**William Herschel’s Defense of Speculative Inquiry**

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Abstract: Although William Herschel (1738-1822) is most well-known as an astronomer and instrument-maker, he also had interests in speculative philosophy (e.g., metaphysics), as several papers he read at the Bath Philosophical Society reveal. These papers, arguably, are the context in which Herschel engaged most directly in philosophical argumentation and are thus worthy of greater scholarly attention. In this article, I focus on Herschel’s paper entitled “On the Utility of Speculative Inquiries,” in which he debates the legitimacy of speculation with an unnamed interlocutor, referred to as the “Gentleman.” In section 1, I briefly discuss Herschel’s intellectual background. In section 2, I review some of the main points of contention between Herschel and the Gentleman. In section 3, I situate their dispute within a broader intellectual context by reference to the distinction between “experimental philosophy” and “speculative philosophy” (ESD). In section 4, I discuss the possible identity of the Gentleman, favoring the itinerant teacher of experimental philosophy John Arden over the more well-known Joseph Priestely. In section 5, I argue for the historical significance of this exchange, specifically that Herschel’s debate provides support for the superiority of the ESD as a historiographical framework over the more familiar rationalism vs empiricism distinction (RED). In section 6, I examine three further arguments Herschel provides to defend speculative inquiry. I conclude in section 7 by connecting Herschel’s arguments to contemporary debates in general philosophy of science on the role that speculation plays in advancing scientific progress.

**Keywords:** William Herschel; speculation; experimental philosophy; empiricism; substantivalism; Bath Philosophical Society

**1. Introduction: William Herschel and the Bath Philosophical Society**

William Herschel (1738-1822) was the most celebrated astronomer of the late 18th and early 19th century. Hailing from a Hanoverian family of musicians, Herschel spent the first half of his adult life travelling around England earning a living as a composer, performer, and teacher of music. After having secured gainful employment as organist at the Octagon Chapel in Bath, Herschel established himself there in 1766 and began to dedicate his time to self-directed study in mathematics, optics, astronomy, and the manufacture of his own telescopes. With the help of his siblings, Alexander and Caroline—the latter of whom would go on to become Herschel’s indispensable assistant and a renowned astronomer in her own right—Herschel constructed the best reflector telescopes in the world. Although he discovered a couple thousand celestial objects, including nebulae and binary stars, Herschel was best known in his lifetime and today for discovering the planet Uranus. The discovery of the first new planet since antiquity granted the amateur astronomer much deserved recognition from the international community. In November of 1781, Herschel was elected as a Fellow of the Royal Society and awarded the Copley Medal, its oldest and most prestigious award for outstanding achievements in science. The following year, Herschel was appointed as King George III’s court astronomer, whereupon he and Caroline relocated from Bath to just outside of Windsor Castle.

 Herschel’s time in Bath played a crucial role in his transition from an amateur to a professional scientist. In late December 1779, Herschel joined the Bath Philosophical Society (BPS), at the invitation of Dr. William Watson Jr., who encountered Herschel by chance in the middle of the street while Herschel was observing the moon through one of his telescopes. The BPS was the first “properly constituted scientific society in the country” (Hoskin 2011: 45) outside of London’s Royal Society. It was at the BPS that Herschel finally found a professional audience for his research. In a little over a year between January 1780 and March 1781, Herschel presented 31 papers at the BPS, a few of which would go on to be published in the *Philosophical Transactions of the Royal Society*, including his “Account of a Comet,” which details his observations of what would later be identified as the planet Uranus. Interestingly, during his membership in the BPS, Herschel also read several papers on more speculative, and even metaphysical, topics. In these papers, Herschel considered questions such as the fundamental nature of matter (“On the Central Powers of the Particles of Matter”), the reality of space as an independent substance (“On the Existence of Space”), and even the problem of free will (“On Liberty and Necessity”). Even though Herschel is most well-known as an observational astronomer and instrument-maker, he also had interests in speculative philosophy, as these papers reveal.

In his unpublished manuscripts, Herschel demonstrates his great facility with philosophical themes ranging from Stoicism, Locke’s arguments for the existence of God, and the problem of evil (Clark 1988). These philosophical interests were by no means peripheral. As Herschel himself remarks, Locke’s *An Essay* *concerning Human Understanding* was one of the first works that he read after learning English as a young man[[1]](#footnote-1), and it proved extremely influential on his intellectual character (Winterburn 2018: 17). Furthermore, Herschel’s scientific endeavors, including his program of cataloguing and attempting to resolve nebulae and his search for extra-terrestrial life, were guided by certain metaphysical principles (Clark 1988: 36-40). Such principles included the idea that we live in a “teleological, ordered and knowable universe designed by a Creator” (Sullivan 2018: 53) and the *principle of plentitude*, the idea that “no genuine potentiality can remain unfulfilled” (Lovejoy 1960: 52).[[2]](#footnote-2)

There has been little discussion, however, of the several papers on speculative philosophy that Herschel read at the BPS, or the views that he articulates and defends within them. Of the writings that Herschel saw fit to share with a professional audience, these papers, arguably, are the context in which he engaged most directly in philosophical argumentation. Thus, they are worthy of greater scholarly attention. In this article, I will focus primarily on the paper that Herschel read at the BPS on April 14, 1780, entitled “On the Utility of Speculative Inquiries,” in which he seeks to defend the very idea of speculative philosophy (e.g. metaphysics) against another unnamed member of the BPS, referred to as the “Gentleman.” In section 2, I review some of the main points of contention between Herschel and his interlocutor, including Herschel’s argument for the legitimacy of metaphysics, which relies heavily on its being analogous in relevant respects to mathematics. In section 3, I situate the debate between Herschel and the Gentleman within a broader intellectual context by reference to the distinction between “experimental philosophy” and “speculative philosophy” (ESD). In section 4, I discuss the possible identity of the Gentleman, favoring the itinerant teacher of experimental philosophy John Arden over the more well-known Joseph Priestely. In section 5, I argue for the historical significance of this exchange, specifically that Herschel’s debate provides support for the superiority of the ESD as a historiographical framework over the more familiar rationalism vs empiricism distinction (RED). In section 6, I examine three further arguments that Herschel provides to defend speculative inquiry. I conclude in section 7 by connecting Herschel’s arguments to contemporary debates in general philosophy of science on the role that speculation plays in advancing scientific progress.

**2. Herschel versus the “Gentleman” on Metaphysics and Mathematics**

 In his paper, “On the Utility of Speculative Inquiries,”[[3]](#footnote-3) Herschel defends the legitimacy of inquiry into speculative topics, against an unnamed member of the Bath Philosophical Society (BPS). In a prior meeting, this member of the BPS objected to discussion of the question “whether space be anything actually existing.” In contemporary philosophy of physics, this question is sometimes referred to as the substantivalism vs. relationism debate, modern discussions of which date back to the correspondence between the Samuel Clarke and G.W. Leibniz. Roughly, according to substantivalism, space is a real substance, ontologically irreducible to the objects that exist within space. By contrast, according to relationism, space reduces to the network of distance relationships between existing objects. This debate is one that Herschel himself takes up with greater depth in another paper that he read before the BPS about a month later, entitled “On the Existence of Space,” in which he provides several philosophical arguments for the substantivalist position.

As a prelude to his general defense of speculative inquiry, Herschel begins his paper by summarizing some key points of discussion from the meeting prior to April 14th. During the last meeting of the BPS, an unnamed objector raised doubts about the “propriety” of taking up the question of the reality of space, suggesting that this was the wrong forum for considering such an abstruse question. Following Herschel, I will refer to this objector as the “Gentleman.”

In addition to thinking that metaphysics was not a topic suitable for discussion at the BPS, in the previous meeting the Gentleman also claimed, “speculations and metaphysics were of little use to mankind.” Instead, the Gentleman claimed that it would be “better to keep only to experimental philosophy.” This second charge that metaphysics is useless is one that Herschel attempted to rebut at the prior meeting by citing Locke’s *Essay* as an example of useful knowledge, albeit metaphysical in character. The first strategy in defense of speculative inquiry thus appeals simply to the authoritative reputation of Locke, the English philosopher *par excellence*. Given Herschel’s intellectual background, it should come as little surprise that he would mention Locke’s *Essay* as a paradigmatic example of fruitful intellectual inquiry. The Gentleman, however, was unimpressed by Locke’s *Essay*, remarking that “this book had done no good, and that Locke himself had allowed it to be of little use.”

Because Locke’s work was not highly esteemed by the Gentleman, Herschel recounts a second strategy that was employed in the previous meeting to defend speculative inquiries. This argument claimed, more directly, that “metaphysics served to instruct the mind and guide it in the search of those truths which could not be ascertained by experiments.” In defending the possibility of speculative inquiry, Herschel here presupposes something akin to the familiar distinction between a priori knowledge and a posteriori knowledge. According to the distinction as it is usually articulated, a posteriori knowledge is derived from experience, including observation and experiment, while a priori knowledge is independent of experience, and is instead said to derive, typically, from reason alone. The second strategy is to point out that, although experience is doubtless useful for gaining much knowledge, some knowledge can only be gained through speculative inquiry. According to this second strategy, if we neglect speculative inquiry, we will miss out on the subset of those truths that cannot be known by experience.

 It should be emphasized, however, that the charge raised by the Gentleman is that speculative inquiry is *useless*. This position is logically consistent with the claim that speculative inquiry yields genuine, non-experiential knowledge. For instance, if speculative inquiry only yielded trivial truths which made little difference to the affairs of practical life, or which had little effect on our conceptions of ourselves, then this would only serve to confirm the Gentleman’s charge that speculative inquiry is useless. Thus, this second strategy, to be successful, must first assume that speculative inquiry yields knowledge that is of significant human interest. Now, in recounting this second strategy, Herschel makes no mention of the truths which “cannot be ascertained by experiment” that he has in mind. But consider some of the standard topics of early modern metaphysics: the existence and nature of God, the existence and nature of the soul, the problem of free will, the problem of personal identity, etc. These are all questions of perennial concern, and one’s stance on them will most likely have downstream effects on the affairs of one’s practical life and one’s self-conception. Thus, it is reasonable to conclude with Herschel, that knowledge in these domains, if attained, would be useful.

As was the case with the first strategy attempted in the previous meeting, Herschel reports that, again, the Gentleman remained unconvinced. The Gentleman did not, at least according to Herschel’s retelling of the debate, criticize the *ends* to which metaphysics is devoted. That is, the claim that metaphysics is concerned with substantive questions of human interest was not challenged. Instead, the Gentleman questioned the *means* by which metaphysicians have attempted to answer these questions. Specifically, the Gentleman mockingly compared the metaphysician to a “dancing master who came in with a fine bow, having amused you a while with his various hops and skips, left you with another very fine bow, no wiser than you were before.” The ultimate aim of this comparison is relatively clear. By way of the analogy, the Gentleman expresses his claim that, although metaphysicians purport to have knowledge of great import to share with us, upon closer examination their methods are ineffectual. The methods employed by metaphysicians do not lead us to the truth. Of course, the Gentleman concedes, engaging in speculative inquiry can be entertaining for a while. However, we should not expect to learn anything useful from the metaphysician about the world.

The final point that Herschel recounts from the previous meeting of the BPS serves to clarify why, according to the Gentleman, the methods of metaphysicians are ineffectual:

When mathematical demonstrations were urged as instances of truths that depended not upon experiments; and the well known proposition, of the three angles of any triangle being equal to two right angles was mentioned, this Gentleman seemed to derive the certainty of that Theorem from its being known to be matter of fact.

There is much that is of interest about this passage both historically and philosophically. Although this point is not explicitly stated, it seems that the problem the Gentleman has with speculative inquiry as an enterprise is precisely that its method is a priori. Recall that earlier, the Gentleman suggested it would be better to keep only to experimental philosophy. What is more, the dialectic that Herschel reports strongly suggests the interpretation that the Gentleman doubts the very possibility of a priori knowledge. Otherwise, it is hard to make sense of the reply, made either by Herschel or some of his fellow members of the BPS, that mathematics also relies upon a priori methods. Why else should Herschel bring up mathematics as a proof of the possibility of a priori knowledge?

 This argument that Herschel suggests on behalf of speculative inquiry can be reconstructed as follows:

1. If metaphysics is objectionable for relying on a priori methods, then mathematics is objectionable for relying on a priori methods.
2. It is not the case that mathematics is objectionable for relying on a priori methods.
3. So, it is not the case that metaphysics is objectionable for relying on a priori methods.

According to the argument, we cannot legitimately dismiss metaphysics for relying on non-experimental methods; otherwise, on pain of logical inconsistency, we would also have to dismiss mathematics, since it too relies on non-experimental methods. But, of course, mathematics is one of the most certain branches of knowledge and so should not be rejected. If mathematics relies on non-experimental methods, then instead what one should conclude is that non-experimental methods are legitimate. Therefore, one cannot object to metaphysics merely because of its a priori methods.

 Interestingly, the Gentleman challenges Herschel’s analogical argument by denying that mathematical knowledge is in fact a priori. Instead, according to the Gentleman, mathematical knowledge is acquired via experimental (or empirical) means. When Herschel mentions that mathematical demonstrations—such as the geometric theorem according to which the sum of the interior angles of a triangle add up to 180 degrees (i.e., triangle sum theorem)—are truths that are known a priori, the Gentleman is reported to have “derived the certainty of that Theorem from its being known to be matter of fact.” Thus, the attempt to defend a priori metaphysical knowledge by likening it to mathematics fails—or so the Gentleman’s argument goes.

The view that mathematical knowledge can be acquired by observation and experiment is something that Herschel finds quite astonishing. When Herschel refers back to the Gentleman’s view about mathematical knowledge, he remarks: “As to mathematics…that it should be imagined they owe the least degree of their evidence to experiments, is what I never heard advanced before.” Now, it is possible that Herschel’s claim to have never heard of someone defending such an account of mathematics is merely a rhetorical flourish. However, there is no independent reason to think that Herschel is being anything other than sincere in his surprise at the Gentleman’s view.

Importantly, the Gentleman’s rejoinder to Herschel’s argument departs significantly from mainstream views about mathematical knowledge at the time, even among British philosophers who identified with the central tenets of experimental philosophy, such as Locke and Hume. Both deny that mathematical knowledge is acquired via experience, accepting that there is a role for a priori reasoning in mathematics. However, they both adopt an ontologically deflationary view about mathematical knowledge; strictly-speaking, mathematical truths are not about the world, but about our concepts or ideas.[[4]](#footnote-4) For instance, regarding mathematics, Locke writes: “if we will consider, we shall find that it is only of our own ideas. The mathematician considers the truth and properties belonging to a rectangle or circle only as they are an idea in his own mind” (1690, *Essay,* 4.4.6). So too, Hume famously divides up our knowledge into “Matters of Fact” and “Relations of Ideas”,the latter of which include “Geometry, Algebra, and Arithmetic”, and which concern propositions “discoverable by the mere operation of thought, without dependence on what is anywhere existent in the universe” (1748, *Enquiry*, 4.1). By contrast, rather than adopting an ontologically deflated view of mathematics, the Gentleman replies by affording experience an even more prominent role than either Locke or Hume. The Gentleman’s views about the nature of mathematical knowledge would not be seen again until John Stuart Mill’s *A System of Logic* (1843), where Mill defends, at length, the doctrine that even mathematical truths are acquired via experiment, observation, and inductive inference.

**3. The Experimental Philosophy vs. Speculative Philosophy Distinction**

 It is difficult to fully understand the dispute between Herschel and the Gentleman without considering the background intellectual context in which their exchange took place. In decrying speculative inquiry and insisting that the members of the BPS “keep only to experimental philosophy,” the Gentleman makes recourse to a distinction very much current during the 18th century, although less so today, namely the distinction between experimental philosophy and speculative philosophy.[[5]](#footnote-5) Experimental philosophy was a method of investigating nature, i.e., natural philosophy, that developed in the mid-17th century in England. As the name suggests, it emphasizes the importance of experiment in the study of the natural world. Here, “experiment” is to be understood as a kind of active intervention into nature, manipulating an object of study by setting up artificial circumstances and observing the results. The origin of experimental philosophy can be traced to Francis Bacon’s conception of natural history and his critique of traditional philosophical systems. Far from constituting a purely classificatory endeavor, as it is sometimes mistakenly regarded, Bacon’s investigative method afforded a central place to observation and experiment. Experimental philosophy was picked up by leading natural philosophers in England, such as Robert Boyle and Robert Hooke, and by its great advocate Henry Oldenburg, quickly becoming the dominant methodology of London’s Royal Society.

As the experimental tradition developed, it came to be associated less with Bacon’s natural history and more with the mathematical methods employed by Newton, who identified himself as an experimental philosopher. It was not long before experimental philosophy became an international movement, spreading throughout continental Europe during the late 17th and early 18th centuries to burgeoning scientific societies in France, Germany, and Italy. In the first instance, experimental philosophy was a method for studying natural phenomena. However, owing to its great success, attempts were made to extend the methods of experimental philosophy to other areas of human inquiry, such as medicine, ethics, and the study of the human mind.

 Proponents of experimental philosophy often contrasted their enterprise with what they pejoratively termed “speculative philosophy.”[[6]](#footnote-6) For most experimentalists, speculative philosophy was characterized by an undue focus on system-building, a priori reasoning from first principles, and putting forth conjectural hypotheses that were not sufficiently grounded in observation and experiment. In the minds of its critics, a paradigmatic example of speculative philosophy could be found in the philosophical system of René Descartes. For instance, Descartes argued that we can deduce the fundamental laws of nature from a priori reflection on God’s essence, e.g., from properties like God’s immutability. Additionally, planetary motion was to be explained by Descartes’ vortex theory, according to which the planets were embedded in large complex accretions of super-fine swirling matter, carrying the planets along in their orbits. In general, proponents of experimental philosophy had little interest in or patience for this mode of investigating nature. Cartesian vortices were regarded as wholly conjectural, not being deduced experimentally from the phenomena.

 It should be noted, however, that experimental philosophers were not opposed to system-building in principle. [[7]](#footnote-7) Rather, what they opposed was the over-eagerness of speculative philosophers to embrace some one particular system, regarding it as definitively proven despite the lack of sufficient experimental evidence. The ultimate goal of the experimental natural philosopher was to eventually come up with a complete and comprehensive system of natural phenomena. And some prominent experimental philosophers, such as Robert Boyle and Robert Hooke, acknowledged that theory and observation could be mutually reinforcing. Generally though, experimental philosophers wanted to refrain from system-building until a more thorough study of nature had been carried out.[[8]](#footnote-8) In having a complete system of nature as a goal, experimental philosophy was in keeping with the traditional view of scientific knowledge dating back to Aristotle. A true and complete science, according to Aristotle, should be presented as a deductive system. The fundamental axioms of the system should correctly describe the essences of those objects that fall under the domain of inquiry, and subsidiary knowledge should be derived from these axioms in the form of theorems. The experimental philosophers, of course, advocated that knowledge of these essences be derived from experiment, and not from other sources like commonsense or speculative reason.

It is tempting to identify the experimental vs. speculative philosophy distinction (ESD) that underlies the dispute between Herschel and the Gentleman with the more familiar rationalism vs. empiricism distinction (RED). However, there are both philosophical and historical reasons to keep these distinctions separate. First, the RED concerns issues of fundamental epistemology. According to one standard formulation, empiricism states that all substantive knowledge of the world ultimately derives from sense-experience. According to one standard formulation, rationalism states that some substantive knowledge is independent of the senses, e.g., by being innate or by being derived from pure reason.[[9]](#footnote-9) By contrast, experimental philosophy is, in the first instance, a method for the study of nature. Although it was later extended to other domains besides natural philosophy, experimental philosophy is strictly-speaking silent on fundamental questions about the ultimate sources of human knowledge. Similarly, while it might seem like empiricism is to be identified with experimental philosophy, empiricism as traditionally understood does not include a suspicion of premature philosophical system-building or conjectural hypotheses, which is part of experimental philosophy.

Second, whereas “experimental philosophy” and “speculative philosophy” were terms used by early modern philosophers, the terms “empiricist” and “rationalist” are analytical categories imposed on early modern philosophy by later historians. The use of the terms “rationalist” and “empiricist” in their contemporary sense traces back to Immanuel Kant and to several post-Kantian philosophers who sought to understand the history of philosophy in terms of these categories. According to the standard story, early modern philosophy was dominated by epistemology, specifically concerns about skepticism and the foundations of knowledge. Some philosophers, such as Locke, Berkeley, and Hume were empiricists, whereas others such as Descartes, Spinoza, and Leibniz were rationalists. The dialectical stalemate between empiricism and rationalism was resolved by Kant’s critical philosophy, which synthesized rationalism and empiricism, and thus transcended the dichotomy.

Here, I will avoid using the terms “rationalist” and “empiricist” as far as possible when discussing the debate between Herschel and the Gentleman. Rather, we should understand Herschel as defending speculative philosophy and the Gentleman as defending experimental philosophy. I will return, however, to the RED and the ESD in section 5. As will become clear, the dispute between the Gentleman and Herschel provides incremental support for the superiority of the ESD over the RED.

**4. The Identity of Herschel’s Interlocutor**

*4.1 The Bath Philosophical Society, according to Edmund Rack’s Journals*

Since the short-lived BPS left us no officially published proceedings or minutes, it is difficult to say on what grounds the Gentleman adopted this unorthodox account of mathematical knowledge. One of the sole remaining records of what occurred during meetings of the BPS is the 31 papers that Herschel read, which were published for the first time in 1912 by a joint committee of the Royal Society and the Royal Astronomical Society. Nowhere in these papers though does Herschel identify by name the anti-metaphysical Gentleman, who would have presumably been known to members of the BPS from the previous meeting in which these matters were discussed

 Despite the lack of published minutes or proceedings, some details of meetings of the BPS are preserved in the journal of Edmund Rack, a Quaker of rural stock, who was one of the founding members and secretary of the BPS (Hoskin 2011: 44-5).[[10]](#footnote-10) According to Rack, it was Thomas Curtis, governor at a general hospital in Bath, who suggested that Rack found a “select Literary Society” in Bath, “for the purpose of discussing scientific and phylosophical subjects & making experiments to illustrate them” (*RJ*, Dec. 27, 1779). In his journals, which were composed “for the entertainment of [his] beloved kinsfolk” (*RJ*, Dec. 22, 1779), Rack reflects on matters of religion, morality, and natural philosophy and recounts details of his quotidian activities in Bath. Additionally, he makes several references to Herschel and the BPS, including some allusions to papers that Herschel read at the BPS, such as his paper “On the Central Powers of the Particles of Matter.” Unfortunately, the last entry of Rack’s journal that has come down to us is dated March 22, 1780, just a few weeks before Herschel delivered his paper “On the Utility of Speculative Inquiries.” Thus, there are no conclusive indications in Rack’s journal regarding who the Gentleman was.

Even so, a closer examination of various entries in Rack’s journal offers some clues as to the Gentleman’s identity. In an entry dated December 31, 1779, Rack lists by name 14 members as attending a meeting of the BPS, including himself and Herschel. A day later, he reports having asked William Melmoth, a lawyer and classicist, to join. However, despite his interest, Melmoth declined, “as his health never permitted him to be out in an evening” (*RJ*, Jan. 1). On January 7, 1780, Rack reports that two new members were admitted but does not list them by name. Finally, a week later, Rack notes that a new rule was created at the meeting that day “to admit no person at any meeting but members – and, as the number is now 18, that no more gentlemen be admitted but by ballot” (*RJ*, Jan. 14). Thus, since membership in the BPS appears to have been rather limited, there are only a handful of members who can be the unnamed Gentleman against whom Herschel contended.

Based on some entries in Rack’s journal, we can rule out a few candidates. For instance, Rack describes a certain “J Collins Esq (alias Jno Locke)”, i.e., James Collings (1721–1788), as “Lockes soul in a new body” (*RJ*, Jan. 29). William Melmoth agreed, commenting to Rack that “no two men were ever more alike in body & mind than Locke & Collins” (*RJ*, Jan. 29). About Collings, Rack speaks approvingly, remarking that “Every time I am in this gentleman’s company my idea of him increases. His understanding is very great, his genius tow[e]ring, and his mind amply enrichd with allmost every thing valuable in science & phylosophy” (*RJ*, Jan. 29). It is highly unlikely then, that either Collings or Rack is the anti-metaphysical Gentleman, given their apparent esteem for Locke.

 Another founding member of the BPS, the stonemason Thomas Parsons, also proves an unlikely candidate, given what we know of his activities. A single page of one of Parson’s contributions to the BPS was discovered on the back of a sheet among Herschel’s papers (Klein 2012: 50). In a paper on the “comparative happiness of Mankind in a State of Barbarity or Civilization”, Parsons begins by stating that his is a topic “so complex and extensive…[that] it would give [him] great satisfaction if some Member of the Society better qualified would undertake it.”[[11]](#footnote-11) As Klein (2012: 51) observes, we can see in Parson’s opening remarks, “a bit of self-effacement, the sign of a man who retained in the arena of free discussion a deep awareness of the hierarchies of status and learning and of his station in relation to them.” Based on his broad intellectual interests, his middling social status, and the lack of self-confidence that he evinces, it is improbable that Parsons is Herschel’s interlocutor. Recall that the Gentleman was not lacking in confidence, having had few qualms about severely criticizing so distinguished a figure as John Locke.

*4.2 Joseph Priestley*’s *Possible Candidacy*

One possible candidate for the Gentleman’s identity is the famous chemist Joseph Priestley (1733-1804), who like Herschel was also a founding member of the BPS. At the time that the BPS was active, Priestley was already well-known for his work in natural philosophy, having discovered the gas that was later identified as oxygen. In 1772, Priestley was awarded the prestigious Copley medal by the Royal Society “on account of the many curious and useful Experiments contained in his observations on different kinds of Air.” Like many men of science at the time, Priestley championed experimental philosophy and decried speculation. In the preface to a book on natural philosophy, he remarked: “Indeed, speculation, without experiment, has always been the bane of true philosophy” (1779: vii). Might then Herschel’s interlocutor be none other than the famed Joseph Priestley?

Despite Priestely’s condemnation of speculation, there are several strong reasons to doubt that Priestely is the Gentleman. First, although Priestely is regarded today as primarily an experimental scientist, for most of his life he played many roles including that of teacher and minister. In addition to natural philosophy, he wrote on a wide variety of topics such as, education, ethics, political philosophy, and most important for our purposes, theology and metaphysics. In his *Letters to a Philosophical Unbeliever*, Priestley provided standard arguments for belief in God, such as the argument from design, and at times arguments that depend on a priori considerations (Dybikowski 2008: 105). In his *Disquisitions Relating to Matter and Spirit*, Priestley weighed in on traditional debates about the relationship between soul and body, defending a unique brand of materialism over immaterialism. In his *The Doctrine of Philosophical Necessity Illustrated*, Priestley argued that the human will is fully determined by the laws of nature, and thus contra-causal notions of free will should be rejected; this compatibilist account of free will, Priestley contends, is still consistent with the idea of God.

Even a cursory look at these works is sufficient to demonstrate that they do not bear the mark of a single-minded thinker whose sole interest was experimental natural philosophy. Nor do Priestley’s works reveal someone with a disdain for speculative inquiry or philosophical system-building. Indeed, in the preface to his *Disquisitions Relating to Matter and Spirit*, Priestley readily acknowledged that his investigation into the nature of the human person consists of “metaphysical speculations” (1777, xii). In this respect, Priestley differs significantly from the anti-metaphysical Gentleman.

Second, some of Priestley’s work is heavily influenced by Locke and, while at times disagreeing with him, Priestley often cited Locke approvingly. For example, in a footnote in *Disquisitions Relating to Matter and Spirit*, Priestley quotes an argument due to Locke for the “materiality of the soul,” referring to Locke as “so considerable a writer” (1777: 218). Furthermore, in his *Examination of Dr. Reid’s Inquiry into the Human Mind* (1775: 5), after outlining Locke’s theory of ideas and offering some mild criticisms, Priestley writes: “[Locke’s] system appears to me, and others, to be the cornerstone of all just and rational knowledge of ourselves.” In addition to commending Locke’s views, Priestely cites the influence of Locke and David Hartley on his own psychological investigations, writing “we may safely take up the subject, where Locke left it, and proceed to attend to what Dr. Hartley has done by following his steps” (1775: 7). One of Priestley’s projects was to provide a materialist basis for Locke’s theory of ideas, according to which different “vibrations” in the brain underly different sensations, ideas, and their associative connections. As Wolfe (2020:34) notes, Priestley sees himself as “carrying on and in some sense actualizing (that is, updating) Lockean psychology.” Clearly, Priestley had a favorable view of Locke, which casts considerable doubt on the claim that he is the Gentleman.

Finally, one further reason to doubt that Priestley is the Gentleman is that Herschel and Priestley were acquainted. Herschel was very much interested in Priestley’s work on optics and his matter theory, and they engaged in written correspondence (Schaffer 1980: 82). It is unclear what the extent of their relationship was, but they certainly knew each other well enough to exchange letters. Additionally, in other papers that Herschel read before the BPS, in which he discusses Priestley’s ideas, Herschel identifies Priestley directly by name (1912, p. lxviii, lxxii; lxxv). It would be odd for Herschel to refer to Priestley rather obliquely as the “Gentleman” only in one of the papers that he read before the BPS. Referring to his opponent as the “Gentleman” suggests a lack of familiarity, casting further doubt on the hypothesis that Priestley is Herschel’s interlocutor.

*4.3 Evidence for John Arden as Herschel’s Unnamed Interlocutor*

 Thus far, the investigation has been entirely negative. However, one of the 14 members listed by Rack in an entry on December 31, 1779, stands out as the best candidate for being Herschel’s unnamed interlocutor: John Arden. Whereas Herschel was described as an “optical instrument maker and mathematician,” Arden was described as a “lecturer in natural philosophy” (*RJ*, Dec. 31). More specifically, Arden belonged to a distinctive class of 18th century itinerant lecturers in natural philosophy, the emergence of which “was a peculiarly English phenomenon” (Gibbs 1960: 111). These traveling lecturers included other important figures such as James Ferguson, whose *Astronomy Explained* Herschel read, and whose lectures he attended in Bath in 1774 (Fawcett 1998: 65). Traveling pedagogues such as Arden specialized in adult education in large provincial towns where a lack of learning opportunities otherwise prevailed. After having traveled around and lectured in various towns in England for many years, including Manchester and Birmingham, Arden eventually settled in Bath for several years, where he continued to give lectures on natural philosophy (Musson and Robinson 1969: 104). Indeed, Rack “began to attend a course of phylosophical lectures on Electricity –the Air, Chemistry, Astronomy, Hydrostatics, & the Globes” (*RJ*, Dec. 22) given by Arden just five days before deciding to inaugurate the BPS. Having attended these lectures thus very likely influenced Rack’s decision to form a new scholarly society in Bath (Fawcett 1998: 67).

 A published outline of one of Arden’s course of lectures survives, which provides some suggestive evidence for the hypothesis that Arden is the unnamed interlocutor with whom Herschel disputed. The outline of lectures is entitled *A Short Account of a Course of Natural and Experimental Philosophy* (1772), *in which* *will be exhibited* *the experiments* *necessary* *for* *the* *explanation* *of*: *natural philosophy in general, mechanics, astronomy, geography, hydrostatics, pneumatics, and optics.*[[12]](#footnote-12)This lecture series is quite similar to the description that Rack gives of the lectures that he attended in Bath in 1779. While Rack calls Arden a “lecturer in natural philosophy”, Arden in this advertisement for his lectures prefers to call himself a “teacher of experimental philosophy” (1772: 1). This emphasis on experiment is reflected in the title, and especially so in the subtitle.

 The most compelling piece of evidence that Arden is the unnamed Gentleman is the following preface to the outline of Arden’s the twelve lecture course:

*THE Advantages which have accrued to the World from EXPERIMENTAL PHILOSOPHY, appear in the frequent Improvements now made in all those Things which supply the Necessities, or serve the Interests of Mankind: Its Uses are so extensive, that there is not a single Art or Science, to the Advantage of which it may not be applied.—A strict Inspection, therefore, into the grand Discoveries founded thereon, which are of so great Consequence to Society, is sufficient to induce us to esteem it as the most effectual Means Speedily to improve all Arts and Sciences, to discover Causes from their Effects, and to make Art and Nature conspire in Subserviency to the Necessities and Ornaments of Life; which may be better understood by seeing the Experiments performed, than by a long and tedious Application to Books only.* (p. 2)

This passage suggests that Arden was not a mere teacher of experimental philosophy. In addition, he was very much an advocate for the power of experimental methods. This attitude is not a surprising one for a lecturer of natural philosophy to adopt, given the astounding advances in experimental science during the 17th and 18th centuries.

Three salient facts loom large in the preface to Arden’s twelve lecture course. First, we can see a substantial concern for benefiting society through scientific discoveries. In Arden’s view, experimental philosophy has led to many improvements that serve the interests of humanity. Second, and perhaps most crucially, Arden claims that there is “not a single art or science to the advantage of which it may not be applied.” The use of experimental methods is the best way, according to Arden, to improve an area of study, no matter the subject matter. Finally, at the end of the preface, Arden recognizes the necessity of actually conducting experiments, or at least witnessing them being conducted. One better understands natural phenomena through direct experimental inquiry, rather than from reading books, a process which Arden derides as long and tedious. In this last remark then, we can discern a preference for an active, interventionist approach to learning about the world, rather than the passive, receptive approach that had long characterized the traditional university education.

 These three salient facts reflected in the above passage from Arden’s course outline cohere nicely with the attitudes, concerns, and views of the anti-metaphysical Gentleman that we glean from Herschel in his paper “On the Utility of Speculative Inquiries.”

For one thing, recall that the Gentleman rejected metaphysical questions because he regarded them as “little use to mankind.” We can thus see in this dismissive remark about metaphysics an implicit concern for scholarly pursuits that benefit society, just as in Arden’s preface we see a concern for pursuits that serve the “Interests of Mankind.” So, while Arden does not explicitly dismiss metaphysics in his preface, both he and the Gentleman are evidently concerned about knowledge that stands to materially improve the lot of humanity.

 For another thing, recall that the Gentleman claimed it is “better to keep only to experimental philosophy.” We can thus see in this remark a great confidence in the power of experiment, just as we do throughout Arden’s preface. The surprising claim made by the Gentleman that even mathematical truths are matters of fact known through experiment fits well with the imperialist ambitions that Arden attaches to experimental philosophy. As Arden claims in the preface, experimental methods can be advantageously applied to every “Art or Science”, and moreover the use of experiment is the most “effectual means” to improve “all Arts and Sciences.” Now, Arden does not mention mathematics specifically in the preface. But if we take Arden at his word here, then he is committed to the further claim that experimental philosophy could also be applied to improve the discipline of mathematics. This claim suggests that Arden should be open to the idea that mathematical knowledge can be acquired via experiment, just as Herschel’s unnamed interlocutor had claimed.

 Finally, recall that the Gentleman dismisses Herschel’s appeal to Locke’s *Essay*, remarking that Locke’s “book had done no good” and that in general metaphysicians are like “dancing masters, showmen who engage in amusing displays but leave you no wiser than you were before.” We can thus discern in these contemptuous remarks an underlying hostility toward traditional scholastic book-learning, which typically did not involve direct experimentation. Likewise, as we saw above, Arden regards actual observation of experiments being performed as superior to a “long and tedious Application to Books only.” Although Arden does not explicitly object to metaphysical inquiry in the preface to his course of lectures, his forceful advocacy for experimental demonstrations and his criticism of mere book-learning suggests that he would rank metaphysics as far inferior to experimental philosophy, just as Herschel’s unnamed interlocutor clearly does. Now, none of the above points are decisive. However, taken together they lead to a strong case that Arden was indeed the unnamed Gentleman with whom Herschel debated.

**5. The Historical Significance of Herschel’s Debate with the Gentleman**

 This exchange between Herschel and the Gentleman is historically significant in several ways. For one thing, it is certainly of interest to find a view about the acquisition of mathematical knowledge that is usually first attributed to John Stuart Mill being debated in scholarly circles some 60 years before the publication of Mill’s *A System of Logic*. Most important though, the conversation between Herschel and the Gentleman bears on a contemporary debate about how to understand the history of early modern philosophy, which has ramifications for our understanding of the history of science as well. Recall that the experimental vs. speculative philosophy distinction (ESD) is superficially similar to the more familiar rationalism vs. empiricism distinction (RED). While the ESD was once commonly employed, the RED has become the central organizing principle of much scholarship on early modern philosophy. Moreover, the RED is reinforced in the teaching of university courses on the history of philosophy. As Anstey and Vanzo (2023) argue, however, the ESD is a better than the RED as a tool for understanding early modern philosophy, despite the RED’s historiographical dominance.

First, according to Anstey and Vanzo (2023), the RED leads to a biased account of early modern philosophy. In particular, i) it leads to accounts of its history that place too much emphasis on epistemological issues, at the expense of other areas of philosophy that were equally important to thinkers at the time; ii) it suggests the overly simplistic view that every early modern philosopher can be neatly classified as a rationalist or an empiricist; and since these categories are ones introduced by Kant, iii) it gives current histories of early modern philosophy an unjustifiably Kantian bias. Second, aside from avoiding these biases, the ESD is, according to Anstey and Vanzo (2023), explanatorily superior in several ways (285-98).

One of their key points is that “experimental philosopher” is an “actors’ category,” being a contemporaneous term with which practitioners self-identified. “Empiricist” by contrast was not a term claimed by any early modern philosopher. In fact, those central figures later identified as empiricists, such as Locke and Hume, often described themselves as employing experimental methods, and frequently employed the same rhetoric as experimental philosophers (2023: 187-8). Additionally, there are some aspects of early modern philosophy that the RED fails to explain, such as the pervasive “anti-system sentiment” and critique of conjectural hypotheses. Consequently, according to Anstey and Vanzo, the ESD “has greater explanatory reach and leads to more nuanced interpretations and a deeper understanding of early modern natural philosophy” (2023: 295). Naturally, given how entrenched the RED is in our way of thinking, the thesis that Anstey and Vanzo put forth has been the subject of various criticisms (e.g., Biener and Schliesser 2014).[[13]](#footnote-13)

Crucially, the dispute between Herschel and the Gentleman provides some incremental support for the ESD over the RED. This is because it is difficult to makes sense of their debate over the legitimacy of speculative inquiry in terms of the categories of “rationalist” and “empiricist.” A key claim the Gentleman makes in his dispute with Herschel is that even knowledge of mathematical truths is acquired by experience. Those in the grip of the RED will certainly be inclined to classify the Gentleman as an empiricist. In doing so, proponents of the RED would be grouping together the Gentleman with other more well-known figures, such as Locke, Hume, and Mill. However, the major difficulty with classifying the Gentleman as an empiricist is that he is staunchly critical of Locke’s *Essay*. What is more, the Gentleman does not merely have a problem with one or two details of Locke’s system *per se*. Herschel does not elaborate much on the Gentleman’s specific criticisms of Locke, but one can plausibly infer that the Gentleman objects, in a deep way, to the very style of intellectual inquiry in which Locke is engaged. The dismissal of Locke as something of a charlatan suggests that the Gentleman does not see his own view on the nature of mathematical knowledge as being derived from some foundational epistemological theory about the ultimate sources of our knowledge. Instead, the Gentleman specifically cites “experimental philosophy” as that subject on which members of the BPS ought to keep their focus. The main point is that conflating “experimental philosophy” with “empiricism” in this context does not do justice to the Gentleman’s position. Rather, the terms “experimental philosophy” and “speculative philosophy” more faithfully represent the debate between Herschel and the Gentleman. Thus, this historical episode provides support for the use of the ESD.

If Arden is indeed the Gentleman, as the evidence strongly suggests, then it is plausible he was led to his views on mathematics from his capacity as a teacher of experimental philosophy. This claim would cohere well with role that the pedagogical tradition played in the spread of the experimental philosophy movement (Anstey and Vanzo 2023: 115-27). If Arden was Herschel’s unnamed interlocutor, then he would not have been led to his view of mathematical knowledge based on any allegiance to an epistemological school, as the term “empiricist” would mistakenly suggest, but because of the demonstrable power of experiment. Perhaps having been impressed by the success of experimental science, and likewise frustrated with traditional philosophical speculation, he concluded that experiment must reign supreme, even in the domain of mathematics. If experimental philosophy has improved so many arts and sciences, then why not mathematics too?

**6. Herschel’s Further Defense of the Utility of Speculative Inquiry**

 After recounting the debate with the Gentleman that occurred in the previous meeting, Herschel spends the second half of his paper attempting to rebut the charges that have been made against speculative inquiry. Recall that the Gentleman raised two charges: i) the BPS is not the appropriate forum to consider questions such as the independent reality of space, and ii) tackling metaphysical questions in general is “of little use to mankind.”

*6.1 Answering the Charge of Impropriety*

 First, Herschel considers the institutional question of whether there is something improper about members of the BPS debating metaphysical issues. Despite the complaints of the Gentleman, for Herschel, there is nothing inappropriate about members of the BPS considering such non-experimental questions. Regarding the particular issue under dispute, namely “whether space be anything actually existing,” Herschel points out that this question is not so arcane as the Gentleman has made it out to be. Rather, the problem itself is expressed in a “plain concise manner”, without any “circumlocution” or “obscurity.” One reason that the question is so clearly intelligible is that the central concepts that are employed in the proposition— “space” and “exists”—are ones that we surely grasp, if we grasp any concepts at all. Not only are these concepts so familiar as to make the question under discussion clearly comprehensible, in addition the concepts are presupposed in many, if not all areas of natural philosophy, e.g., Newtonian mechanics.

 Second, Herschel points out that one of the norms of the BPS is that “members shall be at liberty to discuss with moderation and freedom any subject within the circle of the arts and *Sciences*.” This claim conforms, almost verbatim, with one of the official rules of the BPS, which were written by Rack and ratified by members in the December 31st, 1779 meeting (*RJ*, Dec. 31). The specific rule that Herschel cites also includes “Natural History, the History of Nations, or any Branch of Polite Literature” as suitable topics; other topics that members were free to discuss include “Essays on Morality and the Social Virtues together with Candid Criticisms on new poetical, scientific, and philosophical publications, and new translations of Foreign Authors” (Klein 2012: 48).[[14]](#footnote-14)

To be sure, there were some restrictions on topics that could be discussed at meetings. According to the bylaws of the BPS, it was ruled “that, for obvious reasons, Law, Physic, Divinity, and Politics be never made Subjects of Debate.” In general, such a rule was meant to foster polite conversation[[15]](#footnote-15), in particular “to prevent religious argument” between Anglicans and non-Anglicans, but also to “impede shop talk among professionals” (Klein 2012: 49). Even so, given the wide range of topics that were permitted by the BPS’s rules, Herschel is clearly right that questions in speculative metaphysics, such as whether space is an independent substance, fall under the scope of the BPS’s purview. Provided those topics in metaphysics do not encroach upon specific questions of “Divinity”, which might offend one religious sect or another, there should be no objections to considering whether space exists as a real substance.

More philosophically interesting than the question of whether debating the reality of space accords with the bylaws of the BPS is the second charge raised by the Gentleman, namely that metaphysical questions are of “little use to mankind.” Most of Herschel’s response, albeit adopting the highly deferential tone of someone newly admitted to British scientific circles, is devoted to rebutting this indictment of speculative inquiry. We can discern three different arguments in Herschel’s paper responding to this charge, what I will call the “perfectionist argument”, the “instrumentalist argument”, and the “contemplative argument.” Each of these offers a slightly different rationale for the value of speculative inquiry, although some of these arguments would likely be more dialectically effective against the Gentleman than others.

*6.2 The Perfectionist Argument and the Instrumentalist Argument*

The perfectionist argument is the first one that Herschel gives. According to this argument, engaging in metaphysical speculation is worthwhile because such inquiry helps us to exercise the distinctive capacities that are peculiar to our nature. Herschel endorses the claim, which has a long pedigree in the Western philosophical tradition, that our fundamental nature is that of rationality.[[16]](#footnote-16) Because of this crucial fact about us, the “perfection of our nature is evidently to be looked for in the superior powers of reason and speculation.” Herschel does not go on to defend the assumption, which might of course be questioned, that our fundamental nature is that of rationality. However, on the assumption that this is true, metaphysical inquiry would help us to realize our nature as rational beings.

The second argument that Herschel puts forth is the instrumentalist argument. According to this argument, speculative inquiry is valuable because it helps us to sharpen our intellectual powers, which serves to promote the ultimate aims of natural philosophy. For Herschel, the ambitions of the natural philosopher should extend beyond knowledge of particulars:

What would all experiments avail if we should stop there, and not argue upon them so as to draw general conclusions? And how can we argue and draw conclusions if the superior intellectual powers are not improved by frequent exercise in speculative researches? Half a dozen experiments made with judgment by a person who reasons well, are worth a thousand random observations of insignificant matters of fact.

The true aims of natural philosophy are thus theoretical in nature. It is important to engage in observation and experimentation, but ultimately the goal is to “draw general conclusions”, or conclusions about underlying causes. A few years later in a paper entitled “On the Construction of the Heavens” (1785), read before the Royal Society, Herschel expressed similar sentiments:

If we indulge a fanciful imagination and build worlds of our own, we must not wonder at our going wide from the path of truth and nature…On the other hand, if we add observation to observation, without attempting to draw not only certain conclusions, but also conjectural views from them, we offend against the very end for which only observations ought to be made. I will endeavour to keep a proper medium; but if I should deviate from that, I could wish not to fall into the latter error. (pp. 213-14)

Here, Herschel acknowledges the danger posed by daring conjecture unmoored from sense-perception. Nevertheless, he reasserts his commitment to the importance of speculative inquiry. Observations are not an end in themselves but a means of supporting theoretical hypotheses. So committed is Herschel to the importance of theoretical knowledge that when it comes to the virtue of proper theorizing, Herschel claims, of the two extremes, he would rather fall prey to vice of excessive speculation than the vice of deficiency.

 In response to the Gentleman then, Herschel argues that speculative inquiry should be pursued, at the very least, for its instrumental value. Given that theoretical knowledge is the ultimate aim of natural philosophy, engaging in speculative inquiry ought to be prized because it helps to foster the “intellectual powers” required for making sound judgments in all matters theoretical. The instrumentalist argument for improving our reasoning faculties, perhaps more than the perfectionist argument, is one which, if sound, should be convincing to the Gentleman by his own lights. As we have already discussed, the Gentleman has revealed himself to be an ardent advocate of experimental philosophy. But surely, Herschel would say, the point of performing experiments is to arrive at general conclusions, or explanations of various natural phenomena. Regardless of whether the unnamed objector is John Arden, it is evident in the subtitle of Arden’s syllabus that 18th century experimental philosophy was concerned with explanations for natural phenomena, and not merely with building a cabinet of experimentally corroborated curiosities. In Herschel’s view, some engagement with speculative inquiry will help one develop the creative and imaginative vision of the theoretician, which contributes to the goal of theoretical knowledge in the domain of natural philosophy.

It is worth remarking on the fact that Herschel attempted to live up to these ideals throughout his career as a scientist. Even though Herschel was most well-known as an observational astronomer and instrument maker, as Hoskin (2009: 95) observes, “equally he was a bold and innovative theorist.” Herschel often claimed that his ultimate motivations were theoretical, rather than merely observational. In an 1811 paper read at the Royal Society, Herschel begins by claiming that “A knowledge of the construction of the heavens has always been the ultimate object of my observations” (1811: 169). By the “construction of the heavens”, Herschel had in mind a grander perspective, largely novel at the time, namely a consideration of the “large-scale structure of the universe of stars” (Hoskin 2014: 13), or what we might today call “cosmology.” In the course of his career as a theorist, Herschel contributed to the development of the nebular hypothesis of the origin of the solar system, and from his speculations on the life-cycle of celestial objects, contributed to the development of an “evolutionary worldview”, which influenced 19th century ideas of biological evolution (Brush 1987).

*6.3 The Contemplative Argument and the Mathematics-Metaphysics Analogy Revisited*

The contemplative argument is the last argument that Herschel considers, and the one which he most seems to favor. This argument attempts to meet the Gentleman’s challenge head-on, by claiming that we do have speculative knowledge, and moreover, that speculative inquiry ought to be pursued because the subjects that it comprises are “of the highest concern to those who love wisdom.” In the attempt to provide some examples of genuine speculative knowledge, Herschel comes awfully close to treating one of the topics forbidden by the rules, i.e., “Divinity.” Specifically, he reminds his fellow members of the BPS that “by Metaphysics we are enabled to prove the existence of a first cause, the infinite Author of all dependent beings.” Here, Herschel is clearly gesturing at what is often referred to as the “cosmological argument” for the existence of God. Like his claim that the nature of human beings is rationality, this argument for the existence of God has a long pedigree in the Western philosophical tradition, with which Herschel was clearly familiar from having read Locke.[[17]](#footnote-17) Along with rational demonstrations of the existence of God, Herschel reaffirms his view expressed in the previous meeting that the works of Locke are those of a “good Metaphysician”, which cannot reasonably be compared to a dancing master who leaves you with nothing new. In addition, the “speculative turn of mind” also leads to knowledge of mathematics, logic, and ethics, all of which are noble pursuits. For Herschel, these disciplines all count as “speculative sciences” because they “do not owe the force of their conviction to experiments.” In other words, these disciplines are ones characterized by a priori methods. These domains of knowledge, especially mathematics, Herschel suggests, are so obviously worthwhile, that it is almost unbecoming to give an extensive defense of them.

Of course, the Gentleman would agree that at least some of these domains of knowledge are quite valuable or noble, for instance, mathematics. However, the Gentleman would clearly reject outright the category of “speculative sciences” that Herschel puts forward. Rather, insofar as any of these disciplines provide knowledge, they do so via experiment. In assessing the contemplative argument then, we must return to the Gentleman’s main objection to Herschel’s analogical argument, as discussed in Section 2. What about the claim that mathematical knowledge is a posteriori?

 Unsurprisingly, Herschel rejects the claim that mathematical knowledge is acquired via experiments. After expressing his astonishment about this doctrine, something which “he has never heard advanced before,” he assures his audience that it will “very easily appear to be a mistake.” To rebut the Gentleman’s view about mathematics, Herschel puts forward the following argument:

In all probability there never existed a triangle in the world (at least not such a one as could fall under our senses) wherein this proposition would not have been found to fail. If the most exact triangular figure that art can make be examined with a microscope and its angles measured by a good micrometer, we shall soon give up the equality of the three angles to two right ones.

Here, Herschel argues that our knowledge of mathematical truths, specifically geometrical ones, cannot be gained through the senses for the simple reason that the objects of geometry, e.g., circles, triangles, etc. probably do not exist in the natural world. Since these objects are not spatially located, it follows immediately that we cannot have acquired knowledge of geometric theorems by way of sensory perception. Furthermore, if we attempt to construct a figure corresponding to our idea of a triangle and measure its angles with an extremely fine instrument, then we should not expect to find experimental confirmation of the triangle sum theorem. Presumably, this is because the geometrical figure that we would have constructed will not, despite our best efforts, end up being a perfect triangle. Because of this, we would have little reason, based on observation, to expect the theorem to hold. So, we will not be able to get any experimental corroboration of the theorem via the senses. Consequently, as Herschel points out, if the Gentleman’s a posteriori account of mathematics were correct, then we would not have any mathematical knowledge at all. But, since we do in fact have mathematical knowledge, the Gentleman’s position must be mistaken.[[18]](#footnote-18)

 Now to be sure, one limitation of Herschel’s argument is that he does not consider what was a prominent view about mathematical knowledge among British philosophers, as discussed in Section 2. Namely, mathematical knowledge does not pose any special epistemological challenge because there is a sense in which mathematical knowledge is not about *the* *world*, but rather about our *own ideas*. By ontologically deflating mathematical claims, those suspicious of speculation forestall the challenge posed by the fact that mathematics relies on a priorimethods. It does not appear that Herschel considers this response to his argument. This is surprising given Herschel’s familiarity with Locke’s *Essay*, in which Locke endorses precisely this account of mathematics.

 The upshot though, at least in Herschel’s view, is that the argument from mathematics to the legitimacy of metaphysics, and speculative inquiry in general, goes through. We cannot reject speculative inquiry for its failure to rely on experimental methods. Mathematics is a speculative science in Herschel’s sense, relying on a priorimethods, and it would be sheer foolishness to deny that we have mathematical knowledge. Herschel’s conclusion thus turns his interlocutor’s initial objection on its head. Whereas the debate between Herschel and the Gentleman was precipitated by the latter’s claim that speculative inquiry was of “little use to mankind”, quite the contrary, Herschel claims, “to say *more* upon the utility of speculative inquiries would be useless.” Upon concluding his discussion, Herschel reminds us that “one principal end” of the BPS is “the investigation of speculative truths…that branch of knowledge which…must for ever remain the glory of rational beings.”

**7. Conclusion: Speculation and its Role in Science**

Throughout his contest with the Gentleman in “On the Utility of Speculative Inquiries,” Herschel’s primary focus was defending the legitimacy of metaphysics. We can see in the Gentleman’s objections to speculative inquiry an attempt to carve out a specialized domain for the discussion of experimental philosophy as distinct from other intellectual endeavors. The Gentleman’s qualms about considering metaphysical questions at the BPS thus foreshadows the disciplinary separation of what we would today call “science” from what we would call “philosophy.” This distinction would itself be partly the result of the increasing specialization and professionalization of the sciences in the 19th century (Knight 2009). As it is oft-noted, what we would today call “science” was then still called “natural philosophy,” and the word *scientist* would not be coined until 1833 by William Whewell (Ross 1962). In 1780 when Hershel debated with the Gentleman, such a distinction between science and philosophy was clearly emerging but had not yet solidified. In fact, the speculative topic that prompted the dispute between Herschel and the Gentleman—the reality of space as an independent substance, a debate which remains alive and well (Huggett et al. 2023)—perfectly illustrates that even today it is difficult to draw a sharp boundary between physics and metaphysics.

In addition to the fact that Herschel himself would not draw a sharp distinction between, say, physics and metaphysics, he makes it clear, as discussed in section 6.2, that his defense of speculative inquiry is meant to include bold theorizing in areas that today we would regard as “science.” In an 1837 letter to his friend William Whewell, Herschel’s son John reminisced about his father’s penchant for bold theoretical hypotheses:

I remember it was a saying often in my Father’s mouth ‘Hypotheses fingo’ in reference to Newton’s ‘Hypotheses non fingo,’ [‘I frame no hypotheses’] and certainly it is this facility of framing hypotheses if accompanied with an equal facility of abandoning them which is the happiest structure of mind for theoretical speculation. (Quoted in Sullivan 2018: 46)

Here it can be seen that the elder Herschel, though an admirer of Newton, refused to follow the latter’s austere prohibition against conjectural hypotheses in physics. There is no problem, claims Herschel, with entertaining speculative hypotheses while doing science, so long as one is willing to abandon those speculations when the situation calls for it.

 The recognition by one of history’s most able astronomers of the utility of speculation proves particularly important for general philosophy of science, especially given that the role productive speculation plays in science has, unfortunately, been the subject of some neglect among contemporary philosophers. As the philosopher of science Adrian Currie notes, “Despite wide recognition that speculation is critical for successful science, philosophers have attended little to it.” (2023: 597). One possible source of neglect is that “speculation” is often used as a pejorative, with researchers contrasting “science” with “speculation.” Often theories or research programs, such as string theory (Ellis & Silk 2014), or evolutionary psychology (Richardson 2007), are dismissed by labelling them as “speculative.” This “naive view” of speculation may stem from the simple idea that the goal of science is knowledge of the world, and speculations are, by definition, evidentially unsupported.

Against this naive view of speculation, Currie defends a “functionalist account” of speculation, whereby speculations, even ones that are evidentially unsupported, can play several important functions in science, including “opening new research, or scaffolding the development of theories or experiments, or generating possibility proofs, or providing epistemic links to further knowledge” (2023: 612). Several of these functions for speculation are derived from Walsh’s (2019) study of the role that corpuscular and mechanical hypotheses played in Newton’s work. Despite Newton’s famous dictum, “hypotheses non fingo”, as Walsh demonstrates, speculative hypotheses “played an instrumental role in his experimental philosophy” (2019: 128).

Herschel illustrates some of the functions of speculation identified by Currie (2023) in another paper that he read before the BPS on May 12, 1780, entitled “On the Existence of Space,”
in particular, the idea that good speculations provide epistemic links to further knowledge. In this paper, Herschel defends the substantivalist view that “Space is a real Existence and not merely an abstract Idea of the understanding” (1912: ixxxvi). A full treatment of this paper is beyond my scope here, as Herschel’s engagement with this question is complex, involving among other things a modification of Locke’s epistemology and a discussion of solipsism. One argument that Herschel makes for substantivalism though is that space is a rational *postulate*. Although the skeptic might regard this postulate as a “petitio principii,” Herschel is unbothered by this suggestion remarking:

A postulatum amounts nearly to the same thing as a petitio principii ; And if we can make an argument to prove what it was required to prove, by placing it into such a point of view that the principles it is built upon shall be easily grantable, why may we not add this seemingly new way of proving a point in question, by a petitio principii, to those different methods already introduced in the schools. (1912: lxxxvi)

Here, Herschel suggests that a postulate might be rationally supported if it is fruitful. As Herschel goes on to argue, the postulate of substantival space: i) explains various phenomena, —e.g., the invariance of the distance relations between objects regardless of the intervening medium—ii) coheres nicely with commonsense judgements, and iii) is assumed by Newton’s law of gravitation. Even if one cannot give a knockdown argument for the reality of space, one might regard the postulate as a justified speculation because of the way it unifies, or links up various elements of our background knowledge.

 Perhaps more significantly, in his paper “On the Utility of Speculative Inquiries,” Herschel suggested another important function for speculation to play in science, besides those identified by Currie (2023). Of the three arguments given, the most relevant to contemporary philosophy of science is the second: the instrumentalist argument. Recall a key premise in the instrumentalist argument is that indulging in speculation helps the scientist develop as a theoretical inquirer. As Herschel remarks, “How can we argue and draw conclusions if the superior intellectual powers are not improved by frequent exercise in speculative researches?” We can interpret Herschel as gesturing at a kind of intellectual virtue, what we might call *intellectual boldness.*[[19]](#footnote-19) In accordance with Aristotle’s idea that a virtue is the mean between two unvirtuous extremes, the intellectually bold theorist is willing and able to put forward daring or innovative hypotheses, thereby avoiding the vice of *intellectual sterility,* but without falling into the opposite vice of *intellectual extravagance*. On this interpretation of Herschel’s instrumentalist argument, we can cultivate the virtue of intellectual boldness by engaging in productive yet disciplined theoretical speculation. This idea is meant to parallel the Aristotelian claim that we become morally virtuous, e.g. courageous, by doing morally virtuous things, e.g., acting courageously.

Ultimately though, the extent to which a scientist improves their intellectual powers by the practice of putting forward speculative hypotheses is an empirical question, one worthy of further study. In my view Herschel’s claim that scientists become better theorists by repeated acts of productive speculation is surely plausible. We can find some suggestive evidence for this claim in current research on the positive role that acts of speculation, the consideration of alternative hypotheses, and the exercise of the creative imagination play in science education (Reynolds and Brosnan 2000; Kyza 2009; Hadzigeorgiou 2016). In a 1782 letter to his friend the physician William Watson Jr., Herschel emphasized that those who wish to employ the new, high-powered telescopes that he has been building must first *learn to see*:

Seeing is in some respects an art, which must be learnt. To make a person see with such a power [power of 6450] is nearly the same as if I were asked to make him play one of Handel’s fugues upon the organ. Many a night have I been practising to see, and it would be strange if one did not acquire a certain dexterity by such constant practice.

As a music teacher and performer, Herschel was intimately acquainted with the importance of practice. What holds true for music and astronomy applies just as well to scientific or philosophical theorizing, Herschel might say. Even though speculation is often viewed unfavorably, we will excel in our theoretical inquiries only if we allow ourselves the freedom to practice.

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1. Herschel noted upon arriving in England in 1756: “Here I applied myself to learn the English language and soon was enabled to read Locke on Human Understanding” (Herschel 1912: xv). [↑](#footnote-ref-1)
2. From the principle of plenitude, it follows that we should expect a universe teeming with intelligent life. According to Crowe (2001), Herschel was at least partly inspired by the principle of plentitude to “construct the finest telescopes made in the eighteenth century” (215), and thereby confirm the existence of intelligent life on other celestial bodies, including the Moon. [↑](#footnote-ref-2)
3. This paper can be found on pages lxxxi–lxxxiii in Herschel (1912). All Herschel quotations derive from this paper unless otherwise noted. [↑](#footnote-ref-3)
4. The English astronomer James Bradley and the French natural historian Buffon, both advocates of experimental philosophy, adopted similar views about the nature of mathematical knowledge (Anstey and Vanzo 2023: 125-6; 188). [↑](#footnote-ref-4)
5. Here, I closely follow Anstey and Vanzo (2023) for this survey of the history of experimental philosophy. [↑](#footnote-ref-5)
6. See Anstey (2005) for more on the distinction between experimental and speculative philosophy. [↑](#footnote-ref-6)
7. As Anstey and Vanzo (2023: 220) point out, in the 1746 curriculum of the Berlin Academy “experimental philosophy” and “speculative philosophy” were understood not as antagonistic, but rather as “complementary ‘disciplinary clusters’,” (220) each comprising different subject matters. Perhaps Herschel’s favorable view of metaphysics was influenced by the more positive reception of speculation in Germany. [↑](#footnote-ref-7)
8. Relatedly, experimental philosophers often preferred intermediate causal explanations to ultimate explanations (Anstey and Vanzo 2023: 50). [↑](#footnote-ref-8)
9. It is also common to think of the distinction between empiricism and rationalism as concerning the origin of our concepts. Empiricists say that all our concepts are derived from sense-experience, whereas rationalists claim that some of our concepts are innate. [↑](#footnote-ref-9)
10. Rack’s Journal (henceforth “*RJ*”) is entitled “A Disultory Journal of Events &c at Bath.” The entries date from December 22, 1779 to March 22, 1780. [↑](#footnote-ref-10)
11. Quoted in Klein (2012: 51) and preserved in the Records of the Bath Philosophical Society. [↑](#footnote-ref-11)
12. See Huang (2013) more discussion of traveling lecturers during Herschel’s time. As Huang (2013: 143, fn.38) notes, sometimes in the literature John Arden is confused with his son James Arden. [↑](#footnote-ref-12)
13. See also Currie and Walsh (2019) for an overview of some common objections, e.g., that the ESD doesn’t do justice to Newton’s views, that the two distinctions are identical, etc., along with a defense of pluralism about historiographical frameworks. [↑](#footnote-ref-13)
14. See Turner (1977: 88-9) for the full list of rules. [↑](#footnote-ref-14)
15. See Klein (2012) for a general discussion of “politeness” in 18th century British society. [↑](#footnote-ref-15)
16. Aristotle famously makes this claim, along with those in the Platonic tradition, as well as Kant. [↑](#footnote-ref-16)
17. According to Clark (1988: 29), Herschel “wrote more than seventy pages of manuscript to Jacob [his eldest brother] on John Locke’s arguments for the existence of God, matter, and space.” [↑](#footnote-ref-17)
18. In a footnote to the 1865 edition to *A System of Logic,* Mill considers and responds to an argument similar to the one that Herschel provides here (Snyder 2006: 110). [↑](#footnote-ref-18)
19. In contemporary philosophy, the identification and analysis of intellectual virtues is the province of “virtue epistemology.” See Battaly (2008) for an introduction. [↑](#footnote-ref-19)