

**ON THE ORIGIN OF MODERN NATURALISM:  
THE SIGNIFICANCE OF BERKELEY'S RESPONSE  
TO A NEWTONIAN INDISPENSIBILITY ARGUMENT<sup>1</sup>**

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The best grammar of the kind we are speaking of, will easily be acknowledged to be a treatise of mechanics, demonstrated and applied to nature, by a philosopher [Newton--ES] of a neighbouring nation whom all the world admire. I shall not take upon me to make remarks, on the performance of that extraordinary person: *only some things he has advanced, so directly opposite to the doctrine we have hitherto laid down, that we should be wanting, in the regard due to the authority of so great a man*, did we not take some notice of them. (George Berkeley, *Principles of Human Knowledge*, Dublin, 1710, Part I, section 110; removed in later editions. [emphasis added])

ABSTRACT

I call attention to Berkeley's treatment of a Newtonian indispensability argument against his own main position. I argue that the presence of this argument marks a significant moment in the history of philosophy and science: Newton's achievements could serve as a separate and authoritative source of justification *within* philosophy. This marks the presence of a new kind of naturalism. Along the way, I argue against the claim that there is no explicit opposition or distinction between "philosophy" and "science" until the nineteenth century. Finally, I argue for the conceptual unity between Berkeley's

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immaterialism and instrumentalism. I argue that Berkeley's commitment to immaterialism requires his reinterpretation of science and, thus, the adoption of instrumentalism.

## 1. Introduction and Summary

In the third of George Berkeley's *Three Dialogues between Hylas and Philonous* (henceforth *Dialogues*), Hylas offers an indispensability argument<sup>2</sup> for why the existence of "matter" should be accepted; he deems it essential for the practice of Newtonian science. This is not an isolated occurrence in Berkeley's philosophy. He considers very similar objections (the sixth and tenth) in *A Treatise concerning The Principles of Human Knowledge* (henceforth: *Principles*): the "notions" that Berkeley advances must be false because they are "inconsistent with several sounds truths" of natural philosophy and mathematics. In response to this objection, Berkeley offers an instrumentalist *reinterpretation* of the achievements of natural philosophy (and mathematics).<sup>3</sup> He limits the aim of the sciences to predictions alone. That is, he denies the separate claim to authority of these sciences over philosophy. Philosophy rules the sciences.

Berkeley is not the first to consider an indispensability argument. My concern is not to establish Berkeley's originality, but rather to call attention to the fact that he is among the first (if not the first) to recognize that Newton's achievements could serve as a separate and authoritative source of justification *within* philosophy. He recognizes the appeal of a naturalism not derived from first Principles but justified by the *mere* empirical success of science. Berkeley also seems to realize that

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<sup>2</sup> In general, an indispensability argument is an argument that purports to establish the truth of some claim based on the indispensability of the claim in question for certain purposes (to be specified by the particular argument). It is a variation on the practice of inference to the best explanation. See Colyvan, 2004, note 1.

<sup>3</sup> In this paper, I focus on Berkeley's instrumentalism regarding physical theories. For a sophisticated treatment of Berkeley's instrumentalism, if any, regarding mathematics and its relationship to his instrumentalism regarding physical theory, see Jesseph, 1993: 75-8 and 223-226.

these achievements threaten the conceptual unity between first philosophy and natural philosophy presupposed by his Early Modern predecessors. Berkeley tries to exploit this feature to his advantage.

This paper is divided in four substantive sections. First I analyze Berkeley's formulation of the indispensability argument and draw out its implications for Berkeley's larger project. Second I argue against the belief that there is no distinction between science and philosophy in the Early-Modern period. I then explain how Berkeley's instrumentalism is a natural response to the indispensability argument. Finally, I conclude that Berkeley's 'philosophical therapy,' which is supposed to reconcile philosophers with common life, ends up in failure from the vantage point of later philosophers.

## 2. The Significance of the Indispensability Argument

In Berkeley's third *Dialogue*, Hylas objects to Philonous' attempts to deny the existence of "matter." He asks "what becomes" of all the natural philosophers' "hypotheses and phenomena, which suppose the existence of matter?" (p. 242)<sup>4</sup> Philonous' anti-materialist position cannot be supported because natural philosophers presuppose matter in their explanations of the natural world. They cannot be offered without relying on matter. In context, it is clear that Hylas has Newtonian physics in mind because Hylas and Philonous had just been discussing the formula that "the quantity of motion in any body, is proportional to the velocity and *matter* taken together" (pp. 241-242, emphasis in Berkeley). This echoes Newton's Definition 2, which is itself a new concept of the *measure* of motion based on Definition 1 of the *Principia*.<sup>5</sup> That is to say, Hylas' question contains the following tacit argument:

(i) Natural philosophy is successful in explaining the phenomena.

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<sup>4</sup> References to the *Three Dialogues between Hylas and Philonous* are to the text printed in Berkeley (1948), as supplied by Berkeley (1998). When it is not clear from my discussion, I also supply the dialogue-number.

<sup>5</sup> See Cohen's, 1999: 85-6. It is not clear if Hylas and Philonous understand the difference between the formula and Newton's measure.

- (ii) The supposition of “matter” is indispensable to the success of natural philosophy.
- (iii) Hence, we should suppose the existence of matter.

To think otherwise is to suppose that natural philosophers have “been dreaming all this while” (p. 242). Hylas does not quite reveal the implications of his question because by asking “what becomes of” he is offering Philonous a chance to re-describe the achievements of natural philosophers. Moreover, Hylas does not explain what the nature or source of the natural philosophers’ success is, although his use of “phenomena” implies some kind of empirical component: “phenomena” are the “appearances which I perceive by my senses” (p. 242).<sup>6</sup> The sixth objection in Berkeley’s *Principles* has a similar structure: take away matter and motion “and you destroy the whole corpuscular philosophy, and undermine those mechanical *Principles* which have been applied with so much success to account for the phenomena [...] whatever advances have been made, either by ancient or modern philosophers, in the study of Nature, do all proceed on the supposition that corporeal substance or matter doth really exist” (I.50).<sup>7</sup>

In response, Philonous immediately redefines the objection. He will accept the argument only if Hylas “can prove that any philosopher hath explained the production of any idea in our minds by the help of *matter*.” Instead of debating the issue in the context of the success of natural philosophy, he turns the discussion to “the most inexplicable thing in the world”: mind-body interaction (p. 243). If that can be explained, he says, “I shall for ever acquiesce and look on all that hath been said against [matter] as nothing” (p. 242).<sup>8</sup> Berkeley responds in the

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<sup>6</sup> For Philonous, “phenomena are nothing else but spirits,” *Dialogue* III.257.

<sup>7</sup> References to the *Principles* are to the part and section numbers of the text printed in Berkeley 1948 *The Works of George Berkeley*, as supplied by Berkeley, 1992 (revised edition).

<sup>8</sup> Of course, it is not the only important objection to his position. Berkeley’s much studied, so-called “Master Argument,” for example, is a response to the claim that if somebody can conceive of a substance, body, or any mixture of qualities existing without a mind he will give up his position (e.g., *Principles* §

same way to the sixth objection in the *Principles* (I.50; see also *Siris*: § 251).<sup>9</sup> Within Berkeley's philosophy (and, perhaps, Early-Modern philosophy more generally) the move is a fair one because phenomena are ideas, as Hylas has accepted "a hundred times" (p. 242). Thus, Philonous need not take the success of science at face value.

Here I am not interested in evaluating Berkeley's commitment to the way of ideas. Consider two features of the exchange. First, while the indispensability argument is a *philosophic* argument *within* philosophy it is *not* a conceptual argument. Rather, it depends on the authority of the theories of natural philosophers, who presuppose the existence of "matter." One source of this authority is presumably their empirical adequacy, although the details are left obscure. The force of the indispensability argument depends on the belief that the empirical success of natural philosophy is crucial in assessing the metaphysical status of concepts.<sup>10</sup> Second, in the wake of Newton's astounding success, natural philosophy is, thus, an independent source of authority *within* philosophic debates. This reading of the exchange between Hylas and Philonous may seem a bit strained. Nevertheless, as the epigraph to this paper indicates, Berkeley recognized that Newton's successes had given authority to his views. Of course, I am presupposing for the sake of argument that natural philosophy's empirical success is in important respects independent from philosophical considerations.

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22-3, *Dialogue* 1, pp. 200-1). The label goes back to Gallois, 1974: pp. 55-69. One can find discussion of the argument in nearly all books on Berkeley, e.g. Winkler, 1989: 183-7 or Pappas, 2000: 131-144.

<sup>9</sup> It is not his only argument against realism in Newtonian Dynamics; see Downing, 1995: 197-214. References to *Siris: A Chain of Philosophical Reflections and Enquiries Concerning the Virtues of Tar-water* are to section numbers of the text printed in Berkeley *The Works of George Berkeley* (1948).

<sup>10</sup> This kind of naturalism was not trivial in Berkeley's time as can be seen, for example, by the debates over the intelligibility and possibility of a vacuum in nature (e.g. Hume's *Treatise* 1.2.5.1, 1.2.4.1; for discussion of Hume's naturalism, if any, see Schliesser, 2004 and 2007). Of course, I am not claiming that there were no earlier forms of naturalism.

That natural philosophy constitutes an independent source of authority is also implicitly recognized in the tenth objection of the *Principles*: “the notions we advance, are inconsistent with several sound truths in philosophy and mathematics” (I.58). The “notion” he singles out is his earlier rejection (cf. I.10) of the “abstract” idea of motion.<sup>11</sup> Moreover, in the tenth objection, it is not clear whether or not the “sound truths” of “philosophy and mathematics” that are inconsistent with Berkeley’s doctrines are themselves empirical. For my argument, the most important feature of the indispensability argument is that it indicates that the empirical success of modern natural philosophy, especially its Newtonian version, threatens to override other philosophical considerations; it can separate the results of philosophy (or metaphysics) from those of natural philosophy.<sup>12</sup>

### 3. Natural Philosophy *versus* Metaphysics

Now, it is often claimed by those who worry about anachronism that there is no explicit opposition or distinction between “philosophy” and “science” or “natural philosophy” until the nineteenth century. Those of us who tend to see natural philosophy as a predecessor to the modern notion of science are misguided because we distort natural philosophy by ignoring, say, its religious presuppositions and pretensions. Moreover, we fail to realize that “natural philosophy” often includes all kinds of activities that we would hesitate to call scientific.<sup>13</sup> Furthermore, because

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<sup>11</sup> Fogelin, 2001: 94, calls attention to the importance of these objections.

<sup>12</sup> For more on Berkeley’s attempt to distinguish between natural philosophy and metaphysics, see Downing 2005.

<sup>13</sup> It is difficult to evaluate how widespread such views are. They were considered the standard position at The University of Chicago in the 1990s, and if the exchanges on the HOPOS-list in September 2003 (see HOPOS-L-archives: <http://listserv.nd.edu/cgi-bin/wa?A1=ind0309&L=hopos-l>) are indicative, they still are widespread. For representative views in scholarly literature, see Cunningham, 1988 and Cunningham, 1991. Cunningham, 1991: 383, cites Berkeley as one of the people that fought “perceived atheism” and, in doing so,

many seventeenth-century theorists asserted the conceptual unity of philosophy and natural philosophy (think of Descartes' or Bacon's respective trees of knowledge), it stands to reason that there would not be a substantive distinction. Attention is often called to Whewell's coining of the term "scientist" in 1834, as marking the occasion when the modern distinction (whatever it is) became apparent and perhaps possible at all. While there is much to be said for these considerations, and one should be cautious about reading too much of our metaphysics or practices (whatever they may be) into an eighteenth-century distinction between science and philosophy, we should not ignore available evidence that *some* such distinction, if not exactly ours, was available and not obscure to seventeenth- and eighteenth-century thinkers. (Of course, a follower of Quine would deny *we* have a distinction.)

For example, in the "Epistle to the Reader" to *An Essay Concerning Human Understanding*, Locke accepts a division of labor in the "commonwealth of learning" between the "master-builders" ("Boyle [...] Sydenham [...] the great Huygenius and the incomparable Mr. Newton"), who are said to advance the "sciences," with his own employment as an "under-labourer" devoted to removing "uncouth, affected, or unintelligible terms" from the sciences, if only to make it suitable again for "well-bred company and polite conversation." This is not a mere rhetorical flourish on Locke's part, because the account in the "Epistle" fits his later distinction between "Physica" and "Semeiotike" in Book IV.xxi.4 of the *Essay*. Even Leibniz, who on the whole supports appeals to the unity of science and philosophy, accepts that some division of labor between philosophers and science is occasionally desirable (e.g. *Discourse on Metaphysics*, §10).<sup>14</sup>

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"attempted to revise the prevailing form of natural philosophy or to produce a new version of it." Fair enough. But Berkeley's intended reform of natural philosophy involves a rejection of the prevailing distinction between philosophy and science. For views similar to Cunningham see Shapin, 1998 or the Introduction to Wagner, 2002. For useful discussion, see Lüthy, 2002.

<sup>14</sup> In the seventeenth-century there were debates over who could participate in particular philosophic controversies that anticipate some of the issues I am concerned with. Boyle, for example, opposed reinterpretation of matters of fact by "those [such as Henry More] outside the community of experimental

Moreover, in *De Motu*,<sup>15</sup> Berkeley *diagnoses* the existence of the relevant division of labor between “natural philosophy” and “metaphysics.” He writes about natural philosophy that “today [it] is almost entirely confined to experiments and mechanics.” By contrast, “to treat of the good and great God, creator and preserver of all things, and to show how all things depend on supreme and true being, although it is the most excellent part of human knowledge, is, however, rather the province of first philosophy or metaphysics and theology” (§ 34; see also the complaint about “some modern readers” at *Siris*: § 297). Berkeley suggests that natural philosophy “presupposes the knowledge of God or borrows from it from some superior science,” but by this Berkeley means, as he explains in the *Principles*, that “natural philosophy” presupposes an otherwise question-begging assumption (as Hume repeats to great effect in formulating the problem of induction): the continued uniformity of nature (*Principles*: I.107) and its laws (*Dialogues* II: 210-211 and *Dialogue* III: 253; cf. *Siris*: § 237). Again anticipating Hume, this is what makes it impossible for natural philosophy to attain the status of demonstrations (*Principles*: I.107); our (causal) projections will sometimes “run into mistakes” (I.108). So, Berkeley accepts the reality of a distinction even though he does not draw it in the same way that Locke does.

It is true that Berkeley would like to *reform* the existing state of affairs: “And it is the searching after, and endeavouring to understand those signs instituted by the Author of Nature, that *ought* to be the employment of natural philosopher, and not the pretending to explain things by corporeal causes” (*Principles*: I.66; emphasis added; see also I.107, where philosophers are exhorted to look for “final causes of things”). The fact that Berkeley feels a need to challenge the activity of natural philosophers - explain things by corporeal causes without reference to God - is further evidence that, in Berkeley’s mind, *some*

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philosophers.” See Shapin and Shaffer, 1986: 215.

<sup>15</sup> References to *De Motu* (Of Motion) or *The Principles and Nature of Motion and the Cause of Communication of Motions* are to the section numbers of the translation by A.A. Luce printed in *The Works of George Berkeley* (1948), as supplied by Berkeley (1992, revised edition). In this paper, I assume that Berkeley’s works treated in it present a systematic, unified view.



distinction between natural philosophy and metaphysics is already prevalent in his time.<sup>16</sup> (This passage follows just after the treatment of the tenth objection discussed above.) Moreover, even in his proposed reform toward a more religious approach to natural philosophy, Berkeley accepts the continuing distinction between natural philosophy and metaphysics. As he says in *De Motu* in the context of explaining the difference between “physics” and “first philosophy or metaphysics” (§ 71-2): “Allot to each science its own province; assign its bounds; accurately distinguish the principles and objects belonging to each” (§ 72; see also *Siris*: § 231).

Nevertheless, the indispensability argument in Berkeley’s third of the *Dialogues* does not presuppose a mere division of labor. For, without strict curtailment of the authority of natural philosophy, Berkeley’s metaphysician can be replaced by a natural philosopher. Moreover, he runs the risk that one day a scientist *may* explain mind-body interactions.

Of course, the mere presence of a distinction is not enough for my purposes. This only defeats the claim that there was no meaningful distinction between natural philosophy and philosophy in the Early-Modern period. It does not show that Berkeley’s concern is indicative of a modern problem. After all, Aristotle’s naturalism also accepted a distinction between physics and metaphysics. In this light, Berkeley’s project might be seen as restoring the *status quo* against the revolutionary ardor of the Anti-Aristotelian Cartesians and other adherents of the New Science. While there is something to this suggestion, it does not do justice to Berkeley’s diagnosis.

Consider, for example, that after Galileo published his work on falling bodies in which he presented his times squared law, his successors eventually focused on the following question: if the law is true, what is (to use anachronistic language) the gravitational constant? In the 1640s and 50s, at least three European researchers set out to measure empirically the gravitational constant: the French Minim friar Marin Mersenne, the Italian Jesuit Giambattista Riccioli, and the Dutch aristocrat Christiaan Huygens.<sup>17</sup> In the seventeenth century, the problem

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<sup>16</sup> Of course, Berkeley is challenging the assumption that natural philosophy presupposes the existence of matter, a real secondary cause.

<sup>17</sup> The classic article is Koyré, 1953.

was defined as finding the distance traversed by a body in its first second of free fall. As the leading Huygens scholar Joella Yoder notes, the “problem was compounded by the fact that an accurate means of measuring the second was not yet available.”<sup>18</sup> All three researchers used a pendulum to measure a second of fall, but Huygens’ insight consisted of realizing that the pendulum itself can be both timekeeper and an experimental measure; the pendulum is already a falling body, so the swinging pendulum contains within itself the measure of gravity. Eventually, this led Huygens to the discovery of the isochronous nature of a cycloidal curve and the importance of its evolute in constructing pendulum clocks, and to his important analyses in centrifugal motion and curvilinear fall generally.<sup>19</sup> Once the pendulum clock was built, attempts were made to make it reliable enough to find longitude at sea.<sup>20</sup> Regardless of the degree to which these researchers were drawing on a common conception of “mixed mathematics” going back to pre-Galilean, Italian mechanics,<sup>21</sup> finding the gravitational constant united these seventeenth-century researchers in a common, relatively autonomous *practice* even if they did not share many metaphysical commitments. This focus on measurement and experiment relatively unconcerned with metaphysics, inspired by Huygens’ success, became the dominant approach to natural philosophy in the French Royal Academy of Sciences.<sup>22</sup> This practice confirms Berkeley’s diagnosis of the state of affairs: “today [natural philosophy] is almost entirely confined to experiments and mechanics” (*De Motu*, §34).

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<sup>18</sup> Yoder 1989: 12. I discuss this episode in Schliesser 2005b.

<sup>19</sup> See Yoder, *passim*.

<sup>20</sup> See Eric Schliesser and George E. Smith (forthcoming).

<sup>21</sup> This was suggested by Dan Garber. I have benefited from reading his unpublished manuscript, “What Was the Scientific Revolution?”

<sup>22</sup> See, for example, Huygens’ letter to Colbert in which Huygens presents his vision of the mission of the French Academy. Huygens, 1888-1950, vol 6: 95-6; see also vol. 19: 26ff.

To put this in a striking way: just as most strains of seventeenth-century anti-Scholasticism are united in their belief that philosophy should not be the handmaiden of theology (to echo Spinoza), so we can discern an emerging practice of natural philosophy un-beholden to metaphysics. Rather, metaphysics should not contradict natural philosophy. This trend was so well established that by 1748, Leonhard Euler could claim: “For one has the right to reject in this science [metaphysics] all reasoning and all ideas, however well founded they might otherwise appear, that lead to conclusions contrary to those truths [of mechanics].”<sup>23</sup>

The evidence I have presented is by no means conclusive on these matters, but my argument should re-open debate about the nature of the relationship between natural philosophy and metaphysics. While early twentieth-century historians of philosophy or science, often uninterested in context, were perhaps too quick in equating natural philosophy with science, we should not ignore evidence that relevant practical and conceptual distinctions are being drawn in the seventeenth and eighteenth centuries.<sup>24</sup>

#### **4. “Instrumentalism:” Berkeley’s Response to the Indispensability Argument**

Earlier, I suggested that Philonous’ insistence in response to Hylas’ argument that natural philosophers explain mind-body interaction was a kind of shifting of topics. But as I indicated, if we assume the truth of idealism then Berkeley’s response is more than adequate; metaphysically speaking ‘matter’ is merely an idea too. Empirical science can go about its business just fine as long as the scientists do not have any

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<sup>23</sup> See Euler’s *Opera Omnia*, vol. 2: 377. Quoted from Di Salle, 2002: 55, n31.

<sup>24</sup> Also, the views of Cunningham and Shapin are, in part, the result of a selection bias. If one focuses on the circles around Boyle and Newton then natural philosophy will seem very preoccupied with religious affairs. But what connected their practice with Continental natural philosophy (Galileo, Huygens, etc) is precisely their ability to leave aside, when necessary, appeals to theological concerns.

metaphysical pretensions and stick to their job of making predictions and useful discoveries. For, according to idealism, you do not need matter to explain the emergence of any idea, and so you also do not need matter to explain natural science. Idealism can simply take the whole enterprise of the natural sciences on board, as long as the latter is reinterpreted along idealist lines.

Thus, it is not surprising that Berkeley offers a reinterpretation of natural philosophy. He denies that it is about the discovery of real causes, and insists that such terms as “force, gravity, attraction” (etc.) do not refer to a “true, physical quality” (*De Motu*, § 17). Rather, in response to the Indispensability Argument, Berkeley (or Philonous) offers the following proposal about the nature of natural philosophy: natural philosophy can be interpreted as a system of “useful and entertaining” knowledge about the “laws and methods of nature” (*Dialogues* III: 243) that allows for very successful, even *counterfactual* predictions. Responding to the tenth objection, Berkeley claims, “from the experience we have had of the train and succession of ideas in our minds, [we may] often make, I will not say uncertain conjectures, but sure and well grounded predictions ... and be enabled to pass a right judgment of what would have appeared to us, in case we were placed in circumstances very different from those we are in at present. Herein consists the knowledge of Nature” (*Principles*: I.59; see also I.62). The “mathematical hypotheses” of Newtonian natural philosophy (*De Motu*: § 27, *Siris*: § 250, § 293 - no doubt a dig at Newton’s “*Hypotheses non fingo*”) - not unlike “geometers’ fictions” (*De Motu*: § 3, 9), “serve the purpose of mechanical science and reckoning; but to be of service of reckoning and mathematical demonstration is one thing, to set forth the nature of things is another” (*De Motu*, § 18).<sup>25</sup>

For Berkeley, natural philosophers can discover rules or laws that allow one to summarize past phenomena and make predictions about future ones. Again, they should stick to that goal: “that is the sole mark at which the physicist must aim” (*De Motu*: § 38). Philonous is willing to accept Newton’s “useful and entertaining” discoveries if we understand them as explaining the phenomena not by offering an account of underlying forces but by showing the “manner and order” in which

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<sup>25</sup> For more on this, see Downing, 2005.

successive ideas “are imprinted on our senses” (*Dialogues* III: 242). Natural philosophy can do this without an appeal to matter.<sup>26</sup> To be clear: Berkeley is not so much interested in natural philosophy as such, as he is in preventing certain philosophical/metaphysical implications that been drawn from natural philosophy.

Philonous’ rejection of Newton’s account of forces of nature connects with Berkeley’s independent argument for his instrumentalism. In *De Motu*, §67, Berkeley insists that “mathematical entities” cannot have a fixed meaning: they have no “stable essence in the nature of things.”<sup>27</sup> So, Torricelli and Newton offer different but consistent accounts of the notion of force, “the same thing can be explained in different ways”<sup>28</sup> (see also *Siris*: § 249). Pre-Newtonian, mechanical

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<sup>26</sup> In his letter (November 25, 1729) to Samuel Johnson, Berkeley claims that while “mechanical philosophers” do “suppose (though unnecessarily) the being of matter,” Newton’s (unfortunately labelled) “mechanical philosophy” is not “concerned about matter” (see *Works*, vol. 2: 279).

<sup>27</sup> According to Newton-Smith, 1985, Berkeley offers an early version of the argument for under-determination of theory by data. But as Downing, 1995 argues, Berkeley’s argument can be more plausibly interpreted as a version of an argument from indeterminacy of meaning.

<sup>28</sup> As my previous footnote suggests, *De Motu*: § 67 has to be read with considerable caution. Berkeley does not say that Newton and Torricelli have theories of the same scope. When he says that “the matter is adequately explained by both,” one ought to ask, “Exactly what matter?” For example, Torricelli did not have a theory observationally equivalent to Newton’s theory of gravity. Could Newton’s theory of gravity be reformulated in Torricellian terms? This depends upon exactly what Torricelli’s array of concepts and principles for the theory of motion was; and what Berkeley says does not really tell us this. What “thing” force is, is hardly a well-posed question. And what Berkeley says about Newton, although true, is misleading in this context. Newton distinguished a number of different kinds of what he called “force.” It is true that he says what Berkeley does about “impressed force”; but even this phrase Newton uses in more than one sense. In the *Scholium* to the Laws of Motion, he says: “When a body is falling, the uniform force of its gravity acting equally, impresses, in equal particles of time, equal forces upon that body, and therefore generates equal velocities; and in the whole time impresses a whole force, and generates a whole velocity proportional to the time.” Now what Newton here calls the “whole force”

natural philosophers not only reject the ancients' substantial forms and occult qualities, but also expect (hypothetical) explanations to be cast, as a kind of rational reconstruction, in terms of colliding bodies (cf. *Siris*: § 231-2).<sup>29</sup> The laws of their impact are fundamental both from an explanatory point of view and a model of intelligibility. For Newton, by contrast, rational mechanics "will be the science, expressed in exact propositions and demonstrations, of the motions that result from any forces whatever and of the forces that are required for any motions whatever" (*Principia*, "Author's Preface to the Reader").<sup>30</sup> Even though Berkeley favors Newtonian hypotheses over Descartes' (*Siris*: § 243), his argument for instrumentalism, thus, undercuts the explanatory strategy of Newtonian science (see also *Siris*: § 234). His adoption of instrumentalism is not merely an *ad hoc* response to save his immaterialism. It is a principled strategy. Of course, by emphasizing this

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impressed in the "whole time" is what in at least some versions of later mechanical terminology is called the "impulse": the time-integral of the force. It is also identical with what Torricelli (according to Berkeley) calls an "accumulation or aggregate of impressed forces." And what Torricelli calls the "impetus" that is "constituted" by this aggregate (which--presumably in this form--that is, as impetus) "remains in the body," is - or can be identified with - what Newton calls the total motion generated by the (total) impressed force (i.e., as one later says, "by the impulse of the force"). So it is misleading to call this a case of "very different opinions, even contrary opinions." These comments are quoted (with minor editing) from Howard Stein (personal communication).

<sup>29</sup> For a representative case, see Christiaan Huygens' *Preface* to his *Treatise on Light* (1690).

<sup>30</sup> In the *Principia*'s "Author's Preface to the Reader," Newton does not mention the moderns' tendency to demand an explanation, or what may be termed a 'rational-mechanical reconstruction' of the sort that Huygens advocated in his *Treatise on Light*, in terms of colliding bodies, because that demand is precisely one of the things he rejects in his famous phrase from the General Scholium, "Hypotheses non fingo." For treatment, see Stein, 2002, especially 282ff. and Gabbey, 2002: 335-343. Kant's distinction between a "mathematical-mechanical" and a "metaphysical-dynamical" is, although slightly different, useful in this regard; see Friedman, 1992: 137-140 and 181-183.

element of Berkeley's instrumentalism, I do not mean to preclude other sources that motivate his adoption of this stance.<sup>31</sup>

Yet, one might think that Newton's achievements are the result of some special, privileged method. This potential source of justification of the distinct authority of the sciences would allow natural philosophy to transgress Berkeley's stipulated boundaries between first philosophy and metaphysics. However, in the context of seventeenth- and eighteenth-century practice, this is by no means an easy strategy. The methodology of pre-Newtonian mechanical philosophy offers what was widely seen as the *only* model of intelligibility.<sup>32</sup> From this point of view, Newton's results should be translated in a more acceptable language than the one that allows for occult-like action at a distance.<sup>33</sup> Berkeley's instrumentalism can piggyback on this demand.<sup>34</sup> Perhaps this is why

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<sup>31</sup> For example, in personal communication Sean Greenberg argues that "Berkeley's instrumentalism [...] reflects his desire to reorient men towards God. Instead of seeing natural phenomena as the result of causal interactions between bodies, they should be seen instead as reflecting the uniform operations of God, the only being who can bring about changes in the natural world." Greenberg calls attention to *Principles* I.66 and I.75 as evidence.

<sup>32</sup> "The first thing, that I shall mention to this purpose [that is, to recommending the corpuscular philosophy], is the intelligibleness or clearness of mechanical principles and explications." Robert Boyle, "About the Excellency and Grounds of the Mechanical Hypothesis," *The Works of the Honourable Robert Boyle* (1772), vol. 4: 69, and "by whatever principles natural things be constituted, it is by the mechanical principles, that their phaenomena must be clearly explicated," (*ibid.*, vol. 4: 76). All quoted from Downing, 1998: 386 and 399.

<sup>33</sup> My remarks about pre-Newtonian mechanical philosophy should make it clear that I did not intend to claim in the previous section that natural philosophy is (entirely) free from metaphysics.

<sup>34</sup> Berkeley is far from endorsing the mechanical philosophy. As he writes in *Siris*, "if the explaining a phenomenon be to assign its proper efficient and final cause (§ 154, 155, 160), it should seem the mechanical philosophers never explained any thing; their province being only to discover the laws of nature, that is, the general rules and methods of motion, and to account for particular phenomena by reducing them under, or shewing their conformity to, such general rules" (§ 231; see also §247, 249).

Berkeley does not address this potential objection and does not investigate Newton's own claims about his methodology.<sup>35</sup>

There is, however, one element of Newton's methodology that Berkeley should not ignore. For Newton, theory is not merely a source of explanation. Newton claims that his theory not only leads to surprising new predictions, but also that it opens up new lines of research. Newton conceives of theory as a kind of forward-looking research-engine. In his *Rules of Reasoning*, for example, Newton argues that empirical exceptions to general rules, even minor ones, should be investigated because they open up either the possibility of discovering interesting refinements to general rules or the possibility of formulating a sophisticated new theory:

In experimental philosophy, propositions gathered from phenomena by induction should be considered either exactly or very nearly true notwithstanding any contrary hypotheses, until yet other phenomena make such propositions either more exact or liable to exceptions (*Principia*, Book III, Rule IV).

The Rule is that we should treat well-confirmed propositions as true (or nearly true) until there are deviations that promote new research, which, in turn, will lead us to refine our original propositions or reject them for new ones. But while one has a theory, one must not be distracted by possible differing explanations for the found regularities until one has empirical reason. This disarms the practical impact of the under-determination of theory by data on scientific theorizing. One accepts a theory as true as a *means* to developing a better theory. That is, Newton accepts that physical inquiry may be *open-ended*. As he writes in the "Preface" to the *Principia*, "the *Principles* set down here will shed some light on either this mode of philosophizing or some truer one" (emphasis added).<sup>36</sup> Newton's methodology is forward-looking.

However, by re-interpreting scientific theories Berkeley's instrumentalism is a strictly backward-looking project. It should not have

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<sup>35</sup> For an excellent account of Newton's methodology, see Smith, 2002.

<sup>36</sup> For a more elaborate defense of this point about Newton see Smith, 2002, Stein, 2002, or Schliesser, 2005a.



an effect on the on-going practice of scientific research. Rather, *post-factum* it attempts to constrain certain explanatory or metaphysical implications derived from science.

So, while we risk anachronism, it is still useful to call attention to the contrast between Newton and Berkeley; it is indicative of a contrast between a scientific and philosophical mindset. Of course, scientists are often interested in explanation and some philosophers are interested in developing better theories. One should not reify the distinction being aimed at here.

There is a lot more to be said about the subtleties of Berkeley's instrumentalism and his arguments in favor of it.<sup>37</sup> Here I return to my main argument: Berkeley's instrumentalism is absolutely necessary if he is to save his larger project. So, while Berkeley's recourse to instrumentalism may have many sources within his thought, without it he cannot defeat the threat the Indispensability Argument poses. This threat requires him to offer not only a strict *hierarchical* division of labor between the metaphysician and natural philosopher (recall the use of "superior" and "higher" in *De Motu*: § 34) but also a strategy of re-interpretation of the claims of natural philosophers by supplying a set of semantic, epistemological, ontological (etc.) constraints.<sup>38</sup> This combined strategy allows him to contain the possible authority that the empirical success of natural philosophy might have in philosophic debates. So, for example, in the *Principles*, Berkeley substitutes for Newton's conception of absolute motion, which he thinks is inconceivable and impossible, one that involves relative motion (I.112).<sup>39</sup> As Berkeley explains in the context of discussion of how to understand the term body, "The sounder philosophical method, it would seem, abstains as far as possible from abstract and general notions" (*De Motu*: §23).

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<sup>37</sup> See Downing, 1995 and 2005.

<sup>38</sup> That is, within idealism, Berkeley can handle the threat by burden-shifting. But he still needs to offer a reinterpretation of the language of science.

<sup>39</sup> Berkeley follows Leibniz in misunderstanding Newton on these matters. See Di Salle, 2002 for a useful corrective.

### 5. Berkeley's Therapy and His Instrumentalism

I conclude with a brief thought on how Berkeley's response to the success of natural philosophy complicates his larger ambitions. Assume that Berkeley's instrumentalism is justified and that it can systematically reinterpret Newtonian natural philosophy. It is required to save his larger philosophical project, that is, his immaterialism, from a potentially devastating objection. Regardless of how one understands or evaluates Berkeley's commitment to immaterialism and the different details of it, it, in turn, is put forward as a kind of philosophical therapy for those "most addicted to speculative studies" ("preface" to *Dialogues*: 167). According to Berkeley, he is motivated to close the gulf that has opened between modern philosophy and what he calls "common life." This gulf leads, he believes, to skepticism not only about the existence of God but also about the use and relevance of philosophy. So, Berkeley acknowledges the continued existence of a version of the old problem going back to the time of Socrates between philosophy and common life. Berkeley wants to "rescue" the addicted from their paradoxes and atheism ("the wild mazes of philosophy") and "reduce" them "to common sense" (cf. this with *Preface*: 1-4, 25, of *Principles*). While the cure may be hard to swallow at first, the result, the "return to simple dictates of Nature," will be "not unpleasant." If the therapy works, then, through a kind of trickledown effect, "the study of morality and the Law of Nature" will be revived; the appeal of "skepticism removed, the measures of right and wrong accurately defined, and the *Principles* of natural religion reduced to regular systems" (*Preface* to *Dialogues*: 168; see also *Siris*: § 231). Finally, it will allow the knowable parts of revelation to be acceptable to "right reason," and the other parts to remain "sacred mysteries" (*Preface* to *Dialogues*: 168-169).

Berkeley's philosophical system is a kind of antidote to philosophy.<sup>40</sup> It is designed to make the learned experience the world from the point of view of the common sense vulgar. In fact, a principle of his therapy is that there is no difference in kind between the "natural philosopher and other men." Natural philosophers do not know the

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<sup>40</sup> See Diamond, 1991, Chapter 1, "Realism and the Realistic Spirit."

efficient (or final) causes behind the appearances. Their knowledge consists only of “a greater largeness of comprehension, whereby analogies, harmonies, and agreements are discovered in the works of Nature,” which are then used to formulate rules and generate predictions (*Principles*: 1.105; see also I.114; I.59, 62, and *De Motu*: § 18, 27, and 39).

Yet, this *assessment* of natural philosophy and its relation to common life is offered not from the point of common life, but, rather, from a standpoint informed by the hierarchically superior first philosophy. In this sense, it resembles the vantage-point of Berkeley’s instrumentalism, which is based on a hierarchical distinction, if not a distinction in kind, between natural philosophy and metaphysics. For Berkeley’s philosophic therapy to work, not only must he collapse the apparent distinction between the philosophers and common sense, but he must also prevent his distinction between natural philosophy and first philosophy from undercutting his cure.

The cure creates a potential new disease. For example, Berkeley says that, “we ought to *think with the learned and speak with the vulgar*” (*Principles*: I.51). This does not constitute a philosophical reduction to common sense. Rather, it is offensive to common sense. Moreover, the comment is offered in the context of the Copernican refutation of the common sense idea that the Sun rises. The truths of natural philosophy are a source of challenge to common sense. It is difficult to see how this cure can be maintained once the idea of Enlightenment - with its commitment to public truth - takes hold later in the eighteenth century. One may interpret the vision that inspires Hume’s science of man as a valiant attempt to save the therapy from such bad side-effects.

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<sup>41</sup> NOTE FROM THE EDITOR: since Schliesser's consultation, this entry has not significantly changed in the new Fall 2006 Edition and is consultable on URL: <http://plato.stanford.edu/archives/fall2006/entries/mathphil-indis/>.

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