[4] A conception is said to be 'simpler' or 'more universal' than another when it is predicated of more subjects than the term to which it is being compared. In an example similar to the one above, Hobbes writes that

> if any man [proposes] to himself the conception of *gold*, he may, by resolving, come to the ideas of *solid*, *visible*, *heavy*, (that is, tending to the centre of the earth, or downwards) and many other more universal than gold itself ; and these he may resolve again, till he come to such things as are most universal. (*DCo*, VI, 4)

These 'simple' or most 'universal' conceptions—which we may more idiomatically want to call 'concepts'—are the same as those mentioned above as covered by Aristotle in his books on physics, namely, the concepts of 'body,' 'time,' 'accident,' 'magnitude,' 'quantity,' 'extension,' 'place,' 'motion,' and so on (*De Mundo*, 23–24, fol. 5–5v; 111–112, fol. 78–80). As this relates to giving definitions, Hobbes believes that by separating and identifying the conceptions involved in the 'whole idea' we are able to give definitions in terms of genus and difference, as when we

[4] This subject is treated informatively in Marcus Adams' article *Hobbes, Definitions, and Simplest Conceptions*.

analyze our conception of 'man' and determine that it includes the general conceptions of 'body' and 'animation' alongside the differentiating property of 'rationality.'

Although we will not say much about Hobbes' nominalism in this thesis, there is, as far as I can tell, no way to read *De Corpore* consistently without admitting a belief in genuinely common predicates, especially when Hobbes distinguishes certain conceptions as being 'more universal' than others (*DCo*, VI, 4). As I understand Hobbes, his denial of universals is, by the time of *De Corpore*, simply the denial that non-particulars ever appear to sense. Keeping in mind Hobbes' earlier belief that we can have a conception of 'body' by means of reasoning,[5] Hobbes has the resources available to say the same about universals, that while we do not have any direct perception of a 'universal' property such as 'quantity'—only ever the perception of a particular quantity with determinate properties—we are able to identify that there is a property things hold in common, even if that property does not appear to the senses in non-determinate, non-particular form. Even though Hobbes believes, e.g., that 'body' is perceived by the senses (*DCo*, VIII, 1), what we perceive is only a particular instance of 'body,' not the universal 'body,' and it is then by the process of resolving our conceptions, consciously or unconsciously, that we recognize the existence of a property that is shared among particulars we observe. This is to say that while sense does supply a conception of particular instances of 'body,' there is no appearance to the senses of the 'universal' body that is the subject of the definition of 'body,' which is the common property that we determine by means of reasoning that particulars must share. On this reading, what it means

[5] This comes through in Hobbes' replies to Descartes' *Meditations*, cited in *The Philosophical Writings of Descartes*, Vol. II, eds. J. Cottingham, R. Stoothoff, and D. Murdoch (Cambridge: Cambridge University Press, 1984), 125, 130. For the equation of 'body' and 'substance,' compare the definition of 'substance' (130) with the descriptions of 'body' and 'accident' in chapter VIII of *De Corpore*.

'to conceive' of a universal word, such as 'body' or 'quantity,' is to bring to mind a particular that falls under its extension, considered in the appropriate aspect (*DCo*, II, 9). Philip Pettit has recently suggested that Hobbes' 'nominalism' can be given a plausible interpretation by suggesting that our minds are unconsciously aware of similarities and differences, yet unable to consider these commonalities as objects of conscious awareness until we acquire the use of words.[6] Pettit believes that we can, on this reading, take Hobbes' nominalism not as the claim that things do not share properties or that there are no natural kinds,[7] but as the claim that common properties can only be considered in respect of their universality once we gain the use of words. This interprets Hobbes' brand of 'nominalism' as the belief that universal thought or judgment is not possible without language, rather than the belief that there are no common predicates. Following Pettit, whom I think shares both of these beliefs about Hobbes, I will say that Hobbes' nominalism is not the denial of common properties, but rather the denial, first, that 'general' or 'universal' thought is possible without language, and the denial, second, that non-particulars ever appear to the senses.

1.2 Definitions

Hobbes' view of how definitions should be given begins from the belief that the 'whole idea' of a thing, as produced by external things that act on our senses, can be mentally resolved into a series of more general conceptions. The definition of a 'definition' is a proposition—that is, a truth-functional assemblage of words—where the predicate 'resolves' the subject into separate conceptions, as when we define 'man' as a 'rational' 'animated' 'body' (*DCo*, VI, 14). The act of

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[6] Philip Pettit, *Made with Words: Hobbes On Language, Mind, and Politics* (Princeton: Princeton University Press, 2008), 36.
[7] Pettit, *Made with Words*, 36.

defining a thing can be described as the act of mentally resolving our conception into simpler and more universal conceptions, imposing names on those conceptions, and then creating a proposition that 'resolves' the subject according to the names we have imposed. This is to say that while names are "imposed" by us arbitrarily on our conceptions, the definitions we give of things are correct or incorrect according to whether they track conceptions that come from sense. Here Hobbes may be thought at best to articulate a partial conception of truth, since all that he says explicitly is that a 'true' proposition is one where the subject contains the predicate, and this according to the analysis of our conceptions, as when we say 'man is a rational animal.'[8] Even though it is a language-independent fact that the properties of 'rationality,' 'animality,' and 'body' are predicated of 'man'—as the example of the non-linguistic individual seeing a man walk in from the distance shows—the proposition 'man is a rational animal' is not 'true' until the names are imposed (*DCo*, III, 8), since 'truth' (along with 'falsity') does not exist prior to the imposition of names (*L*, IV, 11; *DCo*, III, 7). While Hobbes does not give any other criteria for a proposition being 'true' other than that the subject has to 'contain' or 'comprehend' the predicate according to the names we have imposed on our conceptions (*DCo*, III, 7), these propositions are still supposed to be correct or incorrect, in a not-purely-linguistic way, according to whether they agree with our conceptions,

[8] As far as I can tell, Hobbes' comments on truth pertain only to propositions involving the resolution of our conceptions, and the result is that his discussions are silent about propositions that cannot be construed in terms of conceptional containment or the meanings of words (e.g., 'the cat is next to the box'). While it may be possible to work out for Hobbes an epistemological position that tracks (at least) the majority of his distinctions, the point for the moment is simply that he does not say explicitly what 'truth' means in other contexts.

which *ex hypothesi* have external causes.[9] The purpose of a definition is to explain the meaning of a word by explicating the conception—in other words, it is supposed to inform an individual of the compound conception for which the word in question is a label (*DCo*, VI, 13, 15).

Having come to the point that a definition is supposed to identify the conception that a word was ordained to signify, we are now in a position to see why Hobbes believes that clear definitions are the essential first step in philosophy. As we mentioned briefly in the previous section, Hobbes believes that we cannot have any thoughts that are not ideas or combinations of ideas that came from sense. What it means 'to understand' a word is that it gives rise to an idea or conception that came from sense, and it is the "concomitance" or co-occurrence of conception with speech that distinguishes a human's use of speech from a parrot's (*HN*, VI, 3; *L*, V, 22). When we hear or read a word that does not give rise to a conception in the mind, either because the word denotes something inconceivable, or because it is a word with which we are not familiar, we are said not to understand but to hear only the sound (*L*, V, 5). When we define a word in terms of other words, and say that what we mean by this word is explained by these other words, whether that definition brings any clarity to the word in question will depend on whether we attach any conceptions to the words of the explanation. If words do not denote conceptions, the propositions in which they appear cannot be true or false, and they are said to be absurd, meaningless, or

[9] When trying to untangle Hobbes' thoughts on language, one often wants to interject that the analysis of a mere representation may not tell us anything at all about the thing that is the cause of that representation (Schmitter, *Where is My Mind?*, 9), and it consistently seems like Hobbes is saying that we can study the world beyond our representations by studying those representations. To some extent, this may simply be an assumption that Hobbes makes. While it is hard to say precisely what he thinks, he does seem to be committed to saying that we can learn, at least to a limited extent, about the things that cause our conceptions by reflecting on our conceptions, since otherwise he would not be able to say anything at all about what the causes of our conceptions are. He would not be able to say, e.g., that our conceptions are caused by bodies, that motion is the universal cause, or that all bodies share certain properties, such as 'extension,' 'magnitude,' and 'figure' (*DCo*, XI, 1).

'insignificant' (*L*, V, 5). While 'truth' is a matter of whether the words of the subject contain the words of the predicate, those words are considered to be 'significant' or 'meaningful' only if they give rise in the mind to conceptions that came from sense.

As we will see shortly, Hobbes believes that the language we learn from everyday speech is often unclear about the conception(s) a word is supposed to signify, with the consequence that individuals regularly, and perhaps as a rule, use words without clear conceptions in mind. The fact that individuals regularly use words without a clear sense of what those words are supposed to signify leads to problems almost immediately when those imprecisions are brought into philosophical discourse, for there disputes arise, as Hobbes is very quick to point out, often for no other reason than that individuals are working with different definitions, with vague definitions, or with no definitions at all (*De Mundo*, 258, fol. 244). While the first and most critical function of definitions is that they are supposed to tie words to sense, definitions are essential to ensure not simply that individuals attach clear conceptions to their words, or that they are not equivocating, but to ensure that they attach any conception to their words whatsoever.

As we alluded to in the previous section, one of the reasons why Hobbes emphasizes so frequently the need to be sure that our words give rise to conceptions is that he believes this is needed to avoid 'absurdity,' which refers in his technical sense to words or doctrines that cannot be understood in principle because they combine words (and the conceptions they denote) in

'inconceivable' ways (*L*, V, 5).[10] Since sense itself is not subject to absurdity (*L*, IV, 13), we can avoid absurdity by ensuring that our words give rise to conceptions that come from sense. The principal causes of 'absurd conclusions' are using words without clear conceptions in mind, and combining words that otherwise name conceptions clearly in 'inconceivable ways,' as when one speaks about 'transubstantiation,' 'incorporeal substance,' or 'accidents of bread in cheese' (*L,* V, 5). These are words or doctrines "whereby we conceive nothing but the sound, [and] are those we call *absurd, insignificant,* and *nonsense*" and consequently are neither true nor false (*L*, V, 5). Since the failure to ensure that our words give rise to clear conceptions is the principal cause of absurd conclusions (*L*, V, 8), one's reckoning should always begin with the careful definition of one's terms. If we define all of our words in ways that give rise to conceptions, and then continue to pay attention and take care not to combine words in inconceivable ways, we will avoid the absurd or 'inconceivable' doctrines of the Scholastics, whose philosophies are the result of language detached from conception, often on the belief that their 'incomprehensible' or 'inconceivable' assertions are the proper subject matter of metaphysics, since they believe it is the study of what goes beyond nature (*L*, XLVI, 14).[11] Beginning from definitions that are conceivable is the first step in ensuring that our philosophies do not issue in absurd conclusions, which are neither true nor false, but are literally 'inconceivable,' 'incomprehensible,' and 'unintelligible.'

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[10] Hobbes, unfortunately, does not tell us with any clarity what counts as 'conceivable,' nor does he give a principled way of determining what can or cannot be 'conceived.' We will not try to define it further, since it will very quickly become contentious. While we are told, in an extensional way, that 'absurdities' are the result of copulating names that cannot be copulated with each other—e.g., when we copulate names of bodies with names of accidents, names of accidents with names of speeches, or names of speeches with names of bodies (*DCo*, V, 2)—we are not told why they cannot be copulated of each other, other than that we cannot 'conceive' of their copulation. Here it seems that Hobbes rests his point on a sort of intuitive, undefined sense of what we can 'conceive.'

[11] *Leviathan* XLVI is a very clear exposition, building on part three of *Leviathan*, of how Scholastic beliefs are shown to be absurd when examined against the clear definitions of universal concepts (e.g., of 'body') that come from reflection on sense.

The belief that many existing doctrines are the result of absurdities helps explain Hobbes' problem with accepting definitions on the grounds of authority. The tendency of authors and students to take over unquestioningly definitions from authorities—and likewise, the subjects and problems that depend on those definitions—has had the effect of perpetuating doctrines that are false or inconceivable. When those who take over definitions on the strength of authority find themselves in difficulties as a result of those definitions, they become lost, like birds who have flown in through a chimney but cannot discern how to leave, because they are unwilling to question the definitions they were given (*L*, IV, 13). The difficulties that result from incorrect definitions are to be uprooted by a new beginning from clear definitions, starting with the careful examination of our conceptions.

One of reasons why Hobbes believes explicit definitions are necessary is that everyday speech is not sufficiently precise for scientific reasoning. Even in contexts where words are explicitly 'ordained' as having an exact and specific meaning, as in mathematical reasoning (*DCo*, II, 4), those meanings become muddled and confused by our tendency 'to abuse speech' and use our words in non-literal ways.[12] Hobbes explains that originally precise meanings are lost in everyday speech by our tendency to use words in ways that are only approximate, by our natural attraction to beautifying, non-literal uses of speech, and by our tendency to use constructions where otherwise precise meanings are made equivocal (*HN*, V, 7). These sources of obscurity combine over time to dispossess originally precise words of their specific meanings, with the result that

[12] One commits an 'abuse of speech' when they use words in a sense other than that for which they were ordained or when they ordain words for conceptions that were never conceived (*L*, IV, 3). These are judged abuses relative to the proper uses of words, which are to facilitate remembrance, to register consequence, and to function as signs by which we make known our conceptions to others (*L*, IV, 3).

many words—especially those that denote very abstract conceptions—become used by speakers without any clear conceptions attached (*DCv*, XVIII, 4). The result is, as Hobbes says in his criticism of Thomas White, that "assuredly those who use words with no conception of what they mean but solely out of familiarity with them in speech, must fall into incongruities" (*De Mundo*, 411–412, fol. 376v). Since the language that we learn from everyday speech is, as a rule, imprecise, it is only by conscious effort on one's part that one learns to assign strict definitions and then to think in accordance with those definitions, which is necessary if we are to achieve the precision at which scientific reasoning aims. In a statement that brings together a number of the concerns we have been tracking, Hobbes says that those who reason simply from everyday speech, or who take over the meanings of words on the grounds of authority, are like

> beggars, when they say their *paternoster*, putting together such words, and in such manner, as in their education they have learned from their nurses, from their companions, or from their teachers, having *no images* or *conceptions* in their minds answering to the words they speak. And as they have learned themselves, so they teach posterity. Now, if we consider the power of those *deceptions* of sense, [...] and also how *unconstantly* names have been settled, and how subject they are to *equivocation*, and how *diversified* by *passion*, (scarce two men agreeing what is to be called good, and what evil; what liberality, what prodigality; what valour, what temerity) and how subject men are to paralogism or fallacy in reasoning, I may in a manner conclude, that it is impossible to *rectify* so many errors of any one man, as must needs proceed from those causes, without beginning anew from the very first grounds of all our knowledge, sense; and, instead of books, reading over orderly one's own conceptions: in which meaning I take *nosce teipsum* for a precept worthy the reputation it hath gotten. (*HN*, V, 14)

Although these passages and others suggest that Hobbes is at least frequently of the opinion that words are originally given a specific meaning that later can be lost, the point at hand—that the

conceptual imprecisions passed on through language and tradition are to be rectified by a close examination of our conceptions—does not depend on belief that all words are originally endowed with a specific meaning.

To summarize what we have seen so far, Hobbes believes that there are number of reasons why philosophy is supposed to begin with the settling of definitions. Hobbes means not only that one should begin a particular argument by setting out clearly one's terms, but that all philosophy should begin by defining clearly its words so that they give rise to clear conceptions in the mind, whether we are defining the concepts dealt with in first philosophy—such as 'body' or 'extension'—or the 'whole idea' of a thing as it came from sense (*DCo*, VI, 14; *SL*, E.W. 7, 226). This process of giving definitions begins first by imposing names on our conceptions and then giving definitions in terms of the names we impose. Even though we may still make mistakes in this process, the goal of ensuring that all terms have conceptions attached is supposed to avoid the absurdities that Hobbes considers typical of Scholastic philosophy. This is all to say that definitions serve multiple purposes: while definitions should be given to assure conceivability, they need to be stated explicitly at the beginning of a reckoning in order to avoid ambiguities and equivocations, since the only alternative is to reason using words whose meanings are known from everyday speech, and this will lead inevitably to equivocation and incongruity (*De Mundo*, 411–412, fol. 376v).

What has been set aside in this discussion of definitions is its relation to the method of geometry. While Hobbes praises geometers for using definitions in a manner that has brought certainty to their discipline, it is not simply because they have avoided ambiguity and equivocation, or tied all of their words to conceptions, that their subject has become 'certain' or 'indisputable' (*L*, V, 7). While clear definitions that avoid ambiguity and equivocation are an important part of

why the results of geometry are certain—for even geometers argue when they stray from their characteristic clarity[13]—Hobbes tells us that the principal reason why geometry is certain is that its practitioners assert only what they can prove from their definitions (*De Mundo*, 24, fol. 5v). The functional role that definitions play in geometrical reasoning, as can be seen in the deductive structure of Euclidean geometry, is that they provide a series of propositions to which geometers can then apply deductive reasoning to demonstrate what must be true as a result of their definitions.[14] This is then to say that the definitions of geometry do not function merely as a glossary of terms, but as a series of true statements from which one can prove propositions that must be true in consequence. The reason why the results of geometry are 'certain' or 'indisputable' is not only that its practitioners begin from definitions that are conceivable, or that they avoid equivocation, but that they assert only what they can show to be a necessary consequence of their definitions. (While geometers make use additionally of axioms and postulates, we will see in the following chapter that Hobbes believes that only definitions are needed as 'principles of demonstration.') The certainty of geometry is not consequent simply to the clarity of its terms but to the fact that geometers assert only what they can prove. When Hobbes says that other subjects need to follow the method of geometry, he is not saying that other subjects need merely to settle their definitions and terminology, but that they need to assert only what can be shown to follow

[13] Hobbes makes the point in *De Mundo* that geometers make mistakes and quarrel when they do not begin from definitions, as in the case of Clavius and Peletier and their debate about the angle of contact. Hobbes believes that this debate arose simply because they did not first define the word 'angle': "had it been clearly understood what an angle is, and, if what is called the angle of contact had been examined against the definition of 'angle,' such great geometers could but have realized at once whether or not [the angle of contact] was an angle and quantity" (*De Mundo*, 258, fol. 244, brackets by translator).

[14] There is a short appendix, at the end of this thesis, about the appropriateness of the word 'deduction' for describing Hobbes' thoughts on geometry and reasoning.

by necessary consequence from their definitions, or, equivalently, from a set of propositions already known or accepted to be true.

Although the following remarks are more a matter of (my) interpretation than what we have seen so far, it appears to me that what Hobbes finds in geometry is the belief that when we define our terms, determine our stock of true (or accepted) propositions, and decide our rules of inference, we will in the process determine unequivocally a set of propositions that follow in consequence, and that as a consequence of this determination we can then treat the 'truth' of a proposition as the factual question of whether it can be inferred from the initial propositions, given the meanings we (explicitly) gave to our words. Given Hobbes' belief that (typical) individuals reason equally well when given the same principles (*L*, V, 16), a body of knowledge structured like Euclid's *Elements* will produce results that are 'certain' and 'indisputable' in the sense that disputes will no longer occur aside from easily correctable errors, since it will be evident to any who examine the initial propositions whether an inference can be drawn (*L*, V, 16). While the results that are reached by this deductive strategy depend, entirely, on the truth of the initial definitions or premises, Hobbes is aware of this, and in the following chapter we will see that he limits the subjects in which 'scientific knowledge' is possible to those where we can have the appropriate 'definitions.' As we will see, the only subjects where we can have the appropriate 'definitions'—or, equivalently, where we can structure our reasoning as a deduction from a set of propositions that we know to be true and which have the content appropriate to science—are those that we make for ourselves.

That all philosophy is to be considered as deduction from propositions that have first been defined through careful consideration of our conceptions is an essential part of what Hobbes considers to be the proper practice of philosophy. While only a small amount of what we have

covered in this chapter has to do with geometry explicitly, all of the considerations we have covered are present when Hobbes praises geometry for beginning from definitions. While we have seen that definitions are important for the sake of clarity and that geometry is certain because it asserts only what it can prove, geometry is not a science solely because it uses definitions in the proper way, nor will any other subject become a science simply for adopting its definitional practice. Hobbes praises geometry's use of definitions not because its use of definitions has made it a science, but because its use of definitions has made it 'indisputable,' that geometers alone have managed to eliminate dispute and clamour by defining their terms and asserting only what they can prove. Whether one's methodologically proper researches can additionally be described as 'scientific' depends on the content of the results: knowledge is described as 'scientific' either when it is explicitly the knowledge of what causes produce what effects, or when it can be derived by necessary inference from that knowledge. One may use the definitional method without attaining scientific knowledge, and one may attain scientific knowledge without using the definitional method. We will see in the following chapter that Euclid's *Elements*, which is always Hobbes' example of proper methodology, is not a science despite its use of what he considers the appropriate method: it only becomes a science in Hobbes' sense once reconceptualized as the study of the effects of simple motion. In order now to see why geometry is a science, and in the process see what is necessary for a subject to become a science on Hobbes' conception, we will turn to the theory of science of *De Corpore*. After having seen how science is the deductive study of the knowledge of motion, we will be in a position to see, in the chapter following, how civil science counts as a science according to the theory of *De Corpore*.

2 Chapter Two

As mentioned briefly at the end of the last chapter, Hobbes uses the word 'science' to refer to a type of knowledge, namely, the knowledge of causes and their effects. While it is possible, in principle, to have scientific knowledge in any subject where there are causes to be known, Hobbes believes that we can give *demonstrations* of scientific knowledge only in subjects that we make for ourselves. He writes that

> Of arts, some are demonstrable, others indemonstrable; and demonstrable are those the construction of the subject whereof is in the power of the artist himself, who, in his demonstration, does no more but deduce the consequences of his own operation. The reason whereof is this, that the science of every subject is derived from a precognition of the causes, generation, and construction of the same; and consequently where the causes are known, there is place for demonstration, but not where the causes are to seek for. Geometry therefore is demonstrable, for the lines and figures from which we reason are drawn and described by ourselves; and civil philosophy is demonstrable, because we make the commonwealth ourselves. But because of natural bodies we know not the construction, but seek it from the effects, there lies no demonstration of what the causes be we seek for, but only of what they may be. (*SL*, E.W. 7, 184)

Bundled in to this very condensed passage are some of the most characteristic aspects of Hobbes' theory of science, from the belief that science proper refers only to the knowledge of the causes of things and what can be learned from this knowledge, to the belief that we can demonstrate causes

and their implications only of subjects that we ourselves are able to produce.[15] By going in detail into the reasons why Hobbes believes we can give scientific demonstrations only of what we are able to make for ourselves, this chapter will explain why Hobbes' theory of science effectively restricts the subjects that can be sciences to geometry and civil philosophy. This will lay the groundwork for our turn to civil philosophy in the following chapter, where we will show how Hobbes' approach to civil philosophy meets the requirements of a science, despite an evident lack of agreement with the more conspicuous aspects of what constitutes a scientific demonstration. What the discrepancies are, and how civil science can meet the requirements for a science, will become clear over the course of this chapter and the next.

As the point of departure for Hobbes' theory of demonstration and science is his conception of geometry, we will begin our exposition by stating the principles of Hobbes' geometry with an emphasis on how they depart from Euclid's *Elements*, which is always Hobbes' example of proper

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[15] A few words should be said at the beginning about Hobbes' definition of 'cause' and why we are not going to work closely with this definition. Hobbes explicitly defines 'cause' as the aggregate of all accidents in the agent and patient necessary to produce the effect (*DCo*, VI, 10) and includes 'motion' as an 'accident' or property. I am not sure that this definition is helpful in explaining any of what we need to cover to understand his belief that scientific explanations are possible only in a limited range of subjects, which is the purpose of this chapter. At least as I read Hobbes, one needs to consider the non-motive 'accidents' of the bodies involved in the production of an effect in order to give an explanation of what he calls the 'sufficient' or 'entire' cause, which requires specifying all of the accidents that are necessary to the effect's production (*DCo*, IX, 3, 4). Hobbes' example from *Liberty, Necessity, and Chance* is that the 'sufficient' cause of the movement of a stage coach includes not simply the accident of motion in the horses, but the accident (or property) of their not being lame, of their being strong, of their being attached to the coach, and of their being obedient (E.W. Vol. V, 383). The way that an accident is determined to be a part of the cause seems to be by a process of logical separation: if we can conceive of an effect being produced without a particular accident present in the agent or patient, then that accident is not a part of its cause (*DCo*, VI, 10). Rather than go further into this conception of causation (or its adequacy), it is sufficient for the purpose of determining the subjects in which scientific demonstrations are possible to say that they can be given only when we know the motions involved in the effect's production. It will then turn out, as we will see, that we can know the motions that are the cause of an effect only when we can produce it ourselves, from motions that are within our power. Although we will explain in this chapter how geometrical demonstrations can be considered demonstrations of the effects of simple motion, and thereby shed some light on what Hobbes means by 'cause,' this goal can be accomplished without having to follow closely a definition that Hobbes himself may not have considered sufficiently.

geometrical practice. While the previous chapter suggested that Hobbes' praise for geometry has to do with its certainty and indisputability, this chapter will show that Hobbes believes it is also the paradigm example of how to apply deductive reasoning to the knowledge of causes. We will see that Hobbes considers geometry to be a subject that deals with causes because he believes it is the study of the effects of simple motion. From here we will be in a position to see that Hobbes' beliefs about what constitutes a proper demonstration, presented in the geometrical terms of analysis and synthesis, provide the basic method to be used for the study of causes. We will then turn briefly to Hobbes' natural philosophy, where we will find confirmation that scientific demonstrations are possible only in a very small number of subjects. Having seen in detail what constitutes a proper, scientific demonstration beginning from causes, we will be in a position to evaluate, in the following chapter, what this means for the possibility of civil philosophy as a 'science.'

2.1 Definitions

As a deductive study, geometry begins from what Hobbes calls 'principles of demonstration.' 'Principles,' as Hobbes understands them, are the indemonstrable 'beginnings' or 'first propositions' from which a reckoning must begin to explain a subject in its entirety (*DCo*, VI, 12; *SL*, E.W. 7, 199).[16] While the principles of demonstration in Euclid's geometry include

[16] Hobbes seems to use the word 'principles' somewhat loosely, which is evident in the quotations following. At times he sticks to his strict definition as the evident yet indemonstrable first beginnings of a demonstration, while at

'axioms,' 'postulates,' and 'common notions,' Hobbes believes that no other propositions "should be called primary; nor, therefore, should any be included in the number of principles" aside from definitions "if we want to act [...] rigorously" (*DCo*, VI, 13). Since (at least Euclid's) axioms and 'common notions' can be demonstrated (*DCo*, III, 9), and 'postulates' are only used in constructing figures but not in demonstrating their properties (*DCo*, VI, 13),[17] Hobbes believes that the theorems of Euclid can be proven using only definitions as 'demonstrative principles.' Beginning only from definitions, without the use of postulates, axioms, or any other principles, geometry proceeds by reasoning through the consequences of its definitions, "by constant composition of propositions into syllogisms," until at last one has given a demonstration of all of the propositions that can be proven from the initial definitions (*DCo*, VI, 12, 16). The belief that the demonstrations of geometry can proceed from definitions alone is the first and most obvious of Hobbes' alterations to Euclid's geometry.

On a more abstract level, what distinguishes Hobbes' conception of geometry is his belief that it is the study of the simple motion of bodies (*DCo*, VI, 6). While Hobbes already inclines

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other times, in less precise contexts, he uses the word to refer to whatever propositions are accepted as premises from the outset of a demonstration, regardless of whether those propositions are true or the starting point acceptable.

[17] Hobbes says that postulates are principles of demonstration rather than construction (*DCo*, VI, 13). As I read this statement, what Hobbes means is that such postulates as Euclid's first in Book I—"to draw a straight line from any point to any point"—are simply statements about how to construct a figure about which a demonstration is subsequently given, so that these 'postulates' are not involved in the demonstration proper. Hobbes seems to have in mind that what one needs in a demonstration is only the definition of a straight line (Def. 4) rather than the postulate 'to draw a straight line…,' since the postulate differs from the definition only by stating the permissibility of drawing it. Regardless of how one explains this particular point, Hobbes does seem to have it mind that whatever content a 'postulate' may possess, it is either not a part of the demonstration, or its content can be proven from definitions.

towards a materialistic, motion-based reduction, he also believes this corrective is necessary to save the subject from absurdity and incoherence. Rather than accept Euclid's definition that a point is that which has no part, as does Wallis (*SL*, E.W. 7, 317), or that a line is a breadthless length, Hobbes accepts the criticism of Sextus Empiricus that these first definitions, so stated, are absurdities, that (among other criticisms) a point is not anything if defined as incorporeal,[18] nor is a line anything if then defined either as a series of points (i.e., incorporeal things) or as the motion of points (since they are defined as being dimensionless).[19] Since a point is nothing, then anything defined in terms of points will also be nothing: "[f]rom this one and first definition of Euclid, '*a point is that whereof there is no part*,' [...] Sextus Empiricus had utterly destroyed most of the rest, and demonstrated, that in geometry there is no science" (*SL*, E.W. 7, 317–318). (These definitions are 'absurdities' in Hobbes' technical vocabulary, as we discussed in the previous chapter, since it is not possible to conceive of a 'length' without 'breadth,' or that which is literally nothing.) While few demonstrations depend on the specific definition of 'point' or 'line,' it is Hobbes' opinion that if these demonstrations are truly to be made rigorous, the basic definitions need to be recast. To correct these mistakes, a point needs to be understood, not as that which has no part, but as "*that whereof no part is reckoned*, [by which] his arguments [i.e., Sextus Empiricus] have no force at all, and geometry is redeemed" (*SL*, E.W. 7, 318). A point needs to be considered, in other words, as a body, which is considered in abstraction from its parts, rather than that which has no parts.

Hobbes argues in the *Six Lessons to the Professors of the Mathematics* that Euclid himself acknowledges in the *Elements* the necessity of defining a point as a body, despite Euclid's lack of

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[18] Sextus Empiricus, *Against Those in the Disciplines*, trans. Richard Bett (Oxford, United Kingdom: Oxford University Press, 2018), 161.
[19] Sextus Empiricus, *Against Those in the Disciplines*, 163.

care in setting down the definition. What Euclid meant by saying that a point was that which had no part was only

> that no argument in any geometrical demonstration should be taken from the division, quantity, or any part of a point; which is as much as to say a point is that whose quantity is not drawn into the demonstration of any geometrical conclusion; or, which is all one, whose quantity is not considered. (*SL*, E.W. 7, 201)

Hobbes believes that his correction, whatever implications it may have for his own philosophy, was acknowledged by Euclid implicitly. Following this quotation he writes that "consequently Euclid's definition of a point is accurately true, and the same with mine, which is, that *a point is that body whose quantity is not considered*. [...] Euclid therefore seemeth not to be of [the] opinion, that [...] a point is nothing" (*SL*, E.W. 7, 201; 204). For reason of the absurdity of supposing otherwise, of opening geometry to the criticisms of the skeptics, Hobbes believes that points defined as bodies considered in abstraction from their quantity need to be taken as the basic unit in terms of which geometrical figures are defined. This definition of 'points' in terms of bodies is the first step in reconceptualizing geometry as the study of the motion of bodies.

When it comes then to defining geometrical figures, they are not treated by Hobbes as a series of points, arranged in the shape of a figure, but the movement of bodies considered in abstraction from their quantity, where figures are then defined in terms of the motion of points. While Euclid defines a line as a breadthless length, Hobbes defines it as the motion of a point, and likewise defines a circle as the circumduction (i.e., circular motion) of a straight line in a plane (*DCo*, VI, 13). Hobbes finds a precedent in Euclid for defining figures in terms of their motions, as when Euclid defines a sphere as a semicircle carried about an axis (*SL*, E.W. 7, 218; *Elements*,

Book XI, def. 14). In response to Wallis's criticism that motion is irrelevant to the definition of a figure, since lines are present in bodies at rest as well as in motion, Hobbes replies that motion should be included in the definition of a line because a line can only be produced by motion (*SL*, E.W. 7, 218). Giving, in his own words, both the charge and his defense, Hobbes says that

> Again, you [i.e., Wallis] object and ask: "What need is there of motion, or of body moved, to make a man understand what is a line? Are not lines in a body at rest, as well as in a body moved? And is not the distance of two resting points length, as well as the measure of the passage? Is not length one and a simple dimension, and one and a simple dimension line? Why then is not line and length all one?
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> [...] [F]irst, I say, to me, howsoever it may be to others, it was fit to define a line by motion. For the generation of a line is the motion that describes it. And having defined philosophy in the beginning, to be the knowledge of the properties from the generation, it was fit to define it by its generation. (*SL*, E.W. 7, 215)

While Hobbes believes it is necessary for the coherence of geometry to define points in terms of bodies, and then figures in terms of the motion of points, he explains in this quotation that the choice to define figures using motions is to agree with his definition of philosophy as the knowledge of causes, or, in his occasional terminology, as the knowledge of the generation of things and of what we can learn about their properties from this knowledge. Given that philosophy properly speaking aims for scientific knowledge, which is always the knowledge of causes, and that Hobbes believes all causation is supposed to be efficient (*DCo*, X, 7), he cannot consider geometry to be a 'science' apart from his reconceptualization of the subject as the study of 'simple motion'—i.e., the motion of bodies considered in abstraction from their quantity and other determinations.

In Hobbes' terminology, it is important to recognize that anything that has a 'generation' has a 'cause,' and anything that has a 'cause' can be considered an 'effect.' When one gives definitions in geometry and defines, e.g., a 'line' as 'the motion made by a point,' one gives for its definition a proposition that is a statement of its 'generation' or its 'cause.' Since a 'line' has a 'cause,' it can be considered as an 'effect,' and since its cause is the motion of a point, it can be considered as an effect of motion. If we remember that a definition is a proposition, the definition of a 'line' as 'the motion of a point' is then an affirmative proposition that states the motion by which the effect is produced. Assuming that the proposition 'a line is the motion made by a point' is true, the knowledge of this definition is an example of scientific knowledge, because it is a true proposition about the motions that produce an effect. By requiring that all definitions state the motions by which what they define is produced—that a 'line' is 'the motion of a point,' or a 'circle' 'the circumduction of a line in a plane'—any inferences that we can make from these definitions will be inferred from scientific propositions. Since consequences derived from scientific knowledge are also scientific knowledge (*DCo*, VI, 16), any deductive reasoning that begins from these definitions will end in science. If the figures used in Euclid's geometry can be redefined to include their causes—and one can reduce all of the premises to definitions, or to what can be proven from definitions, as Hobbes would like to do (*DCo*, VI, 13)—then the propositions of the *Elements* can be considered examples of 'scientific knowledge' in Hobbes' sense, because they are shown to follow necessarily from scientific premises. When explaining why the basic principles of geometry need to include the knowledge of causes, Hobbes says that

> the reason why I say that those things which have a cause or generation ought to be defined in terms of that cause and generation is this: The goal of proof [*demonstrandi*] is the scientific knowledge of causes and the generation of things; and if this scientific knowledge

> is not in the definitions it cannot be in the conclusion of the syllogism which is first built up from the definitions; and if it is not found in the first conclusion, it will not be found in any later conclusion. So no scientific knowledge would ever exist, which is contrary to the goal and purpose of the one who sets out proofs. (*DCo*, VI, 13)

Demonstrations need to begin from definitions that are already scientific, i.e., from propositions that are statements of causes, because otherwise the results will not contain causes and therefore not be scientific. While defining points in terms of bodies is necessary to save geometry from absurdity and to ensure that its subject matter is conceivable, defining figures in terms of their causes is necessary if the result we reach by reasoning from those definitions is to be called 'science.'

We can now see with some clarity why Hobbes reconceptualizes geometry as the most basic study of motion and why he considers it to be the ideal science, aside from the considerations of method that we treated in the previous chapter. By the 'method' of geometry, we mean the 'method' of beginning from clear definitions and then working out the consequences of those definitions. While all subjects are ideally supposed to follow this method, for the reasons given in the last chapter, the method itself does not produce scientific knowledge. If following this method, without any further qualification, was enough to produce science, then the consequences of even arbitrary definitions would count as science, and—at least as I read Hobbes—he wants to disallow that there could be a science of arbitrary or fictional things. It follows from Hobbes' reduction of causation to efficient causation, along with his definition of 'body,' that we can have a science only of things that are (or at least could be) physically instantiated, since scientific knowledge is always the knowledge of causes, which involves motion inseparably, and motion is always the motion of bodies, which are by definition extended in space and mind-independent (*DCo*, VIII, 1).

It is not enough for a subject to be a science that it simply gives clear definitions and then works out the consequences. Even if a subject follows the proper method of reasoning from definitions, whether or not that subject is a science still depends on its content, because only definitions that contain causes (and are about things that could exist physically) will produce scientific knowledge, and, as we learned in the previous quotation, no scientific knowledge can be attained if one's premises do not contain the knowledge of causes (*DCo*, VI, 13). Even if one gives definitions properly, in terms of conceptions, as we discussed in the previous chapter, those definitions will not produce science unless they also contain the knowledge of causes. Geometrical definitions satisfy the criteria both of containing the cause (of what they define) and explicating the conception: when we say that a 'line' is 'the motion of a point,' we identify at once the cause, viz., the motion of a point, and the conceptions involved, viz., the concepts of 'motion' and 'point.' Geometry is the ideal science not simply because it follows the appropriate method, but because it applies that method to definitions that have the content appropriate to science.

Not only does Hobbes believe that geometry needs to be considered as the study of the motion of bodies to save it from absurdity, he believes that it is only on this understanding that it can be brought into the orbit of what he considers science, i.e., the study of causes and their effects. In the context of a theory that aims to reduce all causation to the motion of bodies, geometry is the subject that deals with motion at its most basic: it is the study of 'simple motion,' or of the effects produced by the motion of bodies considered apart from any determinations of quantity, extension, or other properties. Despite a complete reconceptualization of geometry, Hobbes believes that he has, so to speak, changed the foundations without affecting the structure: he believes that the demonstrations of Euclid still hold, only now that their subject matter is defined in a way that is conceivable, that they are now 'scientific' in what he believes is the true and proper sense. The

propositions of geometry can be considered either directly as the knowledge of what motions produce what effects—e.g., that the circumduction of a line in a plane produces a circle—or indirectly as the knowledge of the properties that we can demonstrate that things have by reasoning from their definitions—e.g., that 'the square on the hypothenuse is equal to the sum of the squares on the other two sides.' As we shall see momentarily, this view of geometry, as deductive reasoning from a set of true propositions that are statements of the knowledge of causes, is the model for scientific reasoning that Hobbes wants to extend to all of the subjects of science.

It should not surprise the reader to notice that other subjects do not meet the standard set by geometry, nor is it exactly clear how other subjects could plausibly be modelled as deductions from first propositions expressing the knowledge of causes. Geometry is, in Hobbes' words, "the only science that it hath pleased God hitherto to bestow on mankind" (*L*, IV, 12). Having sketched the reasons why the only existing science is considered to be a science, we are in a position to consider how Hobbes attempts to generalize what he has found in geometry. Since a subject can be considered a 'science' only if it can give demonstrations that begin from the knowledge of causes, we will examine, first, what Hobbes has to say about how to give a proper demonstration, and then examine his reasons for believing that these demonstrations are possible only in certain subjects.

2.2 Demonstrations in Science

As Hobbes often gives very precise definitions to familiar words and then adheres to them strictly, it is important to begin with his definitions. According to Hobbes, a 'definition' is a true affirmative proposition about the thing it defines, while a 'proposition' is a form of speech distinguished from others in that it is true or false; it is understood in opposition to non truth-

functional forms of speech such as prayers, laws, lamentations, threats, etc. (*DCo*, III, 1). Hobbes gives an approximate definition of a 'demonstration' as syllogistic reasoning beginning from definitions. Hobbes writes that

> Any two definitions, which can be compounded into a syllogism, produce a conclusion which is said to be proved because it is derived from principles, that is, from definitions; and the derivation of compound itself is called a proof. Similarly, if a syllogism is made from two propositions, of which one is a definition and the other a conclusion that has been proved, or of which neither is a definition, but each has been previously proved, then that syllogism is also said to be a proof, and so on. Therefore a definition of "proof" [*demonstrationis*] will be something like the following: A proof is a syllogism or series of syllogisms derived from the definitions of names all the way to the final conclusion. From this it is understood that every valid reasoning which begins with true principles is a scientific and true proof. For that approximates the etymology of the name, even though the Greeks used ἀποδέιξις which the Latins translated as the word "demonstratio," only for that reasoning in which they, having described certain lines and figures, put the thing to be proved practically before their eyes, which properly is "ἀποδεικνύειν" or "monstrare." Nevertheless they seem to have done this because they noticed that except in geometry (which is almost the only place for figures of this kind), no reasoning about other matters was certain or scientific, but everything was replete with disputes and shouting. And this happened not because the truth to which they aspired could not appear without figures but because they had not set out any valid principles of reasoning. There is no explanation for this except that if definitions had been presented in each branch of learning, there would be sound proofs. (*DCo*, VI, 16)

While a 'demonstration' is supposed to begin from 'definitions,' 'definitions' in this context refers simply to the premises accepted at the beginning of a demonstration, as when one reasons in geometry from the true affirmative propositions that are called 'definitions.' Since a 'definition'

in this context is interchangeable with an affirmative proposition that states the cause of an effect, we can say provisionally that a 'scientific demonstration' is a syllogism or a series of syllogisms that begins from propositions that state the causes of effects, or from propositions that have already been proven from propositions that state the causes of effects. Seen at this level of abstraction, it is important to note that the premises of a scientific demonstration do not necessarily need to be 'definitions': the premises need only to be true propositions that state the cause of an effect, so that any subsequent propositions will be the necessary consequence of what is already known to be scientific.

Aside from Hobbes' overtly geometrical language, the key evidence for the view that scientific demonstrations are supposed to proceed on the model of geometry comes from Hobbes' discussion of the 'art of the geometers' or *logistica*, which comprises 'analysis' and 'synthesis,' or, in his occasional terminology, 'resolution' and 'composition' (*DCo*, VI, 19; XX, 6). In these passages, Hobbes uses 'analysis' and 'synthesis' in a sense that is specific to geometry, that geometers proceed by synthesis when they demonstrate the consequences of their definitions, or, working backwards, they proceed by analysis when they take a conjectured proposition and attempt to derive from it something already known (*DCo*, XX, 6). Analysis, Hobbes writes,

> is continual reasoning from the definitions of the terms of a proposition we suppose true, and again from the definitions of the terms of those definitions, and so on, till we come to some things known, the [re]composition whereof is the demonstration of the truth or falsity of the first supposition; and this composition or demonstration is that we call *Synthesis*. *Analytica*, therefore, is that art, by which our reason proceeds from some thing supposed, to principles, that is, to prime propositions [i.e., definitions], or to such as are known by these, till we have so many known propositions as are sufficient for the demonstration of

> the truth or falsity of the thing supposed. *Synthetica* is the art itself of demonstration. (*DCo*, XX, 6)

To have a sense of what Hobbes means in this passage, one needs to take account of the process being described. We may take as an example the 47th proposition of Euclid, that "[i]n right-angled triangles the square on the side subtending the right angle is equal to the squares on the sides containing the right angle."[20] By resolving the definitions of each word of a proposition into its constituent terms, and then the terms of those definitions and so on, we will eventually resolve the complex terms of the original proposition into the most general terms involved, such as 'line,' 'equality,' and so on. The process of resolving definitions into simpler terms is the same as the process of resolving our conceptions into simpler conceptions that we saw in the previous chapter, as when we resolve the concept of 'square' into 'equilateral,' 'quadrilateral,' and 'rectangle' (*DCo*, I, 3). By resolving the terms of a proposition into their definitions, and then the terms of those definitions, and so on, we come eventually to the simplest terms and the concepts they involve. These simplest terms, which cannot be defined sufficiently in terms of anything else (*DCo*, VI, 14), are set down adequately when "clear and perfect ideas or conceptions of the things which they name are aroused in the mind of the hearer by means of the briefest speech that can be made" (*DCo*, VI, 13). Having clearly defined all of the concepts involved in the original proposition, we can then attempt a demonstration of the proposition by deduction from those definitions. While analysis is the process of breaking down complex propositions into simpler statements until we determine the definitions implicit in the original proposition, synthesis is the demonstration either

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[20] *Euclid's Elements: All Thirteen Books Complete In One Volume : the Thomas L. Heath Translation* (New York: Dover, 1956).

of the truth or falsity of the proposition by reasoning from those definitions. While analysis is used to reach the 'principles' from which the demonstration can begin, the "true teaching" of geometry is by synthesis—i.e., by deductive reasoning from principles—which "is the art itself of demonstration" (*DCo*, XX, 6).

While Hobbes' account of *logistica* begins as an explanation of the methods used by geometers, it is, by the end of the article, generalized as the procedure to be used in the sciences of demonstrating the cause of an effect or (equivalently) its generation. The final statement on the matter in *De Corpore* says that

> Those propositions, in which analysis ends, are definitions, but such as signify in what manner the construction or generation of the thing proceeds. For otherwise, when [the analyst] goes back by synthesis to the proof of his problem, he will come to no demonstration at all; there being no true demonstration but such as is scientifical ; and no demonstration is scientifical, but that which proceeds from the knowledge of the causes from which the construction of the problem is drawn. To collect therefore what has been said into few words; ANALYSIS *is ratiocination from the supposed construction or generation of a thing to the efficient cause or coefficient causes of that which is constructed or generated. And* SYNTHESIS *is ratiocination from the first causes of the construction, continued through all the middle causes till we come to the thing itself which is constructed or generated.* (*DCo*, XX, 6)

While these remarks on their own are obscure, they can be contextualized readily in terms of what we have seen is Hobbes' conception of geometry. Hobbes considers that geometry, understood as the study of the effects of simple motion, can be described either as the process of reasoning from effect to the cause, as when we reason from a complex proposition down to basic definitions of figures and the motions by which they are produced, or as the process of reasoning from cause to

effect, as when we demonstrate how to construct a figure from definitions that include causes. While Hobbes does not give a clear explanation why the definitions we use when we demonstrate the construction of a figure can be described as the efficient cause of the construction, the important point for our purpose is his belief that the method of geometry can be described as reasoning from the cause to the effect or from the effect to the cause, according to a process of analysis and synthesis, whereby we first reason backwards, from a complex idea to its causes, in order that we can then try to demonstrate how it was produced from its causes.

We are now in a position to see how aspects of this conception of geometry may be generalized into a theory of scientific demonstration. While analysis, or the uncovering of 'principles,' is an essential part of how to conduct a proper demonstration, what we normally mean by 'demonstration' is simply the act of synthesis, or of working out syllogistically the consequences of one's principles which, according to Hobbes, are supposed to be definitions that contain the knowledge of causes (*DCo*, XX, 6). To step back a little from the specifics of his formulation, we may say that what it means to give a scientific demonstration, in any subject, is to reason deductively from propositions that state the causes of effects, or from propositions that have already been proven from the former kind of propositions. One first establishes a series of true propositions that are statements about causes, and then proceeds to work out what propositions must be true in consequence. While Hobbes' conception of science deals with the knowledge of causes and their effects, what one aims to do in a Hobbesian conception of science is prove propositions, as one does in geometry.[21] The sense in which these 'demonstrations' follow the

[21] That science deals primarily with the truth of propositions is Hobbes' explicit view, as when he defines science in *Leviathan* as the conditional knowledge of the consequences of affirmations to each other (*L*, IX, 1).

pattern of analysis and synthesis is that they begin by reflecting on the subject in order to determine the basic principles from which the demonstration is supposed to proceed. As I read Hobbes, the 'principles' from which a synthesis proceeds do not need to be definitions, but simply propositions that state the knowledge of causes. These demonstrations are supposed to begin, in proper, geometrical style, by resolving, naming, and defining the relevant conceptions, setting down explicitly the meanings of our words, and then proceeding deductively, from true propositions that state the knowledge of causes, or from propositions that can be proven from the knowledge of causes.

To pull together the strands of Hobbes' thought on geometry, we may describe the reason why it is a science in the following way. Scientific knowledge is the knowledge of what causes produce what effects or of what can be inferred from this knowledge. Since one's results will not be scientific unless one begins one's demonstration from the knowledge of causes, scientific demonstrations can only be given where the causes are known. Since any explanation of a cause must include the motions by which the effect is produced, we can infer the following limitation, that we can give scientific demonstrations only when we know the motions that are needed to produce the effect. As I am reading Hobbes, we can only know definitively the motions that produce an effect when we can 'construct' or 'produce' that effect ourselves (*SL*, E.W. VII, 184). This limits the number of effects that we are able demonstrate to those that we can produce ourselves. If we consider exclusively the motions that we can initiate, that is to say, from the movement of our bodies, the only effects that those motions alone are able to produce are geometrical figures, which are the effects of simple motion. This reading takes Hobbes very seriously and at face value when he says that "[g]eometry [...] is demonstrable, for the lines and figures from which we reason are drawn and described by ourselves" (*SL*, E.W. 7, 184). When we

set down geometric definitions in terms of their causes, we can be confident in our knowledge of the motions that produce those effects because we are able to produce the effects ourselves. This is supposed to allow that we can treat the subject systematically, by inscribing the causes in the basic definitions, and then working out the consequences. Since the consequences of scientific knowledge continue to be scientific knowledge, any consequences we can draw from our definitions will continue to be scientific, and our demonstrations of various propositions can be presented in chains of syllogisms. This is then to say that the demonstrations of Euclid's geometry can be considered scientific, in Hobbes' sense, because they work out the implications of definitions that have the content appropriate to what he calls 'science.'

Having given a clearer sense to why Hobbes believes that geometry can be treated as a science, the question that follows immediately is whether any other subject could actually be a science in the same sense that geometry is a science. At least as I have presented the issue, the reason why we can give scientific demonstrations in geometry is because we are the cause of the effects that we study, that we know the motions by which the effects are produced because we can produce those effects ourselves. When it comes to other subjects that study causal relations, like the subjects of natural philosophy, we cannot give demonstrations of the motions by which effects are produced, because we do not know the motions by which they are made: this is because we neither produce these effects ourselves, nor do we observe the motions by which they are 'generated.' It would seem, in other words, that if we can give a demonstration only of the effects of which we are the motive cause (*SL*, E.W. VII, 184), then this model fails to apply to any subject other than geometry. What we will now see, in the following section, is that rather than revise his theory in light of this implication, Hobbes accepts that we cannot give scientific demonstrations in

any subject that we do not make for ourselves. As quoted at the outset of this chapter, Hobbes says that

> because of natural bodies we know not the construction, but seek it from the effects, there lies no demonstration of what the causes be we seek for, but only of what they may be.
>
> And where there is place for demonstration, if the first principles, that is to say, the definitions contain not the generation of the subject, there can be nothing demonstrated as it ought to be. (*SL*, E.W. 7, 184)

Demonstrations in natural philosophy cannot be given 'as they ought to be' because we do not know with certainty what the causes are, and where we cannot begin our reasoning from the knowledge of causes, we cannot have scientific demonstrations. While Hobbes never says that we cannot have scientific *knowledge* in these subjects, which is simply the knowledge of what causes produce what effects, he stresses that we cannot have scientific *demonstrations*, that demonstrations cannot be given in natural philosophy 'as they ought to be' because our knowledge of causes at best is hypothetical. To bring out more clearly that Hobbes accepts the implication that we cannot give scientific demonstrations in natural philosophy, the following section will provide a brief overview of Hobbes' thoughts about scientific knowledge in natural philosophy. This will provide indirect evidence for the belief that we can have scientific demonstrations only in subjects that we make for ourselves.

2.3 Science in Natural Philosophy

Given the sheer number of subjects that Hobbes believes fall under natural philosophy (*L*, IX), and the choice on Hobbes' part to describe them as sciences (*L*, IX), one may ask whether he really believes that scientific demonstrations are not possible in its subjects. When I suggest that

demonstrations cannot be given in natural philosophy, one must keep in mind that this is a very significant claim, since Hobbes' breakdown of the areas of philosophy marks every subject except for civil philosophy as 'natural' (*L*, IX). (While Hobbes believes that geometry is a subfield of natural philosophy, because it studies the effects of the motion of bodies, it is easier for the following section simply to treat 'geometry' as a subject separate from natural philosophy, since this section will deal with natural philosophy in its empirical aspect.) The quotations following will corroborate the picture sketched above by helping us see that, while Hobbes still believes that we can acquire knowledge of the physical world through observation and experimentation, he denies that the proper name for the knowledge we receive is 'science.' While we can have knowledge that comes from experimentation, these results are not science, since the mere conjecture that certain motions will produce certain effects, however probable, does not add up to 'knowledge.' Despite the difficulties apparent in his position, we will see that Hobbes accepts that we cannot have scientific demonstrations in the subjects of natural philosophy.

While scientific knowledge needs to be believed to be true and confirmed to be true, for otherwise our belief is not knowledge (*HN*, VI, 2 ff.), our understanding of causes in natural philosophy is limited to probable explanations. Hobbes is clear in the *Elements* that if one has an opinion that happens to be true, but one does not know that it is true, then one's belief is opinion rather than knowledge (*HN*, VI, 2). According to this distinction, any explicitly probable explanations will be opinion rather than knowledge. In an early quotation from the *Tractatus Opticus*, Hobbes explains that natural philosophy is supposed to proceed by hypothesis, or 'supposition,' which is a process where nothing more can be expected than that the motions one posits are imaginable or conceivable, that they can account for the necessity of the effect's occurrence, and that they imply nothing false. Hobbes says that

> The natural sciences differ greatly from the other sciences. In the latter, nothing is needed or admitted as a foundation or primary principle of demonstration other than the definition of terms, by which ambiguity is excluded. [...] But in the explanation of natural phenomena, another kind of procedure must be followed, which is termed Hypothesis or supposition. Suppose a question is raised about the efficient cause of any event which is obvious to the senses, the sort of thing which we usually term a Phenomenon. Any answer will consist standardly in the designation or description of some motion, to which the Phenomenon is necessarily consequent; and since it is not impossible for dissimilar motions to produce the same Phenomenon, it is possible for the effect to be correctly demonstrated using the hypothetical motion, even though the hypothesis may be untrue. Nothing further is required in Physics, therefore, than that the motions we suppose or imagine are conceivable, that the necessity of the Phenomenon can be demonstrated from them, and that nothing false can be derived from them.[22]

As Hobbes writes again in his correspondence, since 'the greatest part' of natural philosophy depends on the motion of bodies so small that they are invisible, "the most that can be atteyned vnto is to haue such opinions, as no certayne experience can confute, and from wch can be deduced by lawfull argumentation, no absurdity."[23] In the subjects of natural philosophy, nothing more is required or possible than that we can show how phenomena may be produced from a possible

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[22] Translation from the *Tractatus Opticus* by Richard Tuck in "Optics and Sceptics: The Philosophical Foundations of Hobbes's Political Thought," in *Conscience and Casuistry In Early Modern Europe*, ed. Edmund Leites (Cambridge: Cambridge University Press, 1988), 252.

[23] Quotation from a letter to William Cavendish (1636) in *The Correspondence of Thomas Hobbes*, *Vol. 1: 1622–1659*, ed. Noel Malcolm (Oxford: Clarendon Press, 1994), 33. For the same opinion about the impossibility of observing invisible bodies, see *Decameron Physiologicum* (*DP*, E.W. VII, 78).

cause. The only criteria for these demonstrations are that the motions are conceivable, that they account for the effect's occurrence, and that no absurdities can be inferred. In order to claim that we have the knowledge of causes rather than the opinion of causes, we need to know with certainty the causes of a phenomenon, yet Hobbes believes that there is a hypothetical element in the study of natural philosophy that is ineradicable and unavoidable.[24] Demonstrations cannot be given 'as they ought to be' unless that demonstration can begin from known causes (*SL*, E.W. VII, 184). In order for a demonstration to be scientific, one needs to begin from causes that are known, yet it is Hobbes' explicit view that our knowledge of causes in natural philosophy can only be hypothetical.

While Hobbes believes that we can still gain knowledge about the physical world from experiments and observations—from 'the legitimate reasoning from the experience of effects'—he denies that this knowledge is scientific. Hobbes writes in *De Homine* that

> *Science* is understood as being concerned with theorems, that is, with the truth of general propositions, that is, with the truth of consequences. Indeed, when one is dealing with the truth of fact, it is not properly called *science*, but simply *knowledge*. Therefore it is science when we know a certain proposed theorem to be true, either by knowledge derived from the causes, or from the generation of the subject by right reasoning. On the other hand, when we know (insofar as possible) that such and such a theorem may be true, it is knowledge derived by legitimate reasoning from the experience of effects. Both of these methods of proof are usually called demonstrations; the former kind is, however, preferable

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[24] Douglas Jesseph, "*Scientia* in Hobbes," in *Scientia In Early Modern Philosophy: Seventeenth-Century Thinkers On Demonstrative Knowledge From First Principles*, eds. Tom Sorell, G.A.J Rogers, and Jill Kraye (Dordrecht, Netherlands: Springer, 2010), 124.

> to the latter; and rightly so; for it is better to know how we can best use present causes than to know the irrevocable past, whatsoever its nature. Therefore science is allowed to men through the former kind of *a priori* demonstration only of those things whose generation depends on the will of men themselves. (*DH*, X, 4–5)[25]

As I read this passage, reasoning from experience does not produce science because it is always involved in reasoning backwards, from effect to cause, and can at best only demonstrate what happened previously, assuming we can do even this non-hypothetically (*SL*, E.W. 7, 184). While science is simply the knowledge of what causes produce what effects, one cannot come to show, by reasoning from experience, that the motions one conjectures will actually produce these effects, but only that it is conceivable that they may, or, in ideal circumstances, that they have produced this effect before. On the other hand, in subjects that are generated 'by right reasoning alone,' that is, where we can reason through the motions by which they are produced, we are able to give demonstrations (apparently) that do not pertain only to the past and which we can call 'science.' The emphasis in this passage, as we saw in the previous section, is that we can give proper demonstrations only when we know the 'cause' or generation.

These quotations support the suggestion of the previous section that we cannot have scientific demonstrations in natural philosophy. Why Hobbes would continue to call these subjects 'sciences,' even though scientific demonstration is not possible in these areas, would seem to be that the phenomena these subjects study are produced by motion, and therefore they could, in theory, be treated scientifically, even though Hobbes believes that we will never be in a position

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[25] 'Experimental science,' as Quentin Skinner puts it, is an oxymoron in Hobbes' terminology [Quentin Skinner, *Reason and Rhetoric In the Philosophy of Hobbes* (Cambridge: Cambridge University Press, 1996), 262].

to know their causes and to give scientific demonstrations strictly speaking. Because we can demonstrate an effect's production or its properties only when we know the causes, and the only situation in which we know the motions that produce an effect is when we can produce the effect ourselves, Hobbes' theory of science restricts the subjects that can be treated 'scientifically' to those of which we are the motive cause.

As far as I can see, it is difficult to avoid the conclusion that Hobbes' theory of science is an attempt to generalize a methodology and a theory of science from geometry that in the end applies properly only to geometry. While, as we will discuss in the following chapter, Hobbes believes that civil science is the one other subject that can be conducted on this model, we will see that this is possible only by a series of qualifications that render the application less than direct. What Hobbes in practice takes from geometry is a deductive methodology that begins by clarifying its terms and that treats its study as deduction from a series of explanatorily basic 'principles.' This methodology, however, produces scientific knowledge only when we can begin from the knowledge of causes. What we will explore in the following chapter is Hobbes' attempt, in *De Corpore*, to explain how key parts of his civil philosophy may be considered necessary implications of the knowledge of causes.

2.4 Conclusion

The basic idea of Hobbes' science is that scientific knowledge is the knowledge of what motions produce what effects and of the properties we can prove that things have as a result of the knowledge of their generation. For a subject to be a science is for it to be treated systematically, as a series of demonstrations beginning from the most basic causes needed for the specific demonstration. However, Hobbes' belief that scientific knowledge is the true knowledge of causes

and effects has the result, as we have seen, of limiting scientific demonstrations to subjects that we can make for ourselves, from motions that are within our power. To return to the quotation from which we began, when Hobbes says that the arts we can demonstrate are those that we make for ourselves, this is said in the context of a theory where a demonstration can only be given 'as it ought to be' when we know the causes. Hobbes does not say that 'we know only what we make' or that 'we can have scientific knowledge only of what we make,' but rather that we can give demonstrations of scientific knowledge only in subjects where the causes are known. Having established that a subject is conducted scientifically when it can be treated as a demonstration beginning from the knowledge of what motions produce what effects, we are now in a position to see how civil philosophy fits into this picture.

Before moving on, we will note finally that, while Hobbes tells us that all scientific demonstrations involve reasoning from definitions, it should be clear by this point that he does not believe that science is a matter only of working out the consequences of arbitrarily defined words. Science aims for the knowledge of causes. Even though science is regularly described as deduction from definitions, one cannot simply decide by fiat the definitions from which a scientific explanation begins. While there is a trivial sense in which we decide the meanings of our words, which we covered in the previous chapter, Hobbes states repeatedly that 'definitions' are always affirmative propositions about the causes of what they define, even in geometry. As such, we cannot choose whatever definitions we like, since it is not a matter of choice what motions produce what effects. Even in subjects of which we are the makers, we have to take care not to assign definitions inaccurately, as when Euclid set down negligently the definition of 'line' (*SL*, E.W. VII, 202), or if one were to define a cube in terms of the rotation about a point. While Hobbes describes scientific demonstrations as deductions from definitions, these 'definitions' are simply

affirmative propositions about what causes what, and are thereby subject to truth and falsity, since it is a matter of fact whether certain motions produce certain effects. Science is a process of deduction from true propositions of the knowledge of causes rather than deduction from words arbitrarily defined. To avoid ambiguity and move from premise to premise by evident, necessary inference, one is supposed to begin a demonstration by settling clearly the meanings of one's words, but this does not mean that philosophy (in the all-encompassing, 17th century sense) does not aim at the knowledge of causes, or that definitions cannot be true or false.

3 Chapter Three

The previous chapter explained that what Hobbes means when he says that we can demonstrate only what we make is that we can give scientific demonstrations only when we know the cause, which turns out to mean that we can give demonstrations only when we know the motions by which an effect is produced. Hobbes' gloss on this belief is to say that we can give demonstrations only of those things that we can make ourselves, since it is only in these subjects that we can know definitively the motions that produce the effect. By going through Hobbes' theory of science, we saw that he believes scientific knowledge is produced by reasoning from 'principles,' by which he means affirmative propositions that define a thing in terms of its cause. If we take Hobbes very strictly in his belief that 'science' refers to the knowledge of what causes produce what effects or what can be inferred from this knowledge, we then have to say that one's knowledge is 'scientific' only when it bottoms out in the knowledge of causes. This chapter will attempt an explanation about how Hobbes' civil philosophy may be a considered a 'science' in this sense, i.e., how it may be considered to involve claims that can be proven by reasoning from propositions that state the cause of effects. If Hobbes cannot show that his civil philosophy is a science according to his own theory of science, which is focused entirely on the knowledge of causes, then we have reason to doubt whether he succeeded, even on his own terms, in raising civil philosophy to a science. By following the theory presented in *De Corpore*, I will not argue that every part of Hobbes' civil philosophy can be traced back to the knowledge of causes, but rather that he believes that certain 'principles' of his civil philosophy can be demonstrated, by deductive reasoning, from the knowledge of causes. This is not to say that Hobbes actually attempts such a demonstration, but that civil science is 'scientific' on the promise that such a demonstration is

possible. While I will suggest that this view was held by Hobbes prior to *De Corpore*, our primary intent is to show how civil science may count as a science according to the view presented there.

The *prima facie* reason for thinking it is possible to locate civil philosophy within Hobbes' causally-focused theory of science is the extreme unlikelihood that this theory contains no place for what he himself called civil *science*, especially since *De Corpore* (1655), which outlines his theory of science, was originally intended as the first installment of a trilogy ending with *De Cive* (1642). I will show in this chapter that Hobbes does give an explanation for where civil science fits in his motion-centric scheme of the sciences. We will begin by exhibiting the fact of Hobbes' belief that the "principles" of his civil science can be demonstrated by reasoning from the "scientific knowledge of the desires and disturbances of minds," which are explained in terms of motions (*DCo*, VI, 7). While civil science can be known by one who does not have any specific knowledge of the effects of simple motion, the reason why Hobbes' civil philosophy is scientific is that he believes it could be demonstrated and proven by one who knew 'scientifically' the 'motions of the mind,' or the passions (*DCo*, VI, 7). Since reflection on experience yields the very same knowledge of the passions as would be known to one who knew scientifically the desires and disturbances of minds (*DCo*, VI, 7), Hobbes believes that he can demonstrate, by reasoning from introspective knowledge of the passions, the same political conclusions that could be demonstrated by one who had scientific knowledge of the mind and its motions (*DCo*, VI, 7). While the appeal to experience or introspection may seem like an easy solution for a theory of science that would otherwise have no room for a civil science, we will see that this is indeed the view of *De Corpore*.

If we are correct in saying that civil science is scientific because it yields the same results as could in principle be demonstrated from the knowledge of causes, then we will then have to say

that a number of commonly received views are not true. While I believe that the following view, at the very least, states the position of *De Corpore* (1655), I will suggest that this is a view Hobbes already held in his earlier works, given that *De Corpore* was originally planned to precede *De Cive* (1642), and that it was being drafted at least eight years prior to the publication of *Leviathan* (1651).[26] After suggesting that this is a view Hobbes likely held earlier, we will address possible objections by considering the alternative cases made by Quentin Skinner and Tom Sorell. While it is recognized widely that Hobbes' conception of science begins with definitions, I will aim to show, when we turn to Skinner's view, that deduction from definitions, in the sense Skinner describes, is not enough for civil philosophy to be a science. Our principal issue with Skinner's account is that it attempts to explain what is scientific about Hobbes' civil philosophy without making any reference to science as the knowledge of causes. Having concluded that Skinner's view is not satisfactory, I will consider direct objections to my own position by turning to Tom Sorell, who argues explicitly against the evidence I have been using. We will devote a section of this chapter each to Quentin Skinner and to Tom Sorell before moving on to closing remarks.

3.1 Motion

In chapter six of *De Corpore*, article six and following, Hobbes goes into detail about the steps through which one must progress in order to give a complete demonstration of the cause of an effect. Since Hobbes believes that anything that has a cause is produced by motion, it should not come as a surprise that the proper way in which the sciences should be studied involves a

[26] Noel Malcolm, "A Summary Biography of Hobbes," in *The Cambridge Companion to Hobbes*, ed. Tom Sorell (Cambridge: Cambridge University Press, 1996), 30.

progression from the knowledge of the most basic effects of motion to the most complex. Beginning first by defining the basic concepts covered in first philosophy—such as 'place,' 'motion,' 'quantity,' 'accident,' and so on—we must move on to consider the most basic effects of motion, that is,

> what is made from motion *simpliciter*. Then we should contemplate in a similar way what effects, what kinds of figures, and what kind of properties of these things exist when motions have been added, multiplied, subtracted, divided in the same way. And from this study arose the part of philosophy which is called geometry. (*DCo*, VI, 6)

After the consideration of motion *simpliciter*, we consider "those things which the motion of one body effects in another body" (*DCo*, VI, 6). We go on, in the third place, to consider how a thing can remain as a whole unmoved, yet change in respect of its parts, as when the 'light, color, transparency, opacity, sound, odor, flavour, heat, cold,' etc. change in a thing, without it ceasing to be what it is, or producing any evident movement in the whole. This third part of natural philosophy, along with the fourth, makes up what Hobbes calls physics, which treats the motions that act on the senses to generate perceptions. It is only in these four parts of natural philosophy, each of which deal with motion, that "proof [*demonstranda*] properly speaking," i.e., a deductive synthesis from first principles, is possible (*DCo*, VI, 6). Following this order of reasoning, we proceed

> After physics [...] to morals, in which the motions of minds are considered, namely desire, aversion, love, benevolence, hope, fear, anger, jealousy, envy, and so on; what the causes of these motions are, and of what things they are the causes. And these things are thus to be considered after physics, because their causes are in sense-experience and imagination, which are the subjects of the study of physics. (*DCo*, VI, 6)

Following the study of physics and the study of 'morals,' one can progress finally to the study of civil philosophy after having achieved the "scientific knowledge of [the] desires and disturbances of minds" (*DCo*, VI, 7). While proper, synthetic reasoning requires that civil philosophy should come after moral philosophy in the order of the sciences, Hobbes believes that "civil philosophy is connected to moral philosophy in such a way that it can nevertheless be detached from it; for the causes of the motions of the minds are not only known by reasoning but also by the experience of each and every person observing those motions proper to him only" (*DCo*, VI, 7). In a passage that is important to quote in its entirety, Hobbes writes:

> Once the synthetic method has achieved a scientific knowledge of desires and disturbances of minds, not only those who, by proceeding along the [synthetic method], hit upon the causes and the necessity for the foundings of cities and acquire the science of natural right, the duties of citizens and what right ought to be in every kind of city, and the rest of the things which are proper to civil philosophy inasmuch as the principles of politics depend upon the knowledge of the motions of minds, and the knowledge of the motions of the minds from the knowledge of sense-experiences and of cognitions, but also those who have not learned the earlier part of philosophy, namely, geometry and physics, can nevertheless come to the principles of civil philosophy by the analytic method. For whenever a question is proposed, such as 'whether such and such an action is just or unjust,' by resolving 'unjust' into 'fact' and 'against the laws' and that notion of 'law' into the mandate of him who has the power to control and 'power' into 'the will of men who establish such power for the sake of peace,' one finally arrives at the fact that the appetites of men and the motions of their minds are such that they will wage war against each other unless controlled by some power. This fact can be known by the experience of each and every person who examines his own mind. Therefore, one can proceed from this point to the determination of the justice or injustice of any proposed action by composition. It is already obvious from the things that we have said that the method of philosophizing of those who simply look for scientific knowledge, without any particular question being proposed, is partly analytic

> and partly synthetic, namely, it is analytic from the sense-experiences to the discovery of principles and otherwise synthetic. (*DCo*, VI, 7)[27]

The crucial part of this passage for our reading is Hobbes' statement that one can reason from the knowledge of motion to the knowledge of civil philosophy, that once one has attained the knowledge of the 'motions of the mind,' that is, of their causes and their effects, then "not only those who, by proceeding along the [synthetic] method [...] but also those who have not learned the earlier parts of philosophy, namely geometry and physics, can nevertheless come to the principles of civil philosophy." One will then be able to acquire "the science of natural right, the duties of citizens and what right ought to be in every kind of city, and the rest of the things which are proper to civil philosophy inasmuch as the principles of politics depend upon the knowledge of the motions of minds." Although Hobbes does not specify in this passage what the 'principles' of politics are, we are told, nonetheless, that the same 'principles' that can be known analytically can be demonstrated synthetically, by one who has studied the earlier parts of natural philosophy. Since the 'principles' reached either way are the same, the civil philosophy that is determined analytically, by reflection on experience and the passions, which are motions, is the same as the civil philosophy that is determined synthetically, by reasoning from the knowledge of first

[27] Hobbes restates the view of this passage later in the chapter, saying that after the study of "the motion of invisible parts, that is, change, and [...] the doctrine of sense-experiences and imagination," one progresses to "the internal passions of animals, especially of men, in which are contained the basic foundations of civic duties or civil instruction" (*DCo*, VI, 17). For those who may doubt whether Hobbes seriously considers that there could (in principle) be something like a demonstration of civil philosophy that is continuous from the knowledge of motion, Hobbes says in this passage "[t]hat the order of a universal instruction ought to be that which I have described can be seen from the following: That what we have said ought to be taught in a later place cannot be proved unless those things which were offered for consideration in an earlier place are known" (*DCo*, VI, 17). We are not saying, to be clear, that Hobbes has attempted a demonstration of his civil philosophy beginning from the knowledge of motion and its effects, but only that he believes in principle it could be given, by one who had the appropriate knowledge.

motions. Hobbes can thereby claim that the content of his civil philosophy, which begins from the knowledge of the 'desires and disturbances of minds,' is the same as would be reached by one who reasons solely from the knowledge of motion. Having determined these 'principles,' civil philosophy can then be conducted as a science by applying the deductive methods that we discussed in the first chapter to principles that can be proven from the knowledge of causes.

That Hobbes would hold the belief that his civil philosophy is known analytically, according to principles that can be proven synthetically, should not be surprising or unreasonable given that *De Cive* was originally planned as the last part of a trilogy of which *De Corpore* was to be the first installment. While the original plan for the trilogy was that readers would be taken (by order of the works) through the study of simple motion and physics before progressing to the knowledge of civil duties, circumstances made "that what was last in order, [...] come forth first in time. [...] because I saw that, grounded on its own principles sufficiently known by experience, it [i.e., *De Cive*] would not stand in need of the former sections" (*DCv,* II, xx). Given that *De Corpore* was planned from the beginning to be the first of the trilogy, it is not unlikely that it was in Hobbes' mind from the time of *De Cive* that, while its principles could be proven synthetically, it could be published earlier, as circumstances required, since they were already "sufficiently known" by experience (*DCv*, II, xx).

In light of these considerations, what we now suggest is that civil science is not 'scientific' simply because it is deductive, or because Hobbes begins his discussions by providing definitions, but, according to the view of *De Corpore*, because it reaches conclusions, on the basis of introspection, that he believes could be proven by one who had the appropriate knowledge of motion. The reason why civil philosophy is 'scientific,' despite the fact that Hobbes does not try to prove his principles by reasoning that begins in the prior parts of natural philosophy, is that he

believes he has reached the same results: he believes that he has learned what can be proven synthetically and scientifically without needing to begin from the knowledge of motion. What he has learned, specifically, is the knowledge of 'the desires and disturbances of minds,' or the passions, "in which are comprehended the grounds of civil duties, or civil philosophy" (*DCo*, VI, 17). While Hobbes does not say explicitly what the 'principles' are that the passions provide, we may remember that he refers to 'principles' simply as the starting point of a demonstration. One's knowledge of the passions may be said to provide 'principles' insofar as we are able to state propositions and make inferences from this knowledge. Once one has reached true knowledge of the passions, either synthetically or analytically, one is in a position to "acquire the science of natural right, the duties of citizens and what right ought to be in every kind of city, and the rest of the things which are proper to civil philosophy inasmuch as the principles of politics depend upon the knowledge of the motions of minds" (*DCo*, VI, 7).

That Hobbes' civil science does rest to a significant extent on the knowledge of the motions of the mind, or the passions, is a fact on display in all of his political works, where the passions explain not only the causes of conflict in human nature, but the inevitability of conflict without an overwhelming power and the need to contain the passions by the regulating force of fear (*L*, XV, 31).[28] Hobbes describes in *Leviathan* the inevitability of conflict that motivates the move from the state of nature to civil society and the making of contract as an 'inference made from the passions' (*L*, XIII, 10). While inferences from the passions constitute only a part of Hobbes' civil philosophy, they account for enough that Hobbes chooses to present civil philosophy as the final subject in the

[28] Amy Schmitter, "Where is my Mind?: Locating the Mind Metaphysically in Hobbes," in *Philosophy of Mind in the Early Modern and Modern Ages*, ed. Rebecca Copenhaver (Milton Park: Routledge, 2019), 19.

study of motion and its effects. As Hobbes states the matter later in *De Corpore*, it is in "the internal passions of animals, especially of men, in which are contained the basic foundations of civic duties or civil instruction" (*DCo*, VI, 17). While Hobbes does not spell out for us how exactly the passions contain the foundations of civic duties, we can locate immediately the influence of the passions on his civil philosophy as providing some of its core beliefs, e.g., that men cannot live in peace unless there is an overwhelming power that can hold them all in awe, acting through the regulating force of fear.

The contribution of the passions to Hobbes' civil philosophy is readily apparent in the laws of nature and the implications he draws from the fear of death and the desire for self-preservation. The desire for self-preservation contributes to Hobbes' civil philosophy by providing, among other things, the rationale for why the sovereign right must stay entire and power cannot be divided, because the purpose of civil association is the preservation of life and the defense of the people, and the sovereign body is compromised in this capacity if any of the essential rights of sovereignty are lost (*L*, XVIII). Although it is not to our purpose that we go too far into the content of Hobbes' civil philosophy, it is the basic competitiveness and glory seeking in human nature that makes any division of powers dangerous, since it inclines those who hold the alienated right to constrain and limit the sovereign body according to their purpose.

We may also add, critically, that the desire to preserve our lives, which Hobbes explains in explicitly motive and naturalistic terms, is what provides the normative direction of his civil philosophy. As all individuals incline towards or away from what helps or hinders the vital motion (*L*, VI), Hobbes believes that the desire to preserve our lives is at the base of our psychology. In language that almost could not be stronger, Hobbes says in *De Cive* that the desire to avoid death, as the greatest of natural evils, "happens by a real necessity of nature as powerful as that by which

a stone falls downward" (*DCv*, I, 7). While Hobbes refers to the aim of self-preservation, at times, as the 'final cause' of the commonwealth (*L*, XVII, 1), we learn in *De Corpore* that this too reduces "to efficient causation" (*DCo*, X, 7), which is another way of saying that it is an effect produced by the motion of bodies. By beginning from the belief that the 'final cause' of the commonwealth is the preservation of life, Hobbes assigns a purpose to the commonwealth in light of which he is able to evaluate possible institutions and structures as better or worse. We may then say that there is no illicit smuggling-in of teleology, or derivation of an 'is' from an 'ought,' in Hobbes' civil philosophy, for its aim is only to show what arrangements best satisfy a goal that Hobbes believes is held universally and which comes from the passions.

Since Hobbes believes that the passions can be known by reflection on experience, yet also that they can be known scientifically, by synthetic reasoning from the knowledge of motion (*DCo*, VI, 7), I suggest that Hobbes has provided an explanation in *De Corpore* for how his civil philosophy may be considered as a science. By starting from the passions, which can be known by reflection, and then making inferences from our knowledge of the passions and their effects on human behaviour, Hobbes believes that his civil philosophy reaches the same conclusions as could be proven by one who had a more basic knowledge of motion and its effects. The 'scientific' aspects of Hobbes' civil philosophy are those conclusions that follow from reasoning about the desires and disturbances of minds, which are efficient causes, and whose effects can in principle be demonstrated by one who has the appropriate knowledge of motion. While this explanation may not account for every assertion in Hobbes' political works as 'scientific,' it explains how key parts of his civil philosophy may be located within his theory of science, according to his own statements on the issue. Having shown that civil science can be considered as a science according to the theory of *De Corpore*, the rest of this chapter will examine how our reading of what makes civil science

'scientific' compares to other, purportedly, textually-substantiated views. We will spend the next section suggesting that the obvious alternative is implausible, that civil science is scientific simply because it involves deduction from definitions.

3.2 Quentin Skinner's Account of Civil Science

Now that we have seen the view expressed in *De Corpore* with some clarity, we are now in a place to examine where our thesis stands relative to existing interpretations. The immediate objection to our thesis is that it is unmotivated, since it is already clear that Hobbes believes civil science is scientific because it involves deduction from definitions. As the objection may be put, there is no reason to believe that the scientific character of civil science comes from reasoning from the passions, which yields the same conclusions as could be proven from the more basic knowledge of causes, since Hobbes himself tells us, in the *Elements*, that science is produced by imposing names, creating 'true' propositions, and stringing those propositions together in syllogistic style (*HN*, VI, 4). As the objection may continue, not only has Hobbes said that science is produced by reasoning through the consequences of definitions, it is possible, as Quentin Skinner shows, to analyze Hobbes' civil science as working out deductively the consequences of definitions. Our immediate reason for doubting this reading is that it does not make any reference to science as the study of causes, and we have already suggested, in the previous chapter, that the method of definitions does not lead to science unless those definitions contain the knowledge of causes. Since I believe that Skinner summarizes the arguments faithfully, we can sufficiently motivate the turn away from any similar belief that science is simply the result of reasoning from definitions by showing, first, that Hobbes' arguments do not seem to follow the pattern of reasoning from definitions, and then that there is good reason for believing that Hobbes did not

think the steps given in the *Elements* were more than a partial explanation of how 'science' is produced. Since part of my argument is to show that problems arise within Skinner's own account, we will go through it in considerable detail.

In *Reason and Rhetoric in the Philosophy of Hobbes*, Skinner begins his account of Hobbes' civil science with a statement about science from the *Elements*, that scientific knowledge cannot fail to be produced (294) by the four following steps: first, that the things we perceive and seek to conceptualize are consistently named; second, that the names are strung together in order to make true propositions; third, that these affirmations are strung together in proper syllogistic style; and fourth, that we link these propositions together in such a manner 'as to be concluding' (296).[29] As is the goal of *Reason and Rhetoric* to show, Skinner believes that Hobbes' civil science is primarily an attempt to undermine the belief that there are no definitive answers to moral questions by devising a scientific test by which one can state definitively whether an action ought to be called just or unjust, virtuous or vicious (317). In support of this contention Skinner quotes Hobbes as saying that the principal aim of *De Cive* is to conduct 'an inquisition into natural justice,' adding to the preface of the 1647 edition that the theme of the treatise is *scientia iustitiae*. For Hobbes, the scientific analysis of justice "is at the heart of any civil science worthy of the name" (309). This scientific analysis is to be conducted in agreement with the method for producing science, according to which Hobbes

> needs in the first place to arrive at a definition of justice capable of satisfying his conditions of scientific adequacy. He needs a definition, that is, which uses words in their generally

[29] In-text citations in this section are to Quentin Skinner, *Reason and Rhetoric In the Philosophy of Hobbes* (Cambridge: Cambridge University Press, 1996).

> accepted meanings; which avoids equivocation or ambiguity; and which enables instances of justice and injustice to be picked out by the application of some purely empirical criterion, thereby forestalling any distorting influences of passion or prejudice. The second task is then to show that, in the light of such a definition, it is possible to demonstrate that a number of 'necessary consequences' follow from it which are at once politically substantial and at the same time logically inescapable. (309)

The scientific analysis of justice, by which Skinner means the determination of a definition and its consequences, is the heart of the work that Hobbes claimed was the founding document of civil science: it would not be an exaggeration, he writes, to say that "the definition of justice and its necessary consequences together make up the backbone" of *De Cive* (309).

From an examination "of the origins and application of the word *iniuria*," Hobbes reaches his definition of the word justice: an action is injurious and therefore unjust if it involves the violation of covenant. Having accomplished the first methodological step of giving a definition of justice, Hobbes is now ready to continue his

> proposal for bringing the 'passionate' and contested names *just* and *unjust* within the ambit of science. The power of his analysis stems from the fact that, if an unjust act is simply an act involving a breach of covenant, and if a just act is simply an act involving no such breach, then the question of whether a given action is properly to be evaluated as an instance of justice or injustice becomes, as Hobbes's scientific method requires, a purely empirical one: the moral question of whether the behaviour was just or unjust reduces to the factual question of whether its performance involved any breach of promise or covenant. (311)

Having acquired his definition, Hobbes is now ready to proceed through the steps of his science and trace the implications that follow.

Skinner gives a brief account of the deductive way in which Hobbes works out the implications of his definition. Since injustice refers only to the breach of covenant, Hobbes goes on to show that since the sovereign body is not party to any covenant capable of being broken, it follows that the sovereign is actually unable to act unjustly. From this it follows that it is conceptually confused to say that the sovereign has a duty to make laws that are just (314), that obedience is owed only to sovereigns who make just commands (314), or that one can overthrow a ruler for acting 'tyrannically,' since this is to exercise the private right of judgment that was renounced in the founding of the commonwealth (315). Since not only has the sovereign not made a covenant, but also the subjects have renounced their right to judge privately the just and the unjust, there are multiple reasons why the sovereign cannot be held accountable for 'unjust' actions.

However, as Skinner writes, Hobbes is far from believing that this bit of deduction from the origin of the commonwealth and the definition of justice is sufficient to confer on the full content of his civil philosophy the name of science. Hobbes' civil science aims to provide a fully demonstrative account of 'Justice & Policy in generall,' or, in the words of *De Cive*, of 'the Elements of moral virtue and civic duties' (316). Having shown how the definition of justice is used in arguments purporting to yield demonstrative, scientific knowledge, Skinner now moves on to show that Hobbes applies the same steps he used to reach scientific conclusions about justice to the study of moral virtue and civic duty. In a passage meant to emphasize the methodological similarity of the analysis of justice and the analysis of virtue, Skinner writes that

> We need in the first place to define the terms we use to describe the virtues in question, ensuring that our definitions are at once respectful of common usage and at the same time purged of ambiguity. We also need to discover some purely empirical criterion for

> identifying instances of each virtue, so that the terms we apply to describe them remain free of distortion by passion or prejudice. We again need to ensure, in other words, that we supplement our definitions with a scientific test capable of placing beyond dispute the question of whether a given action ought or ought not to be classed as an instance of a particular virtue or vice. (317)

These tasks are difficult because the names of the virtues and vices are imposed on things in ways that indicate desire or aversion on the part of the speaker. If we continue to disagree about which actions are praiseworthy or not praiseworthy, which actions should be encouraged and which should not, we will find ourselves in a continuous state of political unrest. It is Hobbes' view that unless

> we can find a scientific method of [...] stabilising the language of moral appraisal, we shall find ourselves condemned to discovering at first hand how quickly political anarchy follows from anarchy in the use of evaluative terms. (318)[30]

By following the method of definitions, Hobbes believes he has uncovered a scientific test for determining the correct application of evaluative terms, i.e., a scientific test whose application overturns the belief that actions can always be redescribed as just or unjust by showing definitively which are or are not virtuous, or which should or should not be encouraged.

Skinner takes Hobbes' civil science to involve a series of interrelated claims: that the laws of nature are identical with the actions prescribed by reason for the preservation of our lives; that

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[30] For the interested reader, see Frederick Whelan, "Language and Its Abuses in Hobbes' Political Philosophy," *The American Political Science Review* 75, no. 1 (1981), for a discussion of Hobbes' belief that the misuse of language is a source of political disorder.

actions contributing to peace can be described "as instantiations of one or other of the leading social virtues of modesty, equity, trust, humanity, and mercy"; and that these qualities are to be regarded as virtues because they are conducive to the maintenance of peace (323). Skinner concludes his exposition of the scientific analysis of virtue by stating that it is a key part of the science of politics, for "[the scientific analysis of virtue] provides a key to solving the problems raised by the technique of rhetorical redescription in the case of all the leading virtues of social life" (322). The insight that actions are virtuous if conducive to peace "provides us with an unambiguous criterion, and hence a scientific test, by means of which we can hope to put an end to arguments about the correct application of all such evaluative terms" (322). Now in possession of this insight, we are able to determine 'scientifically' whether an action is virtuous by asking whether it is or is not conducive to the maintenance of peace, a test as objective and straight forward as that by which we determine whether an action was just by ascertaining whether an agreement was ever made to the contrary.

The power of Skinner's analysis is that he presents Hobbes' arguments as proceeding according to a method that is *prima facie* well-suited for the goal, viz., that Hobbes aims to fix decisively our evaluative terms by a method of reasoning that begins from clear definitions and then works out their implications. Hobbes' goal of creating a scientific test by which we can stabilize the language of moral appraisal has been accomplished, in Skinner's view, by arguments that seek out the necessary implications of definitions, as is required by the methodological steps of the *Elements*. The reader will notice that while Hobbes' theory of science in *De Corpore* revolves around the knowledge of causes, Skinner's account of Hobbes' civil science does not include motions, causes, or effects.

While it is our opinion that Skinner accurately traces the steps of Hobbes' argument, our first comment on Skinner's belief that science is the result of reasoning from definitions is that these arguments are not accurately described as reasoning from definitions, according to Skinner's summaries. While Skinner claims that science is produced by working out the consequences of definitions, we can see clearly from the foregoing summary that in order to give an account of the arguments, one has to involve many premises that are not definitions, nor are proven elsewhere to follow from definitions—e.g., that the sovereign is not party to any covenant, that a state of nature is a state of war, or that reason dictates the preservation of one's life. Hobbes is clear that the demonstrations that lead to science are those that use exclusively definitions as their premises or propositions that can be proven by reasoning from definitions (*DCo*, VI, 16). Skinner's analysis of the science of virtue, which he takes to be the core of civil science, does not utilize definitions until the very end of the argument, for Hobbes' case is only that the actions reason prescribes turn out to be the same as the traditional list of the virtues; the argument culminates only in the suggestion that they are the same. This argument can only very loosely be considered to follow the steps of the *Elements* understood as deduction from definitions, where one is supposed to begin with definitions and then work out their necessary implications; this is an argument that uses a definition among other premises that do not bear any obvious relation to definitions.

Not only can we not construe these arguments in a clear way as deductions from definitions, it is not clear that Hobbes thought, even in the earlier works, that reasoning from definitions that are not statements of causes would yield scientific results. Following the steps given in the *Elements*, Skinner says that science cannot fail to be produced (294) if we follow the steps of naming the things we seek to conceive and conceptualize, stringing these names together to make true propositions, putting these affirmations together in syllogistic style, and using definitions or

the conclusions of previous syllogisms as premises in the next, so that one creates a continuous line of reasoning (296). If these steps, without any further qualification, were sufficient to produce scientific knowledge, then deduction from even arbitrary or fictional definitions would produce science, because these steps do not contain any restriction on the definitions permissible. We have already mentioned, in the previous chapter, that Hobbes restricts the definitions that produce science to those that contain their cause, for otherwise "no scientific knowledge would ever exist" (*DCo*, VI, 13). If one can show that Hobbes believed, at the time of the *Elements*, that science is produced only by definitions that contain the knowledge of causes, then we will have reason to doubt Skinner's argument that Hobbes considers his civil philosophy to be a science because it works out the consequences of the definitions of justice and virtue. Our strategy presently is not to deny that Hobbes thought science should proceed by the steps of the *Elements*, but to show that it is already implicit in the steps of the *Elements* that science is only produced by definitions that involve the knowledge of causes.

While Hobbes clearly feels that the steps from the *Elements* describe scientific practice at a certain level of abstraction, we can see in *Leviathan* that he does not think these steps alone are sufficient for producing scientific knowledge. In a paragraph that expresses the same view from the *Elements* (*L*, V, 17), Hobbes adds that

> *Science* is the knowledge of consequences, and dependence of one fact upon another: *by which, out of that we can presently do, we know how to do something else when we will, or the like, another time: because when we see how any thing comes about, upon what causes, and by what manner; when the like causes come into our power, we see how to make it produce the like effects* (L, V, 17, italics added)

What we take this passage in its entirety to say, very clearly, is that while science can be described at a certain level of abstraction as abiding by the process of naming things, creating true propositions, and working out their consequences, scientific knowledge is supposed to show how an effect can be produced, or be the result of valid reasoning from this knowledge. Hobbes will also give in *Leviathan* the same cause-focused definition of philosophy that he provides in *De Corpore* (*DCo*, VI, 1), saying that

> *BY PHILOSOPHY, is understood the knowledge acquired by reasoning, from the manner of the generation of anything, to the properties: or from the properties, to some possible way of generation of the same; to the end to be able to produce, as far as matter, and human force permit, such effects, as human life requireth.* (L, XLVI, 1)

Since the passage from the *Elements* which suggests to Skinner that science is produced by deduction from definitions (*HN*, IV, 4) reappears in *Leviathan* alongside this definition of philosophy, I suggest that the description of science in the *Elements*—as the steps of imposing names, defining words, making syllogisms, and so on—already contains an implicit restriction of science to the knowledge of causes. Although one cannot infer conclusively from the later view to the earlier, I suggest it is more likely that Hobbes always thought definitions were supposed to track causal relations than that he introduced this restriction later on. Our suggestion, then, is that if one can make scientific arguments involving justice and virtue, those arguments are not scientific because they involve definitions, but either because those definitions or other premises can be proven from the knowledge of causes.

Our objection to the belief that civil philosophy is scientific because it involves reasoning from definitions, specifically the definitions of justice and virtue, is that Hobbes always seems to

have believed that definitions produce science only when they contain the knowledge of causes. There is no sufficient way to describe Hobbes' civil philosophy as deduction from definitions unless one considers that 'definitions' is a circumlocution for propositions that express the knowledge of causes. This is not to say that Hobbes ever presented his political theory as a deduction from first causes, but rather that he believes he has determined, by the method of analysis, a theory that could in principle be proven by one who had this knowledge, and that he believes this entitles the resulting theory to the name of 'science.' While we may ask whether Hobbes has any right to consider civil philosophy 'scientific' only on the promise that a demonstration of his premises is possible, something of this sort is what Hobbes says at *De Corpore*, VI, 6-7: Hobbes believes he has learned by reflection on the passions what can be proven by one who had first progressed through the more basic sciences. To be clear, we are not saying that Skinner is wrong when he says that Hobbes means to devise a test by which the language of moral appraisal can be stabilized and controversies brought to an end, but only that civil philosophy cannot be considered a 'science' unless we are also able to explain how it is the result of the knowledge of causes. If the 'scientific' test Hobbes devises to determine what is just or unjust, virtuous or vicious, is to count as 'scientific,' on his own terms, it cannot be simply because that test is determined by reasoning from definitions, but because those definitions themselves are the product of reasoning about causes.

Part of what is so misleading about Hobbes' theory of science, and why one is predisposed from the beginning to believe that science is produced simply by reasoning from definitions, is that Hobbes very frequently describes scientific demonstrations as deductions from definitions, according to the quotations we saw in the previous chapter. However, when one works through the theory, one realizes that it is very misleading to describe science as the result of reasoning from

'definitions,' since Hobbes says explicitly that definitions turn out scientific knowledge only when those definitions are statements of causes (*DCo*, VI, 13), as when we define a circle as the effect produced by the circular motion of a line in a plane (*DCo*, VI, 13). Undoubtedly, the reason why Hobbes always stresses that science involves definitions, even though it is propositions that express the knowledge of causes rather than definitions that produces science, is that he wants to bring out the parallels with geometry. As we saw in the first chapter, Hobbes has many reasons for believing that definitions are important that have nothing to do with producing the knowledge of causes, which may explain why he frequently talks about definitions and their importance without adding also that they are supposed to state causes. It is our opinion, having followed through the theory of *De Corpore*, that Hobbes does not believe that science is produced by deduction from definitions, words, or affirmations alone, but by reasoning from propositions that express the knowledge of causes, even if other descriptions are accurate at a certain level of abstraction.

An objection that Skinner may raise is that the interpretation we propose reads earlier texts in light of later texts without sufficient evidence for doing so. While Skinner could argue that there is no reason to believe that Hobbes restricted science to the knowledge of causes prior to *Leviathan* (*L*, XLVI, 1), this move would still admit that an alternative account is needed for the later texts. The reason why we have focused on the later texts over the earlier, which were primarily the sources for Skinner's analysis, is that this present study is an attempt to locate Hobbes' civil science within the context of his theory of science. As Hobbes' account of method and geometry is nowhere treated in more detail than *De Corpore*, the later texts are the obvious place for us to begin. Furthermore, since all of Hobbes' political works remark on subjects treated comprehensively only in *De Corpore*, it is natural to assume that at least some of the thoughts

treated in the later text are also present in the earlier works. While it is likely that Hobbes' thoughts changed over the years, his preoccupation with geometry dates from before the *Elements of Law*, whose title is evidently a reference to Euclid.[31] Not only was *De Corpore* originally planned to be published before *De Cive*, it was being drafted for roughly a dozen years before its publication in 1655.[32] While there is no definitive argument in favour of the texts that we are using, it is, at the very least, a justification for our study that scholars should understand the views present in the later texts, especially when one of the texts in question had been planned for years to contain the definitive discussions of key issues. Even if Hobbes did change his mind about method from the earlier works, the view given in *De Corpore* is still compatible with the earlier statements of his political theory. If Hobbes did change his mind between the earlier and later works, we suggest then that the difference is only in the grounding a theory that is in all respects the same, and that *De Corpore* aims to preserve the earlier results while grounding the principles of civil philosophy alternatively, by suggesting that the same civil philosophy can be proven by deductive reasoning from the knowledge of causes.

Having addressed the belief that reasoning from definitions is sufficient to produce science, we can now turn our attention to more direct objections to the view we have been presenting. While Skinner suggests that civil science is scientific because it works out deductively the consequences of certain definitions, Tom Sorell steps back from the claim that science is primarily about definitions, and makes a claim much closer to ours, that science is simply deduction from principles that have a starting point appropriate to Hobbes' theory of science. While there is a level

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[31] Skinner, *Reason and Rhetoric*, 298. *De Corpore* likewise is published as the first part of the *Elements of Philosophy* (*DCo*, title page).
[32] Malcolm, "Summary Biography," 30.

of agreement between our claims, the way that Sorell makes his case raises serious objections to our view, for he argues that synthesis and analysis play no role in Hobbes' civil philosophy and that there is no methodological unity in his account of science. By turning now to Sorell's view, we will address a series of further objections to our thesis.

3.3 Tom Sorell's Objections

While Sorell agrees that Hobbes' civil science is scientific because it is a deduction from "the sort of evident starting point called for in [his] philosophy of science,"[33] he contends elsewhere that there is no common reason or procedure in virtue of which the natural and civil sciences are scientific.[34] Whereas the previous section dealt with an alternative account of what makes civil philosophy a science, this section will deal with the objection that civil and natural philosophy do not share a methodology. As we have seen, the way that science is supposed to proceed, whether natural or civil, is by first determining principles and then working out the consequences, which is the "method" that Hobbes calls *logistica*, or analysis and synthesis (*DCo*, XX, 6). We have argued that civil philosophy involves inferences made from the passions which Hobbes believes can be proven by synthetic reasoning from the knowledge of motion, and we have described the reflection on experience that yields knowledge of the passions as a process of analysis (*DCo,* VI, 7). Sorell raises, then, a serious objection to our reading of Hobbes when he suggests that the chapter on method in *De Corpore* was only meant to apply to natural philosophy, and by implication, that analysis and synthesis play no role in civil philosophy. If Sorell is correct,

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[33] Tom Sorell, "Hobbes's Persuasive Civil Science," *The Philosophical Quarterly* 40, no. 160 (1990): 348.
[34] Tom Sorell, *Hobbes* (London: Routledge, 1999), 14 ff.

then our view is misleading, for it would mean that we have been trying to show how civil science relates to natural science by a method that Hobbes never meant to extend to the study of politics. Sorell introduces his objection as follows:

> [C]hapter 6 of De Corpore draws all but one of its illustrations of how its method works from natural philosophy. In general, it is as if Hobbes's remarks are really about method not in both chief branches of philosophy [i.e., civil and natural], but only in one. [...] Was Hobbes trying to pass off the method of a part of philosophy for the method of all of philosophy? Or was he trying to *generalize* the method of natural philosophy into a method for civil philosophy, much as philosophers since Mill have tried to extend the methods of physics to those of the social sciences?
>
> I think he was trying to do neither of these things, and that there is a relatively simple explanation of what happens in *De Corpore*'s chapter on method. [...] Hobbes is working up to a treatment in Part Two of the very general concepts needed to apply geometry, mechanics and eventually physics, and so in the chapter on method he has something to say about how knowledge of these 'universals' is derived (*DCo*, VI, 68-70), and also what knowledge is made possible once the 'universals' are grasped (*DCo*, VI, 70 ff.). Civil philosophy is hardly touched upon. This is not because it lacks a method, but because its method is not the same as that of natural philosophy: Hobbes is too emphatic about the differences between the bodies studied by the two chief parts of philosophy to assimilate the method of understanding the one to the method of understanding the other. He says that the two chief types of body, artificial and natural, are 'very different from one another' (*DCo*, ix, 11), and this is not the sort of remark that would sit well with the unexplained deployment of a single method for both. When civil philosophy drops out of *De Corpore*'s chapter on method, that is because its method can be understood and applied independently of the knowledge of the foundations of natural philosophy.

> Though chapter 6 of *De Corpore* does not make it very clear, Hobbes actually recognizes the methodological distinctness of civil and natural philosophy. (21–22)[35]

Sorell's remarks in this passage challenge clearly the line of thought we have been pursuing. The following section, then, will deal with Sorell's objections in detail, including three specific objections against the methodological continuity of the civil and natural sciences. We will show that these objections are either formulated improperly or cannot be maintained on the grounds of the text. Having dealt with these objections, we will say a few words about what appears to be the motivation behind Sorell's reading, viz., the desire to show that civil philosophy "can be understood and applied independently of the knowledge of the foundations of natural philosophy" (21–22). What we will see by the end of this section is that the methodological distinctness (or indistinctness) of natural and civil philosophy has nothing to do with the 'independence' of the subjects from the other.

In the section entitled *The Methodological Disunity of Natural and Civil Science*, Sorell lists three reasons in favour of this disunity, that "first [...] the method just described [of natural philosophy] is all about reconstructing a sensory experience from its causes; the method of civil philosophy is not like this"; "second, and relatedly, there is Hobbes's restriction of causes sought for in natural philosophy to efficient causes" and third, there is "a discrepancy in exactingness. Enquiry into natural effects is supposed to be informed by a knowledge of the 'types and degrees of motion' [while] civil philosophy, on the other hand, is supposed to be acquirable by someone who has no specialized knowledge in advance" (24). We will take each of these in turn.

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[35] Sorell, *Hobbes*, 21–22. Citations reformatted for convenience. All in-text citations in this section will be to *Hobbes*.

Sorell's first objection to the belief that natural and civil philosophy share a method is that natural philosophy, but not civil philosophy, is 'all about reconstructing a sensory experience from its causes' (24). This objection is dealt with quickly: it is imprecise, and when restated, it is not an objection. Sorell's reasoning is clear: if the 'method' of natural philosophy is the reconstruction of sensory experience, then clearly the 'method' does not apply to civil philosophy, since civil philosophy does not involve the reconstruction of sensory experience. Our objection is that it is not the 'method' of natural philosophy that it reconstructs sense experience, but its goal; and since this goal is to be accomplished by demonstrating the motive causes that act on our senses, the method by which we are supposed to demonstrate the cause of these experiences will be the same as what we use to demonstrate the effects of motion in other areas of natural philosophy, viz., the method of analysis and synthesis. Sorell's remark that 'natural philosophy' has a method that is 'all about reconstructing a sensory experience' is already false, since there multiple subjects within natural philosophy, including geometry (on Hobbes' reconceptualization of the subject as the study of the simple motion of bodies), that are not reducible to the study of sensory experience; in Hobbes' terminology, the study of how motions act on our senses to generate perceptions refers exclusively to the part of natural philosophy that he calls 'physics' (*DCo*, VI, 6). Were the 'reconstruction of sense experience' the 'method' of all subjects in natural philosophy, then 'natural philosophy' would have a 'method' that is used exclusively by one of its branches, which is evidently not Hobbes' intention (*DCo*, VI, 6–7). We should recall the long passage quoted earlier in this chapter, that the systematic study of natural philosophy is supposed to proceed from the knowledge of simple motion eventually to physics and moral philosophy. Once we see that natural philosophy in its demonstrative aspect does not use the 'method' of 'reconstructing sense experience' but of deductive, synthetic reasoning from principles, we will then have located the

method on a level of generality sufficient to allow for its application in both civil and natural philosophy: they both involve first determining basic principles and then reasoning from those principles. This agrees with the summary of the *DCo*, VI, 7, which says that "the method of scientific knowledge, civil as well as natural, [starting] from sense-experience and [going] to principles is analytic; while [starting] from principles is synthetic" (*DCo*, VI, 7, brackets by translator). The fact that one subject may demonstrate the causes of our experiences while the other demonstrates the duties of citizens does not yet add up to a difference in method; all scientific demonstrations are synthetical (*DCo*, XX, 6), whether the subject being demonstrated is a geometrical figure, the cause of our perceptions, or the duties of citizens.

Sorell's second objection to the belief that civil and natural philosophy use the same method is that while Hobbes restricts the causes sought after in natural philosophy to efficient causes, the final cause of self-preservation is essential for civil philosophy. However, this does not turn out to be an objection either when we consider that Hobbes says in *De Corpore* that final causation reduces to efficient causation (*DCo*, X, 7). While it is possible, although still doubtful, to maintain that Hobbes believes in something like a non-efficient final cause in his earlier works, undoubtedly no such view is expressed in *De Corpore*.

Sorell's third objection runs as follows:

> The third discrepancy between method in natural and in civil philosophy is a discrepancy in exactingness. Enquiry into natural effects is supposed to be informed by a knowledge of the 'types and degrees of motion' and by a knowledge of lots of experiments and phenomena relevant to the effects one is studying. In other words, acquaintance with mechanics is presupposed, and an enquirer is supposed to be well-versed in what Hobbes calls 'natural history.' Civil philosophy, on the other hand, is supposed to be acquirable by

> someone who has no specialized knowledge in advance. That is the message of Hobbes's autonomy thesis. (24)

We have touched briefly in the last chapter about the sense in which experiments are relevant for Hobbes' natural philosophy. While experiments may provide falsification, they are the raw material out of which we furnish hypotheses, which, if correct, express propositions that *ex hypothesi* are demonstrable by reasoning from the knowledge of causes. The reason why we continue to maintain that natural philosophy uses the same method as civil philosophy, even though one makes use of experiments, is that Hobbes describes the process of reasoning from sense-experience to principles as an instance of analytic reasoning (*DCo*, VI, 7). As we have already remarked, Hobbes believes that the principles of civil science can be known analytically, and, as is the view we have been exploring, that these principles could be proven by someone who had the appropriate knowledge of motion. Whether in natural or civil science, the 'method' is to use analytic reasoning from experience to uncover principles to which we then apply deductive, synthetic reasoning in order to demonstrate their implications.

Part of what motivates Sorell's argument is that he seems to be under the impression that the status of what he calls the 'autonomy thesis,' i.e., the thesis that Hobbes' civil philosophy can be known independently from his natural philosophy, is bound up in defending their methodological distinctness (24). When Sorell introduces his argument for their disunity, he says that "[t]hough chapter 6 of *De Corpore* does not make it very clear, Hobbes actually recognizes the methodological *distinctness* of civil and natural philosophy, in keeping with the autonomy thesis" (23). Sorell's worry, which has somehow been displaced onto the question of methodology, is that Hobbes' civil philosophy depends for its truth on his evidently inadequate natural

philosophy, and that recognizing their methodological sameness would mean that civil philosophy can only be known only by 'the scientifically initiated' (25) and this is obviously not Hobbes' view. However, Hobbes can believe at the same time that his civil philosophy can be proven by reasoning from the knowledge of causes and that the same civil philosophy can be derived alternatively, without making any sort of initiation into natural philosophy a pre-requirement for the latter. We find that Hobbes expresses this view clearly in *De Corpore*, where he says that the principles of civil science can be known *both* by synthesis and by reflection on our experience, without any knowledge of motion (*DCo*, VI, 7). While civil philosophy *can* be known from the knowledge of motive causes, it does not *need* to be known from the knowledge of causes. Our reading easily allows that analysis and synthesis are the common 'methods' of civil and natural philosophy, all the while allowing that each can be known independently of the other. We do not have to deny the methodological sameness of civil and natural philosophy in order to say that one can be known apart from the other.

Having dealt with Sorell's objections it is appropriate to restate our own thesis, that the methodological unity of the sciences is found in the process of deductive reasoning to and from the knowledge of causes, or from principles that can be proven from the knowledge of causes. Once we abstract to this level of generality, we have no issues with saying that science involves a method that can be transposed from subject to subject, insofar as those subjects can be analyzed as having prior causes. The locus of this generalized "method" is Hobbes' theory of what constitutes a scientific demonstration, according to which principles are reached analytically and demonstrations given synthetically. We do not find in Sorell's objections any reason for doubting that civil and natural philosophy share a method, or for believing that *De Corpore*'s chapter on

methodology was meant only to refer to natural philosophy. When Sorell adduces as evidence for his thesis that *De Corpore* "draws all but one of its illustrations of how its method works from natural philosophy," we should note that the passage he dismisses directly contradicts his belief in a methodological disunity: the summary of this article in the table of contents for the chapter is "the method of scientific knowledge, civil as well as natural, [starting] from sense-experience and [going] to principles is analytic; while [starting] from principles is synthetic" (*DCo*, VI, 7, brackets by translator).

3.4 Concluding Remarks

This thesis began from the recognition that Hobbes makes exceptionally strong claims for his civil philosophy: Hobbes believes that he has uncovered the principles of reason which, if followed to the letter, will allow one to avoid civil war in perpetuity. By working out the consequences of these principles, Hobbes believes that he has elevated civil philosophy to the status of a science. We have shown in the foregoing pages how Hobbes believes his civil philosophy fits into his geometry-based theory of science. Following the theory of *De Corpore*, we have seen that Hobbes believes he has been able, by reflection on the passions, to determine the same political theory as could be demonstrated by one who had scientific knowledge of the mind and its motions. What Hobbes does not provide, unfortunately, is a demonstration that his alternative strategy reaches the same results, or a sort of guarantee that all of the relevant information has been taken into account. Since Hobbes believes that philosophy excludes all doctrines that are either false or doubtful (*DCo*, I, 8), one is left to conclude that civil philosophy does not meet Hobbes' own standards for science, since one is more than capable of doubting the results. It is the final position of this thesis that Hobbes' civil philosophy can be considered

scientific only on the promise of a future demonstration, given in accordance with his idiosyncratic theory of science. What we are left with in the end is not a theory that has been proven beyond doubt, by deduction from the knowledge of causes, but a series of arguments that purport to proceed by necessary inference from a series of principles that are intuitively plausible. These arguments follow the method that is supposed to be used by all of the sciences, taken from geometry, of defining one's terms at the outset and then asserting only what follows from these definitions or from other 'principles' that have already been accepted or proven.

The most serious objection to our reading of Hobbes' civil science is that he himself did not work out some of his views as deeply as we have been suggesting, and that we have connected the pieces in a way that yields views he never held. When one reads Hobbes, one finds many bold and consequential pronouncements in a short space of text, which, when revisited and rephrased in other contexts, suggest that his thoughts are more complex than is apparent from all of the quotations on a subject. It is very hard to deny that at least occasionally this is the case with Hobbes, for he often makes slightly different, consequence-laden pronouncements that are clearly relevant to earlier or later treatments of a subject, but whose connection he does not mark in detail; in these cases, it is very hard not to conclude that Hobbes has a more detailed theory than he presents explicitly, especially when pieces of the more detailed view come out in later works in a way that provides an explanation for the earlier remarks. An especially prominent worry is whether Hobbes' frequent restatements of the same issue indicate a change of mind, or a continuous elaboration of a thought. The possibility one has to keep in mind, which I think is the most important objection to this thesis, is that the material through which we have been working has discrepancies that Hobbes did not resolve or was unaware of; that, in other words, we can bring Hobbes' thoughts together into a coherent theory, at a sufficient level of detail, only by attributing to him beliefs that

he did not have. It is possible that his occasional pronouncements on an issue may be more akin to free association on a theme than continuous glimpses of a theory not presented anywhere in its entirety. It is my belief, however, that we have followed the views accurately and that there is direct textual evidence for our views.

If we have not given the right explanation for why civil science is scientific, then I do not think a better answer is waiting. We have tried, in this thesis, to show how civil philosophy may count as a science according to the theory of *De Corpore*. We have suggested that civil philosophy can be sufficiently located within Hobbes' theory of science only if one allows that parts of this philosophy can be derived from the knowledge of causes. If our answer is wrong, then either we need to find some other way to consider civil philosophy a science within the context of Hobbes' theory, or accept that it simply is not a science, on Hobbes' definition or any other, despite his insistence on its scientific character. If one believes that Hobbes is serious when he says that civil philosophy is a science, yet one does not find that it can be adequately situated within his deeply considered theory of science, then one should accept that there is no deeply worked out theory for why it is so, that at best Hobbes' only serious attempt to do so came after the fact, and that his assertion of its scientific character is a matter of rhetoric rather than science.

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Appendix

This appendix contains a short explanation for why I use the word 'deduction' to explain the process of reasoning that Hobbes describes. When I say that Hobbes believes geometers proceed by 'deductive' reasoning, I mean that they reason by necessary inference. There are a number of reasons for using the word 'deductive,' the first of which is that Hobbes himself uses 'deduce' as a verb throughout *De Corpore*. While the words 'deduction' and 'demonstration' may have changed their meaning over time,[36] it is clear that Hobbes thinks about reasoning in terms of necessary inference from the fact that all reasoning is supposed to proceed syllogistically, using as premises only definitions or statements that have been proven from definitions (*DCo*, VI, 16), and in a properly constructed syllogism the conclusion cannot but follow from the truth of the premises (*DCo*, IV, 5). (Hobbes also uses the phrase 'necessary inference' to describe his reasoning in *De Cive* VI, 11.) One of the reasons why one may want to use the word 'syllogistic' rather than 'deductive' is that Hobbes believes that the progression in the mind from the understanding of the premises to the understanding of the conclusion is syllogistic in form—that the mind makes a necessary and immediate progression from the premises to the conclusion once the premises are understood (*DCo*, III, 20; IV, 8). It is possible, given his tireless insistence that proper reasoning is syllogistic (e.g., in the first part of *De Corpore*), that Hobbes simply did not have a conception of necessary inference that did not implicitly follow the pattern of a syllogism. While this may suggest that 'syllogistic' is the more suitable adjective to describe his thoughts on reasoning and 'demonstration,' there are inconsistencies in Hobbes' writings, as when he says that every form of

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[36] Donald W. Hanson, "The Meaning of 'Demonstration' in Hobbes's Science," *History of Political Thought* 11, no. 4 (1990): 624.

the syllogism is superfluous in philosophy except those that use exclusively universal affirmations (*DCo*, IV, 7). I am hesitant to describe Hobbes' writings as syllogistic (or as attempts to instantiate such a method) because it does not seem to be follow his practice: Hobbes did not present any of his writings in directly syllogistic form, and one certainly cannot shoehorn either Hobbes' geometry, let alone his less-deductively-presented writings, into syllogisms whose premises use exclusively universal affirmations. It seems to me that the reason why Hobbes focuses so much on the syllogism may simply be that he does not have a conception of necessary inference that is not syllogistic, and that the failure of his writings to conform to this pattern is a result of the fact that he does not have an alternative way to describe the procedure of reasoning by necessary inference. At least as I read Hobbes, what he is trying to pick out by saying that reasoning should proceed syllogistically is simply that it should proceed by necessary inference, which I believe we can describe not misleadingly as 'deduction,' if we understand by that word simply a series of steps that proceed by necessary inference. The use of the word 'deduction' also brings this current study in line with other pieces of secondary literature, such as Brandt, *Thomas Hobbes' Mechanical Conception of Nature*, 367; Jesseph, *Squaring the Circle*, 227; and Skinner, *Reason and Rhetoric*, 296.

The only work of which I am aware that challenges the use of the word 'deduction' as applied to Hobbes is Donald Hanson's article *The Meaning of Demonstration in Hobbes's Science*, where he suggests that the reason why it is so difficult to find a consistent deductive thread in Hobbes' political theory, despite his insistence on its demonstrability, is that he is using the word 'demonstration' in a way that is synonymous with 'explanation' rather than 'deduction' (624-625). I read Hobbes in a substantially different manner. I think it is abundantly clear from his writings on geometry that Hobbes *does* have a conception of demonstration as proceeding by necessary

inference, especially since he believes that a 'demonstration' is a series of syllogisms (*DCo*, VI, 16), that the understanding of the premises 'causes' necessarily the understanding of the conclusion (*DCo*, III, 18; for Hobbes on necessity, see Brandt, 274-275); and that the syllogisms of a demonstration are supposed to use as premises only definitions or propositions that have been proven from definitions (*DCo*, VI, 16). As I read Hobbes, the failure of his arguments elsewhere to actually follow a deductive pattern (or at least an easily traceable one) suggests a gap between his theory and his practice, rather than a non-deductive theory of 'demonstration.'