

Essence, Experiment, and Under-determination in the Spinoza-Boyle Correspondence

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ABSTRACT. I examine the (mediated) correspondence between Spinoza and Robert Boyle concerning the latter's account of fluidity and his experiments on reconstitution of niter in the light of the epistemology and doctrine of method contained in the *Treatise on the Emendation of the Intellect*. I argue that both the *Treatise* and the correspondence reveal that for Spinoza, the proper method of science is not experimental, and that he accepted a powerful under-determination thesis. I argue that, in contrast to modern versions, Spinoza's form of naturalism was a highly rationalist and anti-empirical one. I conclude with a brief account of the value of experience and experimentation for Spinoza's scientific method.

Introduction

The pantheon of great early modern scientists includes some philosophers of the first rank, but there is one notable absence – Spinoza.¹ This is justified, to an extent. While other early modern philosophers (Leibniz and Descartes, for example) were fully immersed in both the science and the scientific culture of their day, Spinoza contributed relatively little to these, and, apart from his geometrical reworking of Descartes' *Principles of Philosophy* and the so-called physical digression in the *Ethics*, wrote relatively little in the way of explicitly scientific treatises.²

But this does not mean that, upon a closer look, Spinoza has nothing to say on the topic. While Spinoza made no explicit and significant contributions to the actual content of the natural sciences,

1. Unless otherwise specified, English quotations of Spinoza are from Spinoza (1985) (abbreviated C.I) and Spinoza (2016) (abbreviated C.II); where appropriate, I will note whether I have emended the translation. Latin quotations of Spinoza are from Spinoza (1925) (abbreviated G). The *Ethics* is cited as [part].[proposition/definition].[scholium]; unless otherwise specified, all English citations are from C.I. The *Treatise on the Emendation of the Intellect* is cited as TdIE [section]/G.[volume].[page]; all English citations are from C.I. The letters are cited as C.[number].[page in Spinoza (1985)]/G [volume].[page]., and are referred to as Ep.[letter number]. The *Short Treatise* is cited as KV [part].[chapter].[section]/G.[volume].[page].

2. For a fairly comprehensive treatment of his contributions, see Gabbey (1995).

he had a good deal to say about proper scientific methodology. To bring this out, in this essay I'll be paying close attention to an exchange between Spinoza and Boyle, mediated by Henry Oldenburg.

Some philosophers have argued that Spinoza did not think experimental science was up to deciding the most important scientific questions. Gabbey (1995) points out that for Spinoza, “sensory knowledge belongs to the imagination, the knowledge of essences and causes to the intellect alone.”³ Klever (1990), while holding that Spinoza does have an important place for experience in his view of science, nonetheless argues that Spinoza’s view was that of an anti-falsificationist, by which he means that for Spinoza, “experiments and/or experience can never prove or disprove definitively that something is or is not (necessarily) the case.”⁴ And, in his extended study of Spinoza’s interaction with experimental science, Richard McKeon argues that “adequate knowledge does not come from experience; experimentation can not in the nature of things lead to a knowledge of what things are.”⁵

But why is this, and what can experiment in fact do? These are the questions I will attempt to answer in this paper. On my reading, Spinoza believed that experimental science simply was not up to the task of doing what true science is supposed to do. While commentators such as McKeon and Klever have tried to contextualize Spinoza’s criticisms of Boyle and the experimental method against his epistemological views expressed elsewhere, mostly their argument is that, according to Spinoza’s view, experience could not yield knowledge of essences. And since, according to Spinoza (though not necessarily other of his contemporaries), the point of science is to discover essences, that’s that.⁶

While there is much correct about these interpretations, they does not give a deep understanding of just *why* Spinoza holds this view. I intend to give positive arguments as to *why*, on Spinoza’s view, this happens. In particular, I will argue that he held that empirical evidence under-determines theory, and that this under-determination is closely tied to his views on essences and epistemology.

3. Gabbey (1995, 177)

4. Klever (1990, 133)

5. McKeon (1928, 145)

6. I will take no firm stance on whether or not there are kind essences in Spinoza (as, for instance, in Curley (1988, 111–2), Melamed (2013, 78n81), Hübner (2015)), or merely particular ones (as, for instance, in Della Rocca (2008, 95), Ward (2011)). I believe the latter conclusion to be the correct one, but since it forms no significant part of my argument, I will not take up the question.

A subsidiary aim of the paper is to give a positive account of just what the role of experience and experiment is, if they do not discover essences. In the latter part of this paper, I offer a hypothesis as to what role experiments and sense experiences generally *do* play in the sciences, for Spinoza: They have the effect of persuading interlocutors by means of producing an idea in them that is more powerful than those corresponding to their prior beliefs.

I should clarify the scope of my claims. I am *not* claiming that the interpretation of Spinoza as holding that we can only learn of essences by intuitive knowledge and not via experience is novel. Such an interpretive position, along with a justification of this position, has been given by a number of commentators (for instance, Della Rocca (1996, Chapter 5), Hübner (2015, 11), Soyarslan (2013), Primus (2017), to name just a few). But my reading is novel, I believe, in at least three ways.

First, most of these readings (including the ones I have just mentioned) focus primarily on the *Ethics*. They do not focus on the *Treatise on the Emendation of the Intellect* or on the Boyle correspondence; mine does (though I will at times bring in the *Ethics* when these other lines of evidence fail). Second, none of these authors either impute to Spinoza an under-determination thesis or argue that such a thesis would lead him to reject the possibility of knowing essences through sense perception. My interpretation does both. This allows us to see Spinoza's comments and commitments in the Boyle correspondence as not being simply ad hoc responses to problems raised by his interlocutors, but as principled extensions of positions he already held. Third, they have generally not given a reading of the positive role of experience and experiment for Spinozistic science; I do.

i. Setting the stage: Why use the *Treatise*?

Before getting started, I should say something about my choice of interpretive framework – that is, why I am choosing, as my interpretive touchstone, the *Treatise on the Emendation of the Intellect* (henceforth TdIE). There are at least three reasons for this. None of them is definitive, but jointly they provide a solid justification for turning our attention to TdIE.

First, we may consider an appeal to fruitfulness. In the extant literature, if any effort is made to place Spinoza's comments in these letters in the context of his thought more broadly, it is usually

done by reading this correspondence against the *Ethics*.⁷ (I will at times use the *Ethics* as an interpretive tool, but only when necessary – i.e., when the resources of the other texts in question are exhausted.) So in choosing another one of Spinoza’s works as giving the intellectual framework of the correspondence, one may uncover new and perhaps useful insights into Spinoza’s thought more generally. One of the great benefits of studying the history of philosophy is that one may be exposed to new avenues of thought, new conceptual categories, and new arguments. Surely, then, a new interpretation may be beneficial on those grounds.

Second, we may consider a question of context. If one wishes not merely to discover interesting arguments but discern what a particular historical figure was indeed arguing, it is useful to place any particular argument or exchange against the broader context of what this figure thought at the time. Appeals to the *Ethics*, though perhaps useful, stand less of a chance of doing that, since they lie at a greater historical remove. When it comes to interpreting Spinoza’s exchange with Boyle, then, where should we look? The obvious candidates are the extant letters written around the same time, the *Short Treatise* (henceforth KV), and TdIE.⁸

There is some evidence that Spinoza was at work writing a treatise that resembled the (unfinished) TdIE in some respect at the time of the correspondence we’re examining. At the end of Ep. 6, Spinoza writes the following:

As for your new question, how things have begun to be, and by what connection they depend on the first cause, I have composed a whole short work devoted to this matter and also to the emendation of the intellect. (C.I.188 / G.IV.36)

A natural inference, given the specific phrasing, is that Spinoza is referring to a work at the very least containing what would become what we now possess as the *Treatise on the Emendation of the Intellect*. If that is the case, then we might take the positions presented in TdIE as representative of Spinoza’s positions at the time of the writing of Ep. 6. A version of the work mentioned above was

7. Schliesser (2018) primarily reads them against the *Tractatus Theologico-Politicus*.

8. I do not include his *Principles of Cartesian Philosophy*, since as the preface of that work indicates, Spinoza is there recapitulating Cartesian physics, much of which we know he did not agree with. Taking anything from PCP as stating Spinoza’s own view, then, can really only be justified by looking to see whether he agrees with that view in other, contemporaneous works. Hence, I focus on these and leave to the side an examination of PCP.

underway by the mid-1660s at least. Curley (C.I.405) suggests that a first draft was near its end by 1665. Probably it was begun in the early 1660s (see both Curley (C.I.405) and Nadler (1999, 155)).

On the other hand, Filippo Mignini (in, e.g, Mignini (1979, 1987)) argues that the work referred to in the above passage in Ep. 6 is the second part of KV, rather than TdIE. This is a common assumption of most contemporary Spinoza scholarship, with Piet Steenbakkers writing that “[m]ost [Spinoza] scholars now share this view.”⁹ If this is correct, then we cannot *automatically* assume that the contents of TdIE represent Spinoza’s thoughts at the time of Ep. 6. I do think, however, that we may reasonably make the following hypothesis: where TdIE does not conflict with KV, we may (defeasibly) take TdIE to represent Spinoza’s thoughts at the time of the correspondence.

What motivates this hypothesis? Simply this: I think it is reasonable to hold that, if an historical philosopher writes a work that contains his or her doctrines on particular topics, and does not (at least not until a certain date) write anything which indicates that he or she has given these doctrines up, we should hold to the maxim that *qui tacet consentire videtur*. Hence, absent positive divergence in the period stretching from the composition of TdIE and the writing of the correspondence (and therefore, Spinoza’s work on KV), we may infer that Spinoza still held to his positions on the questions involved in TdIE.

As I will say later on in this paper, there are (at least) three questions taken up in TdIE whose answers bear directly on arguments made in the Boyle correspondence. These are, first, Spinoza’s arguments concerning the proper aims of the sciences; second, his categorization of the four kinds of cognition and his arguments concerning which of these bears on the aims of the sciences; and third, his discussions towards the end of TdIE concerning essences. Of these, only one is touched on in any detail in KV: the four kinds of cognition, in KV II. When we examine these later on in the paper, I will discuss the points of continuity between TdIE and KV, and argue that, for my purposes, we may treat the doctrine expressed in TdIE as indicative of what was held at the time of Ep. 6. For now, then, we assume merely that in the other two points, Spinoza thought the same things when writing Ep. 6 as he did when writing TdIE.

9. Steenbakkers (2021, 20–1)

Third, and finally, there is a question of aptness of topic. All of what I have written in this section is not to say that there is *no* discontinuity between KV and TdIE, or that there might not be valuable points to be gleaned by instead using KV as an interpretive framework. It is true, however, that KV is simply devoted to a different topic than is TdIE. As we will see, TdIE is a treatise on method, or “on the way by which [the intellect] is best directed toward the true knowledge of things.” (G.II.5) KV on the other hand is, as has sometimes been noted, a sort of proto-*Ethics*. The two parts of it concern, in order, “God, and what pertains to him,” (KV I / G.I.15) and “a Perfect Man, capable of uniting himself to God.” (KV II / G.I.51) If, then, we wish to inquire which of Spinoza’s works to consult when trying to figure out the broader methodological implications of his specific arguments given in the Boyle correspondence, we should (all else being equal) look at works which deal substantially with methodology. In other words, in this case and on this count (and not necessarily on any others) we should look to TdIE instead of KV.

2. Background of the correspondence

We have no reason to believe Spinoza and Boyle ever met. Spinoza was acquainted, however, with Henry Oldenburg, an active member of the the Royal Society, with whom he kept up a correspondence between 1661 and 1676 with a hiatus between 1665 and 1676. The first report we have of their meeting is in August 1661, when Oldenburg writes (in Ep. 1) of a meeting between him and Spinoza in Rijnsburg, where they “talked about God, about infinite Extension and Thought, about the difference and agreement of these attributes, about the way the human soul is united with the body, and about the Principles of the Cartesian Philosophy and of the Baconian.”¹⁰ (C.163-4 / G.IV.5-6) In this letter, Oldenburg informs Spinoza that there is a new work on the presses, “written by an English Noble of exceptional learning”, which makes a treatment of “the nature of air and its Elasticity...of Fluidity, Solidity, and the like.” By October 1661, Oldenburg had sent the letter. The version that he sent to Spinoza was almost certainly the Latin translation, *Tentamina quaedam physiologica*, since Spinoza (by his own admission; see Ep. 26 (C.1.394 / G.IV.159)) could not understand English.

10. For a more detailed examination of this initial meeting and of Spinoza’s stay at Rijnsburg, see Nadler (1999, 213-4, Chapter 8).

Boyle, for his part, had met Oldenburg when the latter was serving as tutor for Boyle's nephew, Richard Jones. They would stay in close contact for the rest of Boyle's life.¹¹ In addition to his prodigious skill as an experimentalist and chemist, Boyle was an accomplished scientific methodologist. Inspired by Roger Bacon, he coined the term "crucial experiment", referring to experiments which decide between competing hypotheses. He detailed his approach to scientific method in the preface of *Defence of the Doctrine Touching the Spring and Weight of Air*: "[I]t was not my chief Design to establish Theories and Principles, but to devise Experiments, and to enrich the History of Nature with Observations faithfully made and deliver'd."¹²

Here, Boyle is placing himself squarely among the ranks of those who practiced "experimental natural philosophy". Peter Anstey characterizes this school thus: "experimental natural philosophy involves the collection and ordering of observations and experimental reports with a view to the development of explanations of natural phenomena based on these observations and experiments."¹³ This is in contrast to speculative natural philosophy, "the development of explanations of natural phenomena without prior recourse to systematic observation and experiment."¹⁴ Rose-Mary Sargent writes that

For Boyle, the importance of hydrostatic investigations extended beyond proving that certain regularities obtain in nature to an explanation why they "ought to be so." The first task was largely mathematical. The second was the province of natural philosophy.¹⁵

Boyle's emphasis on experiment, and ingenuity as an experimentalist, made him the ideal foil for Spinoza, who – as I will now go on to argue – held a collection of views which fit the profile of a speculative natural philosopher quite well.¹⁶

11. See F. Buyse (2013a, §1). The entire paper provides a very thorough background to the "correspondence".

12. Boyle (1662, Preface).

13. Anstey (2005, 215)

14. Anstey (2005, 215)

15. Sargent (1995, 66–7).

16. This contrast between Boyle the experimentalist and Spinoza the rational naturalist is also noted in Hall and Hall (1964).

3. Ep. 6

3.1. Spinoza on Boyle's experiments on niter. The essay in *Certain Physiological Essays* we will treat, *A Physico-Chymical Essay, containing An Experiment with some Considerations touching the different Parts and Redintegration of Salt-Petre* (henceforth *Physico-Chymical Essay*) is devoted to an extensive treatment of some experiments Boyle carried out on “niter” (probably potassium nitrate), “fixed niter” (probably potassium carbonate), and “spirit of niter” (probably nitric acid). Curley describes the experimental procedure as follows:

Boyle melted niter in a crucible, added a live coal which kindled the niter, and continued adding coals until the kindling stopped. The mixture was then heated further until all ‘the volatile part’ escaped. The remaining ‘fixed niter’ was then divided into two parts. Boyle dissolved one part in water, then added drops of ‘spirit of niter.’ This was continued until the effervescence stopped. The other part was treated similarly, except that the fixed niter was not first dissolved in water. Each solution was then set to evaporate near an open window. The first solution crystallized in a few hours, yielding niter. The second solution crystallized very slowly, but after water was added and the solution was evaporated, niter crystals were also produced. (C.I.173n15)¹⁷

Oldenburg reports (in Ep. 11) that according to Boyle, the experiment described in *Physico-Chymical Essay* has two purposes. First, Boyle wanted to demonstrate that “the doctrine of Substantial Forms and Qualities, received in the Schools, rests on a weak foundation.” (C.I.197 / G.IV.48) He writes in the preface to *Some Specimens of an Attempt to make Chymical Experiments* (one of the constituent essays of *Certain Physiological Essays*) that he intends to illustrate that the phenomena he is investigating “may be at least plausibly explicated without having recourse to inexplicable forms, real qualities, the four Peripatetick Elements, or so much as the three Chymical Principles”.¹⁸

17. For a more thorough discussion of the experiment, see Banchetti-Robino (2012).

18. Boyle (1669, 123)

Second, Boyle wanted to show that “what [the Schools] call the specific differences of things can be referred to the size, motion, rest, and position of the parts.” (C.I.197 / G.IV.28-9) In his own words, “his Experiment seems to afford us an instance by which we may discern that Motion, Figure, and Disposition of parts, and such like primary and mechanical Affections (if I may so call them) of Matter, may suffice to produce those more secondary Affections of Bodies which are wont to be called Sensible Qualities.” (*Physico-Chymical Essay* §12) Therefore, the experiments show that the mechanical hypothesis is superior to that of the Schools.¹⁹ These are two separate aims, since Boyle could show the inadequacy of the Scholastic account without showing the adequacy of the mechanical one.

The hypothesis that Boyle takes his experiments to support is that salt-petre is produced by the concurrence of two sorts of bodies (one a salt, the other a spirit), neither of which is inflammable. (*Physico-Chymical Essay* §20) Spinoza takes this to be a thesis about the nature of niter, but he does not think the observations Boyle has made confirm this thesis.

Against Boyle’s hypothesis, according to Spinoza all one needs to explain this phenomenon is one kind of body, with different modifications – namely, one group of these bodies is at rest, and the other is in motion. The “fix’d Salt”, which Boyle took to be one of the two distinct kinds of bodies constituting the nature of niter, Spinoza proposes to treat merely as an impurity. (C.I.174 / G.IV.17)

In this hypothesis, Spinoza thinks he has an explanation for some of the chief differences between niter and spirit of niter. The phenomena he gives an explanation for in terms of his own hypothesis are: the reconstitution of niter, the difference of taste between spirit of niter and reconstituted niter, and the difference in flammability between niter and spirit of niter.

Spinoza then passes to three experiments which offer some illustration of his explanation. We will not deal with these in great detail, except to note something odd about the language he uses. Earlier on in the letter (C.I.174 / G.IV.17) he announces his intention to give the simplest explanation of the phenomena, and also to “add two or three quite easy experiments which in some way

19. That Robert Boyle was a mechanist is not in much question. Whether Spinoza was one, however, is more controversial. F. Buyse (2013b), F. A. A. Buyse (2020), and Schliesser (2018) say no, while Chalmers (2009, 109), Martin (2018), Clericuzio (2000, 129ff), and Clericuzio (1990, 574ff) say yes. Taking a side in this debate is well beyond the scope of this essay.

[*aliquo modo*] confirm this explanation”.²⁰ With respect to each of the experiments, Spinoza does *not* say that these experiments show that his hypothesis is correct. He says that these experiments “seem to confirm [*comprobare videntur*] this explanation” (C.I.176 / G.IV.21). In drawing conclusions from the first experiment, he says that “I seem to be able to infer [*videor posse concludere*]” two things, and only with respect to the third conclusion does he say that “from this it follows that [*ex quo concluditur*]”, abandoning the “seem” construction. (C.I.177 / G.IV.22) He says of the second experiment that it “seems to show [*ostendere videntur*] that the fixed parts are only impurities in the Niter”, and of the third experiment that it “seems to indicate [*indicare videtur*] that, when the particles of the spirit of Niter lose their motion, they are made inflammable” (C.I.177 / G.IV.23).

What are we to make of this coy and hesitant language? What is the function of these experiments, if *not* to prove or demonstrate definitively a preferred hypothesis? I think we find a clue in Ep. 13. By this time, Oldenburg had conveyed Spinoza’s criticisms to Boyle, and (in Ep. 11) had conveyed Boyle’s responses back to Spinoza. In responding to Boyle, Spinoza writes that he offered these experiments “to confirm my explanation – not absolutely [*non ut absoluto*], but as I expressly said *to some extent*.” (C.I.209 / G.IV.66) He continues, after a few lines:

As I expressly said, I did not offer these experiments that I might confirm absolutely [*prorsus confirmarem*] what I said. It was only that these experiments, which I had said and showed to agree with reason, seemed to confirm those things to some extent [*aliquo modo confirmare viderentur*]. (C.I.210 / G.IV.66)

This, I think, is a clue to what is motivating Spinoza’s view of experiment. This view is a bit more clearly demonstrated in Ep. 13. But, before giving a thorough analysis (which we will do in a later section) it will be useful to examine Spinoza’s general views about the method and aims of the sciences, as well as his epistemology, at the time of Ep. 6. In other words, as I argued in an earlier section, we should look to TdIE.

20. Indeed, it might be that these experiments are not experiments properly speaking (in the technical sense used today, or even in the sense of what Boyle carried out), but rather are a part of “daily experience,” which further diminishes their epistemic status. Macherey (1995, 749–51) makes essentially this point, and he is certainly right to note that “from Spinoza’s point of view, experience ought to be kept in a complementary and purely illustrative role, which subordinates it to the consideration of reasons and causes.” (Macherey (1995, 751); translation my own).

4. Knowledge, Essence, and Method in TdIE

What sets TdIE apart from other contemporary or near-contemporary texts on method is Spinoza's aim. It is useful to contrast him with one of his predecessors and influences, Thomas Hobbes. Hobbes' account of both the proper aim and method of philosophy is found in Chapter 1 of *De corpore*. According to him, the proper method of philosophy, depending on the particular topic of inquiry, is either analytical or synthetical.²¹ The analytical method "proceeds from sense to the invention of principles."²² It is in this way that the first principles of the sciences are discovered. The synthetical method, on the other hand, moves from principles to the characteristics of individual things – for instance, what the properties of matter are, or whether any particular appearance is a material body or a mere accident.²³

The general aim of any philosophy we conduct by this method, according to Hobbes, is

[T]hat we may make use to our benefit of effects formerly seen; or that, by application of bodies to one another, we may produce the like effects of those we conceive in our mind, as far forth as matter, strength, and industry, will permit, for the commodity of human life.²⁴

Or, in slogan form: "The end of all knowledge is power."²⁵

Contrast this with Spinoza's account. According to his system, the proper end of human endeavor (science included) is blessedness: "[L]ove toward the eternal and infinite thing feeds the mind with a joy entirely exempt from sadness. This is greatly to be desired, and to be sought with all our strength." (TdIE §10 / G.II.7)

21. Hobbes (1839-1845, 66)

22. Hobbes (1839-1845, 75)

23. Lodewijk Meijer discusses this distinction between analytical and synthetic methods in the preface to *Principles of Cartesian Philosophy*, and he attributes this knowledge to Spinoza. (C.I.226 / G.I.129) The particulars of the method, however, are likely to be Cartesian rather than Hobbesian, given the direct reference Meijer makes to the Second Objections and Replies. Furthermore, the analytic method referenced in this preface is described to be one which "shows the true way by which the thing was discovered, methodically, and as it were a priori." (C.I.226 / G.I.129) The synthetic method, on the other hand, "uses a long series of definitions, postulates, axioms, and problems." (C.I.226 / G.I.129) This does not seem perfectly to track the distinction we see Hobbes making above, where the analytical method moves from sensations to principles. While the differences in method between Descartes and Hobbes are extremely interesting, they are not within the scope of this paper.

24. Hobbes (1839-1845, 7)

25. Hobbes (1839-1845, 7)

One might well ask whether something like Hobbes' position is true of Spinoza as well. EI-IIp12, for instance, tells us that "the Mind, as far as it can, strives to imagine those things that increase or aid the Body's power of acting." And in EIVpref, he tells us that "when I say that someone passes from a lesser to a greater perfection...[I mean that] his power of acting, insofar as it is understood through his nature, is increased or diminished." This is a fair point, but it is not clear that Spinoza has such a doctrine in mind in TdIE. There the highest good is a person's arrival at a human nature "much stronger and more enduring than his own" (TdIE §13 / G.II.8); this nature is said to be "the knowledge of the union that the mind has with the whole of nature." (TdIE §13 / G.II.8) Certainly there is emphasis on the strength (and hence, one might think, the power) of this nature, but it does not seem that its essential characteristic is its power, as in the *Ethics*. Rather this nature (and hence the perfection and blessedness) is a sort of recognition of the mind's place in the cosmos.

He goes on: "This, then, is the end I aim at: to acquire such a nature, and to strive that many acquire it with me." (TdIE §14 / G.II.8) It is this dominant aim that dictates his method and subordinate aims. The ones he enunciates are (TdIE §§14-15 / G.II.9):

- (1) "[T]o understand as much of Nature as suffices for acquiring such a nature."
- (2) "[T]o form a society of the kind that is desirable, so that as many as possible may attain it as easily and surely as possible."
- (3) "[To pay attention] to Moral Philosophy and to Instruction concerning the Education of children."
- (4) "[To work out] the whole of Medicine."
- (5) "Mechanics is in no way to be despised."

Before this can be done, Spinoza says that "we must devise a way of healing the intellect, and purifying it, as much as we can in the beginning, so that it understands things successfully, without error and as well as possible." (TdIE §16 / G.II.9) Because he wishes to "direct all the sciences toward one end and goal, viz. that we should achieve...the highest human perfection...anything in the

sciences which does nothing to advance us towards our goal must be rejected as useless”. (TdIE §16 / G.II.9)

This point is important for my reading of these texts. Whether or not sense perception (and hence all experience related to sense perception, be it simple experiences or highly structured experiments) has high or low epistemic value, or whether or not we should draw scientific laws from experimental evidence, is ultimately going to be determined by whether or not these methods will contribute towards the blessedness of humanity. And, as we will see, if these are found wanting on this score, they are to be rejected. Consequently, I think properly to understand the conditions Spinoza sets on knowledge in general, and knowledge of essences in particular, one needs to understand the motivation for these restrictions.

4.1. Perception and its types. At TdIE §19 / G.II.10, Spinoza introduces a four-fold distinction amongst types of perception (and the corresponding kind of cognition).²⁶ These distinctions rest on the modes of perception by which we come to acquire this cognition. I will categorize these modes as follows:

Type One: “Perception we have from report or from some conventional sign.”

Examples: the date of our birth, who our parents were, and other things that under ordinary circumstances we never doubt

Type Two: “Perception we have from random experience [*experientia vaga*], that is, from experience that is not determined by the intellect.”

26. I render “cognitio” as “cognition”, rather than “knowledge”. I am not unique in doing this. For instance, Spinoza (2018) translates the relevant passages in EIIp40s using “cognition” instead of “knowledge”. This is perhaps not overly consequential as regards TdIE, but that will nonetheless be my practice. It is, however, reflective of the fact that the early moderns often meant very different things by *scientia*, *cognitio*, and their cognates than do modern epistemologists. An important exposition of this view is Carriero (2013). See also Antognazza (2020), which categorizes what we would today call “knowledge” as a mode of cognition importantly different, and indeed different in kind, from belief (especially relevant are pp. 11-2).

Examples: that we will die, that oil feeds fire, that water puts it out, that a dog is a barking animal, that man is a rational animal.

Type Three: “Perception that we have when the essence of a thing is inferred from another thing, but not adequately. This happens, either when we infer the cause from some effect, or when something is inferred from some universal, which some property always accompanies.”

Examples: when we infer, from the fact that we get sensory experience through only a single body, that the soul is united to one and only one body; when we know the nature of our vision, and in particular that it presents nearer objects as larger and distant objects as farther, we come to know that the real dimensions of the sun differ from its apparent dimensions.

Type Four: “Perception we have when a thing is perceived through its essence alone, or through cognition of its proximate cause.”

Examples: that two and three are five, that parallel-ness is transitive, &c.

In general, I will use the locution “**Type One** cognition” to refer to cognition gained through **Type One** perception, and so forth for the others. Whenever I say “experience” unmodified, I will be referring to the type of experience that Spinoza references in his description of **Type Two**. Further, in reference to **Type Two** perception, Spinoza says that it has the name “random experience” because it “presents [itself] by chance, and we have no other experiment which attacks it, and hence it remains in us, as it were, unshaken.” (G.II.10)²⁷ Here I think the use of “other experiment [*aliud...experimentum*]” most naturally suggests that Spinoza thinks that whatever that experiment is, it is of a kind with the initial instance of **Type Two** perception (else why add the

²⁷ The translation here is my own, because I think that Curley’s translation importantly misconstrues the text; it sequesters off the last clause into its own separate sentence, and drops the “tanquam” altogether.

qualifier “other”?). As a result, going forward I will take any use of “experiment” to single out, not a perception in a distinct perceptual class from a **Type Two** perception, but an additional **Type Two** perception

What the distinction between **Type Three** and **Type Four** cognition is supposed to be is clear enough, but its importance is not. In two footnotes, Spinoza makes two points which bring this importance out. In the first, he makes the following point: While **Type Three** perception can let us make true inferences, and can yield ideas of a thing with accurate content, it will not allow us to gain a complete characterization of a thing’s essence. In the case of inferring cause from effect, we will only be able to infer as much from the cause as we find in the effect. According to Spinoza, when this happens we are only able to make very broad inferences, such as “therefore there is something which has caused this effect”. This tells something about the nature of the thing in question, but it does not suffice to narrow it down: as far as the ordinary course of nature goes, an event may have infinitely many potential causes (TdIE §100).

In the second footnote, Spinoza remarks that

Although such a conclusion is certain, it is still not sufficiently safe, unless we take the greatest care. For those who do not take such care will immediately fall into errors. When things are conceived so abstractly, and not through their true essence, they are immediately confused by the imagination. What in itself is one, men imagine to be many. For to the things they conceive abstractly, separately, and confusedly, they give names which they use to signify other more familiar things. Hence they imagine these things in the same way as they are accustomed to imagine the things to which the names were first given. (TdIE §21 / G.II.II)

The conclusion that Spinoza is speaking of here is that the soul is united to the body. The ground of this inference is the fact that “we clearly perceive that we feel such a body, and no other”. We may infer that there is some sort of union between the body and soul from this sensation, but we will not learn anything about this union from this inference other than what we have learned in the sensation initially. And when this union is conceived of abstractly, it is susceptible of much

more confusion by the imagination. from this work of the imagination that fictitious and false ideas arise.²⁸

It may not be clear why all of these types of cognition mightn't contribute something towards the achievement of our goal. But it is important to recognize that Spinoza's views on epistemology are driven by his views on method and the aims of the sciences. He claims that the mode of perception we are to choose is the one which will best aid us in securing the means to the ultimate end of the sciences. These means are, first, exact self-knowledge, and second, as much knowledge of the natures of other things as will let us understand their accidents ("differences, agreements and oppositions"), "conceive rightly what they can undergo and what they cannot", and accurately compare them with our own nature and power. (TdIE §25 / G.II.12) Hence, if one of these types of cognition can achieve these goals and the others can't, we should go with the one that can and shed the ones that can't – or, at least, recognize that the achievements of the other kinds of cognition are ultimately parasitic on achievements of the preferred kind.

Spinoza's next conclusion comes as a result of a few separate arguments. First, Spinoza argues that **Type One** perception, and hence **Type One** cognition, will not let us reach the goals of true science. Since, as I will go on to argue, what we are concerned with here is **Type Two** perception and cognition, I will not go over the argument here; nor will I review the reasons why Spinoza thinks **Type Three** perception cannot yield knowledge of essences. I will simply note that in both cases, Spinoza thinks that the relevant type of perception is not up to the task. He says of **Type One** perception that, through it, "we do not perceive any essence of a thing." (TdIE §26 / G.II.12) And of **Type Three** perception, he says that "it will not through itself be the means of our reaching our perfection." (TdIE §28 G.II.13) Since reaching our perfection involves coming to know our nature and the nature of things (see TdIE §25 / G.II.12), I infer that **Type Three** perception by itself will not be sufficient for coming to know the essence of things.

Since, as I will argue, **Type Two** perception is more relevant to our topic, I will now examine the argument that Spinoza gives for its inadequacy. This argument goes as follows:

²⁸. See TdIE §84 / G.II.32.

(P2.1) In **Type Two** perception, we only perceive the accidents of a thing.

(P2.2) If we do not know the essence of a thing, we do not understand its accidents clearly.

So (C2) In **Type Two** perception, we do not understand a thing's accidents clearly.

One might wonder, quite reasonably, why Spinoza thinks he is entitled to (P2.1). We are not in a position to answer this question now, but once we have developed enough machinery, we will return to it.

This argument has at least two upshots. The first is that any clear understanding gotten from **Type Two** perception is going to presuppose cognition of an essence, which **Type Two** cannot give us. The second is that, unless we understand a thing's accidents clearly, we won't be able to reach an adequate understanding of what sorts of changes that thing can undergo and which it can't, or what the differences between that thing and others is.

Type Four, by contrast, will definitionally achieve the desired ends. If we have **Type Four** perception of our essence, then we will gain exact cognition of our nature. And if we have **Type Four** perception of the nature of things, then we will clearly be able to infer all the properties necessary to meet Spinoza's desiderata.

So according to Spinoza, we should "chiefly use" **Type Four** perception. (TdIE §29 / G.II.13) He does not say that we should not employ the other types of perception in pursuit of our goal, but he has other commitments which ought to push him in this direction. Recall his comment that "anything in the sciences which does nothing to advance us towards our goal must be rejected as useless" (TdIE §16 / G.II.9); recall too that our intellect is to be purified, "so that it understands things successfully, without error and as well as possible" (TdIE §16 / G.II.9). The first two types of perception do not advance us towards our goal, since they only yield adequate cognition if we already have cognition of the essences of things; they also admit of significant error. **Type Three** might yield some cognition of essences, but it does not guarantee an error-free conclusion, does not understand things successfully, and certainly does not do it as well as possible. I say "does not guarantee an error-free conclusion" because, as noted a few pages earlier, Spinoza thinks that this kind of perception involves a high degree of abstraction. And since any kind of abstraction can be

influenced by the imagination, this sort of perception can very easily lead us astray. This kind of perception, according to Spinoza, is very delicate.

But it is **Type Two**, and not **Type Three**, that concerns us in our analysis of Spinoza's response to Boyle. I base this claim on two reasons, one of them textual and one of them substantive. I will treat the substantive reason at length later, but before I examine the textual one, let me first say a bit about how this compares with the analysis of the types of cognition given in KV.

4.2. Perception and cognition in KV and TdIE. As mentioned in §1, the counterpart in KV for this introduction of the types of cognition and perception is KV II.1-2. The statement itself comes at KV II.1.2 / G.I.54:

We acquire these perceptions [of ourselves and of those things that are outside us], then, either 1. simply through 'belief' (which comes from experience or from report), or 2. through a true belief, or 3. through a clear and distinct concept. The first is commonly subject to error. The second and third, though they differ from one another, cannot err.

Spinoza then goes on to give the example of the "rule of three," just as in TdIE (which we will discuss momentarily). While this is a threefold rather than fourfold typology, that particular difference is merely cosmetic. A little while later in the same work, at KV II.4.9 / G.I.61, Spinoza writes that "[w]e have divided perception into four kinds: *report alone, experience, belief, and clear knowledge.*"

There is continuity elsewhere. Spinoza insists that "true belief," the KV counterpart of what I have called in TdIE **Type Three** cognition, does not show us the essences of things: "[true belief] shows us, indeed, what belongs to the thing to be, but not truly what it is." (KV II.4.1 / G.I.59) This parallels what Spinoza says of **Type Three** cognition in TdIE: it does not disclose essences. Spinoza does not, that I can see, directly say that "true knowledge" discloses essences, but elsewhere in KV he does call it "an immediate manifestation of the object itself to the intellect," (KV II.22.1 / G.I.100) which comes to about the same thing given the definition of essence that he gives at KV II.pref.5 / G.I.53:

That belongs to the nature of a thing without which the thing can neither exist nor be understood: but this is not sufficient; it must be in such a way that the proposition is always convertible, viz. that what is said also can neither be nor be understood without the thing.

The reasoning for this goes as follows. given this definition of essence, if a thing presents itself directly to my intellect, then I must be able to understand it. And, since I cannot do this without understanding the essence (or so it seems to me that the definition given above says), I must at the same time understand the essence of the thing. Hence, the fourth kind of cognition discussed in KV discloses essences.

Furthermore, Spinoza speaks in KV of the relation between “true knowledge” and the proper end of humans. He calls it “the final end we seek, and the most excellent thing we know.” (KV II.4.9 / G.I.61) Our well-being, that is, “our greatest blessedness,” is “the Love of God,” (KV II.19.1 / G.I.89) cannot be brought about by the lower kinds of perception. The lowest two are the source of the passions, and “reason...has *no power* [emphasis mine] to bring us to our well-being,” (KV II.22.1 / G.I.100). “Reason” here seems to refer to “true belief”; for instance, in the rule of three example in KV, Spinoza writes that a man has a case of “true belief” when “Reason tells him that because of the property of proportionality in these numbers, this is so, and could not have been, or happened, otherwise.” (KV II.1.3 / G.I.55) Instead, our blessedness can only be brought about by “true knowledge”: “so if we come to know God [by “true knowledge”], then we must necessarily unite with him...As we have already said, our blessedness consists only in this union with him.” (KV II.22.2 / G.I.100)

So we have at least three points of continuity between the account in KV and that of TdIE: first, the general typology of kinds of cognition is the same; second, the third kind of cognition (**Type Three** in TdIE and “true belief” in KV), and hence, we might infer, certainly not lower kinds, does not disclose essences; and third, only the fourth and highest (**Type Four** in TdIE and “true knowledge” in KV) can help us achieve blessedness. These are the crucial points that I have argued that TdIE makes above, so I conclude, on this basis, that there is sufficient continuity between KV

and TdIE to assume that *with respect to the things I set out in this paper*, and those alone, the account of the four types of cognition set out in TdIE and that set out in KV are the same.

4.3. The case of the “rule of three”. At TdIE §23-4 / G.II.II-2, Spinoza gives a concrete example of how we go about obtaining cognition using each of them. He poses a problem: suppose you are given three numbers p , q , and r , and are asked to find a fourth number s such that $\frac{s}{r} = \frac{q}{p}$. Someone using **Type One** perception will rely upon something that a teacher once told them without demonstration, and will proceed to find the fourth number. Others will conduct a series of trials and notice that, in pairs where the proportion is obvious, the numbers follow a set pattern (namely, that $s = \frac{rq}{p}$). From numerous trials, this person will “construct a universal axiom from an experience with simple numbers” (§23-4 / G.II.II-2), and this axiom will be derived using **Type Two** perception.

A person using **Type Three** perception, however, will come to find the fourth number because he has grasped the nature of proportion (Spinoza’s language, not mine; the Latin is *natura proportionis*), and he because understands a particular property of proportionality. From this property he infers what s is. But this is still not the highest form of perception for Spinoza – that comes when this property is apprehended “not by the force of that Proposition, but intuitively, without going through any procedure” (TdIE §24 / G.II.12).

When Spinoza then goes on to give his arguments concerning why **Type Two** perception is not up to the task, he says the following:

As for the second, again, no one should be said to have the idea of that proportion which he is seeking. Apart from the fact that it is a very uncertain thing, and without end, in this way no one will ever perceive anything in natural things except accidents. But these are never understood clearly unless their essences are known first. So that also is to be excluded. (TdIE §27 / G.II.13)

I read “that proportion” as referring to the proportion which was mentioned in the preceding example. The procedure mentioned by Spinoza in the “rule of three” example that corresponds to **Type Two** perception seems experimental. If one reads the passage in §27 against the passages in §§23-4, it seems clear that Spinoza is targeting experimentalists. This impression is bolstered by a

footnote to §27: “Here I shall discuss experience somewhat more fully, and examine the Method of proceeding of the Empiricists and of the new Philosophers.” While this does not amount to full-scale textual endorsement of the notion that **Type Two**, and not **Type Three**, perception is what is involved in deriving inductive laws from these experiments, it is the next best thing.

But while textual evidence that Spinoza held a view is interesting and valuable, it does not tell us much about *why* he should have held these views, nor why we should consider whether we should hold them. In the next section, I take up that question, and address the substantive reason that I mentioned above.

5. Ep. 13

Recall that Spinoza took Boyle to “[want] to explain the nature of Niter to us, that it is a heterogeneous body, consisting of fixed and volatile parts.” (C.I.208 / G.IV.64) His response was intended to show that all the chemical characteristics of niter could be accounted for by the simpler hypothesis that niter is homogeneous, and that the varying properties that Boyle attributed to heterogeneous types of bodies can be explained by differences in motion and rest. He continues:

[I]t was not my task to show that the fixed salt is an impurity in Niter, but only to suppose it, to see how [Boyle] could show me that the salt is not an impurity but is absolutely necessary to constitute the essence of Niter, *without which Niter could not be conceived* [emphasis mine]. (C.I.208 / G.IV.64)

The view of essence which Spinoza expresses here is important, since it gives him a strong reason to reject the notion that Boyle has shown him the essence of niter in this experiment. The reasoning goes like this:

- (1) A thing cannot be (adequately) conceived without its essence.
- (2) We can (adequately) conceive of Niter without the properties Boyle takes as constituting its essence.

So: (3) The properties that Boyle takes to constitute the essence of niter are not actually the essence of niter.

Spinoza believes (1), and takes himself to have established (2). So if his doctrine of essences is conceded, (3) follows. So far from demonstrating the essence of niter (as Spinoza thinks was the intent), Boyle has offered an hypothesis (that it is of the essence of niter to consist in heterogeneous parts) which *cannot* be right.

This argument has potentially troubling undertones – undertones which become more overt later in the letter. Spinoza writes (in a somewhat lengthy passage which nonetheless bears quoting):

[Boyle] says, further, that there is a great difference between those experiments (the readily available and doubtful ones I have adduced), where we don't know what Nature contributes and what things intervene, and those regarding which it is established with certainty what things are contributed....I do not know why the Distinguished Gentleman is bold enough to maintain that he knows what Nature contributes in the matter we are speaking of. *By what reasoning, I ask, will he be able to show us that that heat has not arisen from some very fine matter? Was it perhaps because so little of the original weight was lacking? But even if none was lacking, one could, in my judgment at least, infer nothing. For we see how easily a thing can be imbued with a color from a very small quantity of matter, and not on that account become sensibly heavier or lighter. So it is not without reason that I can doubt whether perhaps certain things have concurred which could not have been observed by any sense perception – especially so long as we do not know how all those Variations which the Distinguished Gentleman observed in experimenting could have come about from the bodies mentioned.* (C.I.211 / G.IV.67)

Spinoza had criticized Boyle's attempt to show that "all tangible qualities depend only on...mechanical affections". He had claimed that Boyle's experiments with niter were of about as much good as much simpler ones to accomplish that goal, such as rubbing two pieces of wood together. (C.I.179 / G.IV.25)

In response, Boyle had claimed that there is a crucial difference between experiments where we know what sorts of things are taking part in the experiment and ones in which we don't. In

the case of the wood rubbing together, we have a very composite body, whereas in the case of the experiments with niter (presumably) we are dealing with simpler bodies, and therefore have a better idea of what we are experimenting on.

It is possible that at this point Boyle and Spinoza are simply talking past each other. At one point (C.I.147 / G.IV.48) Oldenburg chides Spinoza gently on Boyle's behalf concerning the purpose of Boyle's tracts: The intent was to show the weakness of the Scholastic conception of substance and form. So – one might ask – why should we expect Boyle to be moved by Spinoza's criticisms?

For one thing, Spinoza and Boyle seem to have related conceptions of essences. For Spinoza (at least in the *Ethics*; nowhere in TdIE does he give an explicit definition of an essence that I can find), the essence of a thing is that without which the thing can neither be nor be conceived, and which can neither be nor be conceived without that thing. (EIIId2) According to Boyle, in his work *The Origin of Forms and Qualities According to the Corpuscular Philosophy* (first published in 1666):

This *Convention of Essential Accidents* being taken (not any of them Apart, but all) *together* for the Specific Differences that *constitutes* the Body and *discriminates* it from all other sorts of Bodies is by one Name, because consider'd as one *collective* Thing, call'd its Forme...or, if I may so name it, an *Essential Modification*.²⁹

These “essential accidents” are said to be a “determinate *manner of existence* of the matter” of which the body is constituted.³⁰ This is fairly close to Spinoza's notion, though not couched in the same terminology. Since the essence of a thing is what distinguishes it from all other things, presumably it will be impossible to conceive *this particular* thing adequately without also adequately conceiving of its essence – otherwise, how would we conceive of *this* thing as opposed to some other one?

So, if Boyle and Spinoza share a similar notion of essence, we might expect Spinoza's criticisms to move Boyle. But even if they would not have moved Boyle an inch – say, because Boyle is concerned with the most general affections of matter and not with specific essences of things,

29. Boyle (1666, 102)

30. Boyle (1666, 102). See Jones (2007) for a comparison of the theory of essences of Boyle and John Locke.

or because they have different conceptions about the aim of the sciences and all of human knowledge – I think that understanding Spinoza’s philosophical motivations in this correspondence is both illuminating and important. It allows us to see the positions he takes, not simply as islands in conceptual space with no real connection to one another, but as an integrated view, one where seemingly disparate parts cohere together surprisingly well.

5.1. Under-determination. Now, we return to Spinoza’s response. He speaks of certain things affecting the outcome of experiments which could not have been observed by any possible experience or experiment (though perhaps they may have been discerned by experience which is “determined by the intellect”; we will discuss this briefly in a later section). So how can we ever be sure, when conducting an experiment, that we have actually discovered the cause of the macroscopic phenomena? He even goes so far as to say that “I regard it as certain that the heat and effervescence [Boyle] recounts have arisen from foreign matter”.³¹

Here is a concrete example of the sort of thing I am reading Spinoza as saying.³² Suppose that we determine experimentally that the gravitational force exerted on mass M_1 by mass M_2 is proportional to both masses and the inverse square of the distance between them:

$$F_{M_1 M_2} \propto \frac{M_1 M_2}{r^2}$$

Since any body of experimental evidence will have some associated error, the data from which we’ve induced this law will also be consistent with another law where the force is proportional to both masses and the inverse square-plus- ϵ of the distance, for small-enough ϵ ³³:

31. This vein in Spinoza’s thought has been picked up by some in the secondary literature; for instance, Biasutti (2013) writes that “[w]hen considered as it simply appears to our senses, nature is classifiable in the most diverse ways, without any one of these making itself absolutely preferable to another.” As we will see, Spinoza has good systematic reasons for thinking this.

32. The example is inspired by a similar one given in Weinberg (1992, 85).

33. Newton considers something like this in Book 3, proposition 2 of the *Principia Mathematica* (referencing Book 1, proposition 45, corollary 1), and argues that the law governing the force of gravity cannot depart at all from the inverse square. His argument there is that even the slightest departure from the inverse square law would result in “a noticeable motion of the apsides in a single revolution and an immense such motion in many revolutions.” (Newton (1999, 802)) This notwithstanding, I think the example can be made to work simply by choosing the ratio of the total angular motion “with which the body returns to the same apsis” to the “angular motion of one revolution” (Newton (1999, 543)) to be $1+\delta$ or $1-\delta$ for δ picked small enough so as to fit all hitherto-observed data. This is jerry-rigged, to be sure, but that does not concern us at the moment.

$$F_{M_1 M_2} \propto \frac{M_1 M_2}{r^{2+\epsilon}}$$

It doesn't seem plausible to take the fact that the latter law also fits the data as a serious reason to doubt that gravity follows an inverse square law. But for Spinoza, since any body of experimental evidence will be compatible with both laws for small-enough ϵ , we are never justified in this inference when the experimental evidence is all we have to go upon.

Consider just how radical this skepticism is. Spinoza takes Boyle's experiments to be directed at discovering the essences of chemical substances. These essences are things without which we cannot conceive the thing in question. Now, if sense experience can never distinguish between two contrary hypotheses about the essence of a particular thing, then such experience – and hence experiments, since these are only a controlled and highly artificial version of sense experience – can never reveal the essences of the things in question. It should come as no surprise, then, that Spinoza writes, in Ep. 10 (to Simon de Vries), that “experience³⁴ does not teach any essences of things” (C.I.196 / G.IV.47), and in TdIE that “in [experience] no one will ever perceive anything in natural things except accidents” (TdIE §27 / G.II.3) This apparent skepticism is noted in Hall and Hall (1964, 254), who write: “Spinoza's position here seems to be that if two or more equally rational accounts of a phenomenon can be proposed, there is no reason to choose one as true rather than another.”

If all Spinoza thinks we have to go on is what we can infer from the sensible phenomena, then the conclusion would be extreme skepticism. But I do not think this is the correct conclusion. Perceptions gained solely from experiment are going to be **Type Two** perceptions, and so any cognition reached on these sorts of perceptions will be **Type Two** cognition. But Spinoza expected this anyway. We should be aiming at **Type Four** cognition, according to the arguments in preceding sections, and therefore should not be surprised if **Type Two** perception fails to reveal essences. Importantly, Spinoza does think cognition of essences is possible, but only with the aid of **Type Four** perception. (TdIE §29 / G.II.13)

34. It should be noted that Spinoza does *not* here use the technical term *experientia vaga*, but rather simply *experientia*, which suggests a wider meaning.

So Spinoza is not a skeptic about the possibility of cognition of essences. Rather, I read him as accepting a form of under-determinationism, which flows, ultimately, from his views on the aim of the sciences. On the view I have imputed to him above, there is in principle no amount of experimental evidence which will suffice to yield cognition of the essence of any created thing. Spinoza holds both that one of the chief aims of the sciences is to teach us the natures of things, and that no experience generally, and hence no experiment particularly, will suffice to fix the facts about the essence of any particular thing. So, whenever we attempt to discover the nature and essence of any particular thing or class of things by experiment alone, we will be unsuccessful. And, if this is all we have to go on, no such discovery will be possible. But, fortunately for us, Spinoza does not think this is all we have to go on.

I am not imputing to Spinoza what some under-determinationists take to be an important or essential part of that thesis, viz., confirmation holism. This is the doctrine that hypotheses are never tested in isolation, but only against the whole of a scientific theory (or in more extreme cases against the whole of science). This view comes to us from Pierre Duhem by way of Quine (probably most influentially in Quine (1951)), and to impute it to Spinoza would be anachronistic.³⁵

But there is another reason why Spinoza definitely did not hold to some variant of the Duhem-Quine thesis. One of the catch-phrases of Quine (1951) is that “[a]ny statement can be held true come what may, if we make drastic enough adjustments elsewhere in the system.”³⁶ Elsewhere he puts it like this: “Any one of the statements [of a scientific theory] can be adhered to in the face of adverse observations, by revising others of the statements.”³⁷ Spinoza would dissent from this. Statements which are supported by **Type Four** perception can be held to be true, come what may. But no statement derived from **Type Two** perception may be. The easiest way to see this is by considering a case where two statements bump up against each other, one of which derives support from a **Type Four** perception and the other from a **Type Two** perception. In a case like this, the **Type Four** perception will always win. Instead, Spinoza’s brand of under-determination is much closer to what is sometimes called contrastive under-determination. Laudan (1990) puts it

35. Note that Quine himself cautioned against conflating the two ideas; see Quine (1975, 313)

36. Quine (1951, 40)

37. Quine (1975, 313)

this way: “for any theory T, and any given body of evidence supporting T, there is at least one rival (i.e. contrary) to T that is as well supported as T.”³⁸

Nancy Maull claims that this under-determination presents itself because geometrical demonstrations are the way to show these truths. In speaking of the exchange with Boyle and Oldenburg she writes:

Spinoza’s message, conveyed unmistakably in his pesky insistence throughout the exchange, is that the experiments (because they admit to different interpretations) decide no unique hypothesis and that a mechanical hypothesis about the sizes, shapes, and motions of unseen bodies may only be justified by rigid mathematical proof from higher principles.³⁹

I think Maull is correct about the under-determination, but wrong about its source, for two reasons. First, what Spinoza thinks Boyle is offering is not just an hypothesis about the “sizes, shapes, and motions of unseen bodies”, but also an hypothesis about the essence of a particular thing, whereas Maull seems to take him to be concerned with an hypothesis about particular motion. And that sort of hypothesis simply cannot appeal to experiment for its justification in the first place. Second, I do not think it is correct to read Spinoza as saying that such a hypothesis could be confirmed by a demonstration, either. In the example of the “rule of three”, the kind of cognition that Spinoza says we attain by force of a demonstration in Euclid, when we have understood it, is **Type Three** cognition, not **Type Four** cognition. And it is only **Type Four** cognition, according to him, that will reliably disclose truths about the essences of things to us.

6. Why did Spinoza think poorly of Type Two perception?

So far, I have made two arguments. First, Spinoza thought poorly of sense experience as a way of obtaining scientific knowledge. Second, he held to an under-determinationist thesis, on which any body of sense experience is compatible with multiple hypotheses about the essences of the things involved. In this section, we will put these two theses together.

³⁸. Laudan (1990, 271)

³⁹. Maull (1986, 6)

I will argue that, given his under-determinationism, Spinoza had a strong reason to distrust **Type Two** perception, and hence **Type Two** cognition, as a means of disclosing essences. In doing so, I will contrast my analysis of Spinoza's attitude towards experiment with those of McKeon (1928), and Klever (1990). I will argue that these positions are in large part correct, but incomplete: They don't offer a good reason as to *why* Spinoza held the views that he did. I will not go into the details of the view expressed in Gabbey (1995, §6) (mostly for reasons of space) except to note that he basically agrees with McKeon: "for Spinoza *experientia vaga* does not uncover causes or essences." Since he concurs with McKeon but does not (as far as I can tell) give a systematic reason for why this experience does not reveal essences, I will treat my discussion of McKeon as applying to them both.

It should be said, at the outset, that Spinoza's thoughts on the poor epistemic status of **Type Two** perception is somewhat overdetermined. For instance, in TdIE §84 he comments that "false...ideas have their origin in the imagination, i.e., in certain sensations that...do not arise from the very power of the mind, but from external causes." So – one might reason – shouldn't we already expect Spinoza to think poorly of **Type Two** perception on other grounds, and hence conclude on the above basis alone that it cannot disclose essences to us?

This point is certainly correct as far as it goes. Spinoza does think that all false ideas have their origin in **Type Two** perception. But this does not show, by itself, that *the only* thing that arises from **Type Two** perception are false ideas. Going only on what Spinoza says in TdIE §84, it might still be the case that *certain* instances of **Type Two** perceptions can indeed produce cognition of essences. In other words: while all false ideas arise from **Type Two** perception, not all ideas arising from **Type Two** perceptions need be false.⁴⁰ What I will argue in this section, however, is that no idea arising from **Type Two** perception is a true idea of an essence.

40. One might say that this is not true in the *Ethics*, and that there, the fact that any idea of the first kind of cognition represent two causes (my body and the external object) is what makes it necessarily confused and inadequate.

While this is true in the *Ethics*, the case in TdIE is somewhat different. In TdIE §63 Spinoza writes: "all confusion results from the fact that the mind knows only in part a thing that is a whole, or composed of many things, and does not distinguish the known from the unknown (and besides, attends at once, without making any distinction, to the many ideas that are contained in each thing)." No mention of an idea arising from multiple causes is made – *all* confusion in ideas arises from the sources mentioned. This is compatible with what is said in the *Ethics* of course, and perhaps what is said there is, upon further argument and reflection, compatible with what is said here. But it is not *obviously* the same doctrine or explanation, and so since my purpose is to read the correspondence against TdIE whenever possible, I will default to that.

6.1. McKeon's reading. In his thorough study of Spinoza's approach to experimental science, Richard McKeon makes an argument similar to mine. On his reading, Spinoza held that

[t]he ideal of science is rational, and consequently knowledge of the nature of things may be attained by reflection concerning essences; experimentation could reveal nothing essential concerning things. "Only accidental qualities which are never clearly understood unless the essences of things are previously known" can be discovered by methods of observation.⁴¹

On this reading, **Type Two** perception simply is not up to the job, since it only reveals accidents and not essences. Furthermore, since cognition derived from sense perception is uncertain, it cannot be genuine, scientific knowledge.⁴²

But it is fair to ask why this is the case. Why is it, on Spinoza's view, that we only gain cognition of accidents from **Type Two** perception? If this is true simply by stipulation, then we are no closer to understanding why our senses are untrustworthy. McKeon does not provide a satisfactory answer to this question. Given his view, we are no closer to understanding why Spinoza should have taken this view.

I think, however, there is an argument, starting from Spinoza's views on under-determination, which leads to the conclusion that we only perceive accidents in **Type Two** perception. It is this:

- (1) The properties we perceive in **Type Two** perception never uniquely determine the essence of a thing.
- (2) If a property does not uniquely determine the essence of a thing, it is an accident.

So: (3) The properties we perceive in **Type Two** perception are accidents.

If my reading is correct, Spinoza is warranted to accept (1) because of his under-determinationism. Recall the hypothesis he offers as a rival to Boyle's in the case of the reconstitution of niter. According to his argument, the phenomena are just as compatible with his hypothesis about the nature of niter as with (what he takes to be) Boyle's hypothesis. He also holds that there are in principle

41. McKeon (1928, 134)

42. McKeon (1928, 152–3)

many ways in which (what we would term) the micro-physical structure of the world can be arranged which will reproduce the phenomena we observe. Recall that he says that he can “doubt whether perhaps certain things have concurred which could not have been observed by any sense perception.” (C.I.2II / G.IV.67) The upshot of this is that the properties of objects which we encounter in sense perception can be produced by multiple different corresponding micro-physical goings-on, and hence by multiple different essences.

How about (2)? Here Spinoza might argue as follows. An accident is a property which a substance (or in Spinoza’s case, a mode) can have (or not) without making a difference to its essence. Now, let us assume that a particular property does not make a difference to the essence of the thing in which that property is instantiated. Then it follows that that thing can possess that property (or not) without the its essence being affected. And consequently, the property is an accident. Hence, Spinoza is entitled to the conclusion that all we perceive in **Type Two** perception are accidents.

If these properties did make a difference in terms of uniquely identifying the essence in question, then the presence of one or more of these properties would suffice to fix that essence. But, as Spinoza can argue, these properties do not so suffice. Consequently, perception of accidents cannot hope to reveal essences. Since this is all we have in **Type Two** perception, it will never do this either.

Rather than simply having to rely on his fourfold typology of perception, Spinoza has substantive reasons for holding that **Type Two** perception will not yield cognition of essences. He can appeal to his under-determination thesis, as well as his account of essence, to explain why this is. So, on the reading I am offering, the assertion of the insufficiency of **Type Two** perception seems far less arbitrary than it did before. In contrast to McKeon’s account, which simply stipulates that Spinoza holds that experience is not worth the trouble here, my account gives a substantive explanation about why this should be.

6.2. Klever’s reading. Wim Klever, like McKeon, interprets Spinoza as being suspicious of the value of experiment. He writes that “according to Spinoza the senses are not able to demonstrate something against our rational expectations.”⁴³ On his view, Spinoza was an anti-falsificationist.

43. Klever (1990, 128)

By this, he seems to mean that, for Spinoza, “[v]erification or falsification of ideas can only be performed by other ideas.”⁴⁴ He sums it up nicely in the following way: “Experiments don’t have the power of proving the necessary structure of reality.”⁴⁵

For Klever, this distrust is explained by the fact that there are infinitely many causes involved in producing a phenomenon. If this is true, and we can only locate finitely many causes by carrying out experiments, then experiment can never access the true causal nexus responsible for the phenomena we observe. Klever draws this conclusion from the fact that Spinoza writes the following: “For it is by reasoning and calculation that we divide bodies to infinity, and consequently also the Forces to move them. But we can never ‘confirm’ this by experiments.” (C.I.182 / G.IV.29) Klever draws the following moral from this:

A phenomenon cannot be looked upon as the product of a finite number of causes...Of course this endless quantity can never be grasped or made visible by experiments, which would be, however, necessary to get an adequate proof of the constitutive elements and sufficient causes of a phenomenon.⁴⁶

This reading has at least two shortcomings. The first is textual. The passage which Klever cites occurs in Spinoza’s criticism of another essay which appears in Boyle (1669), *The History of Fluidity and Firmness*. Here is the quote in full context (the italicized text is Curley’s translation of the passage from Boyle reproduced in the letter):

[I]t would scarce be believed how much the smallness of parts may facilitate their being easily put into motion, and kept in it, if we were not able to confirm it by Chemical experiments. No one will ever be able to ‘confirm’ this by Chemical experiments, nor by any others, but only by demonstration and computation. For it is by reasoning and calculation that we divide bodies to infinity, and consequently also the Forces required to move them. But we can never ‘confirm’ this by experiments.

44. Klever (1990, 129)

45. Klever (1990, 130)

46. Klever (1990, 132)

It is not clear that the point Spinoza is making here concerns experiments generally. His objection is to the idea that we can confirm how the size of the parts of fluids can make it easy for them to be put in motion. The reason Spinoza criticizes this supposed confirmation, I propose, doesn't have to do with the infinity of causes, but rather with a category mistake. The division of bodies with respect to their size belongs to mathematical demonstration, and hence the computation of the forces required to move them requires demonstration of the same kind. As a result, it is foolish to think that chemical experiments can demonstrate anything about the force required. This would be true whether or not we are dividing forces or bodies to infinity, so it is not clear that the infinitude of causes is doing any argumentative work here.

Second, Klever's view doesn't tell us why we cannot discover essences in experiment. According to the reading of TdIE given above, it is only necessary to know a thing's proximate cause in order to know the causal elements of its essence. Why can experiment not reveal this, on his view? A particular body may be composed of infinitely many other bodies, but it is not necessary to have adequate cognition of each of these bodies in order to know that the body constituted of them is the proximate cause of something.

7. Rational naturalism

Spinoza is often classed as a *naturalist*, that is, as someone who holds the view that “everything in the world plays by the same rules”.⁴⁷ Jonathan Bennett puts it like this: “The whole story about people, [Spinoza] held, can be told with the concepts that are needed, anyway, to describe other parts of Nature.”⁴⁸ But if this is taken to have the empiricist connotations which the word has today, this perception is mistaken. Contemporary naturalists hold (roughly) that experimental science is the means of investigating reality. If what I have argued is correct, Spinoza has no truck with this.⁴⁹

Part of the reason for this division is as follows. Modern forms of naturalism often seek to bring philosophical questions and theses more closely in line with the deliverances of the natural

47. Della Rocca (2008, 5)

48. Bennett (1986, 59)

49. For a nice overview, and an argument that there is no useful sense in which Spinoza is a naturalist, see Douglas (2015). Engaging with his argument is, unfortunately, beyond the scope of this essay.

sciences. With Spinoza, in a sense the opposite is true. Instead of assimilating philosophical inquiry into empirical science, the sciences should adopt the method of philosophy wholesale. After all (as we saw above) the chief aim of the sciences is to give us a closer knowledge of the union which we as humans have with the whole of nature, and this can only be achieved by strongly aprioristic methods. Empirical and experimental investigation, to the extent it is useful at all, plays a subsidiary role. *True* science is not empirical at all.

One might think that I am illegitimately running together two theses. The first (relatively uncontroversial) thesis is that the lower types of perception do not represent the “gold standard” of perception, and hence should be dispreferred to **Type Four** perception and cognition. The second (and more controversial) thesis is that the lower types of perception and cognition cannot play any role at all in achieving **Type Four** cognition. The objection runs: surely Spinoza believes the former, but this is less evidence for the latter thesis, which is the one I am supposed to be imputing to Spinoza.

I think this objection itself runs together two theses. The first is the claim that the lower types of perception cannot help us achieve **Type Four** perception. The second is that we cannot achieve knowledge of essences through the lower types of perception. While the first thesis may well be true, and may be closely linked to the second, it is not one which concerns me here. I am concerned only with the a weakened version of the latter claim. Since, as we have seen, the true aim of the sciences is to teach us the essences of things, only those modes of perception which can yield knowledge of essences can be included in a true science. But – as I have been at great pains to argue – Spinoza thinks that the lower types of perception do *not* give us knowledge of essences. He states explicitly that **Type One** (TdIE §26: “from report...we do not perceive any essence of a thing”) and **Type Two** (TdIE §27: “in this way no one will ever perceive anything in natural things except accidents.”) perception do not yield knowledge of essences. Here we have it in his own words: “only the fourth mode [of perception] comprehends the adequate essence of the thing.” (TdIE §29) Even if **Type Three** perception is in some sense useful, all I really need for the purposes of this essay is the claim that **Type Two** perception (which, as we showed earlier, is the type of perception involved in empirical investigation) is “to be excluded” (TdIE §27) from the sciences.

So, on the reading that I advocate, the naturalism that Spinoza holds to is *not* the sort of naturalism which places a high premium on experimental science in discovering truths about the world. Rather, it is a rationalist naturalism, one which sees mankind as occupying a particular but ultimately not all-that-distinctive niche in the universe, governed in the same way as the rest of nature, and one which most emphatically does *not* see experiment and experience more broadly as the means for exploring that niche.⁵⁰ On this count I agree with Alison Peterman, who writes that, for Spinoza, “no matter how carefully or systematically you look, no matter how powerful your microscopes or telescopes, you make *no progress* toward knowing about bodies through [experiments like Boyle’s],”⁵¹ as well as with G. H. R. Parkinson, who writes that, for Spinoza, “general laws about what exists are not discovered by induction from particular experiences: the so-called ‘laws’ which are discovered in this way are not really *known*.”⁵²

This interpretation – that true science is not empirical at all – is not completely unproblematic. Schliesser (2018, 158–163) points to other places in Spinoza’s writings, such as the *Tractatus Theologico-Politicus* (TTP), where Spinoza speaks of the proper method of interpreting nature as “putting together a history of nature, from which, as from certain data, we infer the definitions of natural things.”⁵³ (TTP VII.6 / G.III.89) Spinoza also speaks in Ep. 37 (1666) of putting together “a little history of the mind, *or* of perceptions”. (C.II.33 / G.IV.189a) These passages suggest that the composition of a “history” of the properties of objects, discovered empirically, is crucial to understanding nature. Still more problematically for my view, Spinoza speaks of how we can “infer the definitions of natural things” from this history.

This is a strike against my view, I will admit. But we should not be hasty. First, I have been stressing the importance of reading the correspondence with Boyle against Spinoza’s earlier works.

50. Some disagree; see for instance Curley (1990). Parkinson (1964, 159) takes a superficially similar view, on which “experience must occupy a position of great importance in Spinoza’s theory of knowledge,” though his view on the value of experiment for Spinoza is not far from my own; see Parkinson (1964, 157–62).

51. Peterman (2014, 216)

52. Parkinson (1964, 160)

53. We should not take this to mean that Schliesser thinks that we can have empirical knowledge of essences; indeed, according to him, for Spinoza knowledge of essence “is purely intellectual knowledge”. (Schliesser (2018, 169))

From that chronological perspective, the comparison with the TTP seems less apposite. The rationalist naturalism which I see Spinoza as espousing is confined for the most part (at least, for the purposes of this essay) to the earlier works.

That said, I do bring in later works (viz., the *Ethics*) to aid in interpreting Spinoza's positions in the correspondence with Boyle. So let's concede for the sake of argument that we can overlook developmental concerns and read the TTP and other works back into TdIE and the Boyle correspondence. I still contend that the objection is not decisive. To see why, let's survey some other views Spinoza held in the TTP and contemporaneous works. In both Ep. 37 (C.II.32 / G.IV.188a) and the TTP (TTP VI.21 / G.III.86) Spinoza holds that clear and distinct ideas can only be produced by other clear and distinct ideas (or from something known through itself). So if we are to have clear and distinct ideas (in other words, adequate cognition) of the definitions of things, and hence their essences, these ideas must be produced by clear and distinct ideas. The upshot is that if we are to have adequate cognition of the essences of things through such a history, the ideas the history comprises must themselves be clear and distinct.

If this is true, however, such ideas cannot be ideas gotten from **Type Two** perception. In TdIE, Spinoza emphasizes that adequate ideas do not come from sense perception. He writes at TdIE §91 / G.II.34 that clear and distinct ideas are those "such as have been made from the pure mind, and not from fortuitous motions of the body." At TdIE §108 / G.II.39 he writes that "the clear and distinct ideas that we form seem to follow so from the necessity of our nature alone that they seem to depend absolutely on our power alone." Since clear and distinct ideas depend only on our own power, they cannot be ideas gotten from **Type Two** perception, as this kind of perception is not under our own power. Consequently, whatever the ideas in these histories are, they cannot be derived from **Type Two** perception if they are to produce adequate ideas of the essences of things.

So we appear to be left with an inconsistency.⁵⁴ On the one hand, Spinoza seems explicitly to suggest that empirical inquiry into the definitions of things is possible. On the other, he seems to have good systematic reasons for thinking that such empirical inquiry should not be able to yield knowledge of essences. What are we to do with this tension? I do not know. Whether or not

54. I am not the first to note this tension; see for example Schliesser (2018, 170).

Spinoza's rationalist naturalism is coherent may be a topic for further inquiry. But, as I have tried to show, there are deep-running strands in Spinoza's thought which militate against the success of any essentially empirical project.

8. What role *does* experience play?

The reader might now be puzzled. If Spinoza really does think so poorly of experiment, then why does he carry out experiments, or speak of them "seeming to show" or "seeming to confirm" certain results? If they cannot discover essences, what confirming or evidentiary role do experiments have? Spinoza is not generous enough to give us a fully worked-out theory of confirmation. He does tell us, in the letters, that confirmation comes in degrees; the experiments he offers confirm his explanation "not absolutely, but...*to some extent*". (C.I.209 / G.IV.66) But what does this confirmation "to some extent" constitute?

I will address this in just a moment, but I first need to make a small lexical digression. I am taking "confirmatio" and "comprobatio" to track the same concept in Spinoza, or at least in the passages in the Boyle correspondence and in the *Ethics* which we will examine. This departs from Curley (see the Index entry on C.I.630), but I believe that there is good reason for this assimilation. At C.I.174 / G.IV.17, Spinoza speaks of some experiments which "to some extent confirm [*aliquo modo confirmatur*]" his explanatory hypothesis. And later at C.I.176 / G.IV.21, after putting forth his explanation, he says that these experiments "seem to confirm [*comprobare videntur*]" it. The inference I draw from this is that what these experiments are said to be doing in both cases is the same thing, and hence that "confirmare" and "comprobare" are tracking the same action in the Boyle correspondence. This will have import for my proposed solution.

As far as I can tell, Spinoza does not use "confirmare" or "comprobare" (or their cognates) in TdIE at all. He does, however, use "comprobare" in a passage in the *Ethics* which seems relevant. Admittedly, to invoke the *Ethics* to make an interpretive point about the Boyle correspondence goes against what has been my practice in this essay. But in an instance where there is little help to be gotten from TdIE, perhaps it may be helpful to bring in other interpretive loci.

In EIIIp2, Spinoza writes that “the Body cannot determine the Mind to thinking, and the Mind cannot determine the Body to motion, to rest, or to anything else (if there is anything else).” In the scholium to this proposition, he intimates that he has clearly shown the proposition such that “no reason for doubt remains”. But, still, he goes on to say that “I hardly believe that men can be *induced* to consider them fairly unless I confirm [*comprovabero*] them by experience.” This might strike the reader as somewhat odd. If it is the case that no reason for doubt of the proposition remains, why is it that Spinoza thinks that men can only be “induced” to believe these things when confirming them by experience? It seems like experience isn’t playing any evidentiary role here.

That is precisely my interpretation. The use of “comprobare” or “confirmare” is not, I think, meant in the same sense which we would use it today. For Spinoza, to say that x confirms y is, in this sense, not to say that x has objective evidentiary bearing on the truth of y. Spinoza continues in that scholium to say that men “are so firmly persuaded” that the mind can induce the body to move, suggesting that the examples of experiences which he will go on to give are meant to address the firm persuasion. This can be true if the examples are meant to have an evidentiary bearing on the truth of EIIIp2, but it can also be true if they are meant simply to undermine the firmness of the belief that men are said to have. If Spinoza is right that there remains no reason for doubting EIIIp2, the examples from experience become evidentially otiose, which suggests that their function is not evidentiary at all. They may instead play a persuasive or illustrative role. I take no firm position on the positive role that experience (and hence experiment) plays for Spinoza. Instead, my point is simply negative: it does *not* play an evidentiary role.

At least, not by itself. Spinoza speaks in some places of the value of experience that is “determined by the intellect” (TdIE §19 / G.II.10), and how once we know the “mechanical principles of philosophy” certain experiments may be useful in investigating the nature of niter (C.I.210 / G.IV.67). So we are left with two sorts of experience: *experientia vaga*, and experience which is, in some way, determined by the intellect. The former is not going to deliver adequate cognition, whereas the latter might. To explore this distinction is unfortunately far beyond the scope of this essay. But it is clear from the relevant passage that, whatever this experience that is determined by

the intellect is, it *isn't* sense perception – and that is all that is needed for this argument. Put simply: Since ideas gotten from **Type Two** perception are not determined by the intellect, and ideas gotten from sense experience are all instances of **Type Two** cognition, no idea gotten from sense perception will be an “experience determined by the intellect.”

But what is “experience determined by the intellect”? To offer and argue for a characterization of this concept goes far beyond the ambit of this paper. But here is one possibility. First, note that “experience” is equivocal. It can refer to sense experience in addition to the experience we have of consciousness more generally (though throughout this paper I have assumed it to reference sense experience). So perhaps one can give a characterization like this: experience which is determined by the intellect is conscious experience that follows from our intellect alone, and not from sensory input. This derives some small support from a passage in TdIE §71. There, Spinoza writes that

For if we should suppose that the intellect had perceived some new being, which has never existed...and that from such a perception it deduced others legitimately, all those thoughts would be true, *and determined by no external object, but would depend on the intellect alone.*

So here, it seems that Spinoza is contrasting being determined by an external object and being determined by the intellect. My conjecture is that sense experience belongs to the former, while experience “determined by the intellect” (in the above case, the experience of those things deduced from the new being) belongs to the latter. These depend (causally, conceptually, or otherwise), not on an external object, but on the intellect alone.

One final question remains. If confirmation is not an evidentiary notion for Spinoza, then how can it persuade at all? We have seen the “that” already. What is yet to be adumbrated is the how. This question would take a paper all to itself, but here is a sketch of an answer.

First, Spinoza says that men can only be “induced” to believe certain things by experience. What does he mean by “induce”? He nowhere gives us a substantive theory of inducement that I can find, but he does use the concept elsewhere in the *Ethics*. In EVp41s, he speaks of persons who are “induced to live according to the rule of the divine law...not only by this hope, but also, and

especially, by the fear that they may be punished horribly after death.” So men are induced to action, at least, by hope and fear, which, for Spinoza, are passions (EIIIp18s2), and hence inadequate ideas.

Second, Spinoza elsewhere in the *Ethics* tells us how it is that we can shake ourselves of false imaginings. We do it, he says, by confronting them with stronger ideas:

It happens, of course, when we wrongly fear some evil, that the fear disappears on our hearing news of the truth. But on the other hand, it also happens, when we fear an evil that is certain to come, that the fear vanishes on our hearing false news. So imaginations do not disappear through the presence of the true insofar as it is true, but because there occur others, stronger than them, which exclude the present existence of the things we imagine, as we showed in IIP17. (EIVp15)

What I take Spinoza to be saying here, then, is this. If I have an imagination, then it is not destroyed by a true idea insofar as that idea is true, but insofar as that latter idea is *more powerful* than the former.⁵⁵

I propose, then, the following understanding of “confirmation” at play when Spinoza speaks of confirming things via experiment or experience. The persuasive power of “confirmation by experience” derives from presenting someone with a *more powerful* idea than that which one is seeking to overcome. This is inducement: by providing the listener with a more powerful idea (or by bringing about some change in them such that they have that idea), one induces the listener to adopt the desired belief. So when Spinoza speaks of inducing men to consider fairly things that “are such that no reason for doubt remains” by confirming them by experience, he is saying that, in order to overcome this prejudice, he must create in the reader (in this case) a more powerful idea. And, crucially, this idea *may be one derived from experience*. Recall in the passage quoted above that one can destroy an imagination by use of another imagination. This process, importantly, is not necessarily rational, and hence needn’t be a matter of evidentiary weight. Instead, it is simply a matter of one idea being more powerful than another.

⁵⁵. This point is not unique to me. See for instance Della Rocca (2003) and Steinberg (2017).

So we have an answer to the question: “what confirming role do experience and experiments play in a mature science”. As Spinoza’s remarks indicate, sometimes one’s interlocutors will not be able to consider a position fairly unless they are induced to do so by experience. One can make them do so by carrying out experiments which one communicates to them. The ideas which come from conveying the results of these ideas to one’s scientific interlocutors, it is hoped, will be more powerful than the ones which correspond to their previous, mistaken beliefs.

This is of course entirely compatible with experience or ideas gotten by **Type Two** perception playing some additional roles in epistemology or scientific practice more generally. For instance, they might play an important role in our coming to possess the so-called “common notions” of EIIp37-40 (see especially EIIp39). But in this scheme, **Type Two** cognitions play what we might call an inciting role. Such-and-such an idea, gotten by **Type Two** perception, provides the raw material for the “good” abstraction by means of which we attain the common notions. But, on my reading, they play no role at all in providing *evidence* for any hypotheses concerning essences, whether to us or to our scientific peers, or in justifying our beliefs about the common notions. When it comes to that, they are entirely effete.

Concluding Remarks

Some interpretations of Spinoza’s philosophical project see it as primarily or even only driven by his metaphysical commitments. For instance, della Rocca argues that “Spinoza’s epistemological views...derive, in surprising ways, from his metaphysical commitments, commitments that also underlie his psychology,”⁵⁶ commitments which ultimately, for della Rocca, lead Spinoza to the rejection of inexplicable relations and facts. Whether this is what is going on in the *Ethics* is a matter of debate.⁵⁷ But be that as it may, in the TdIE, considerations about the *aim* of the sciences are at least as important. Metaphysical doctrines certainly obtrude into this discussion (Spinoza’s account of essence and definition, for instance), as do epistemological issues (the four types of perception, for example). But the reason they are employed at all is in examining how we may best achieve the goal of the sciences, or what he calls the highest good, “the knowledge of the union

56. Della Rocca (2007, 851)

57. See for instance Garber (2015) and Lin (2019, 166–8).

that the mind has with the whole of Nature” (TdIE §13 / G.II.8), in addition to “love towards the eternal and infinite thing”, which is “to be sought with all our strength” (TdIE §10 / G.II.7).

If the arguments I have given in this paper are correct, then Spinoza was a thorough-going under-determinationist, at least at the time of the Oldenburg-Boyle correspondence and the TdIE. What I have tried to draw attention to is that, once Spinoza’s under-determinationism is put up against his broader epistemological and methodological commitments, it is well-motivated; this is also true of his view of the role of experience and experiments in the sciences. There is, as one would expect, a method behind Spinoza’s madness.

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