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Adam Smith and Newtonianism: The Method of Philosophical Enquiry and the Didactic Method

Kyosuke Misawa
GRADUATE SCHOOL OF ECONOMICS, THE UNIVERSITY OF TOKYO
k-misawa@g.ecc.u-tokyo.ac.jp

Abstract

This paper reconsiders how Adam Smith's appropriation of Newton's method varies across his works. Previous scholarship has generally treated Smith's Newtonian method in both Lectures on Rhetoric and Belles Lettres and History of Astronomy as essentially equivalent. However, this study demonstrates that Smith's reception of Newton's method differs according to the purposes it serves: the didactic method in Lectures on Rhetoric and Belles Lettres versus the method of philosophical enquiry in History of Astronomy. Specifically, in Lectures on Rhetoric and Belles Lettres, the Newtonian method functions as a didactic method for communicating established knowledge systematically. By contrast, in History of Astronomy, the method of philosophical enquiry—namely the method of scientific investigation—is exemplified by Newton's celestial physics. On this basis, this paper argues that the didactic Newtonian method in Lectures on Rhetoric and Belles Lettres is not equivalent to Newton's method of philosophical enquiry in History of Astronomy. Rather, the Newtonian method as a didactic method is methodologically equivalent to René Descartes' method. Descartes' method, both as a didactic method and as a method of philosophical enquiry, was a synthetic method that lacked the process of analysis. Likewise, the Newtonian didactic method was also synthetic in character. In comparison, Newton's method of philosophical enquiry in History of Astronomy incorporates both analytical and synthetic processes. From the standpoint of Newton's methods of analysis and synthesis, this suggests that the rise of Newtonianism transformed the method of philosophical enquiry but did not bring about a corresponding transformation in the didactic method.

Keywords: Adam Smith; Isaac Newton; Newtonian method; philosophical enquiry; didactic method; method of analysis and synthesis

1. Introduction

Eighteenth-century philosophers were profoundly influenced by Newtonianism.[1] Newtonianism shaped not only the natural philosophy, including physics and mathematics, but also disciplines such as logic and rhetoric. The methods of analysis and synthesis outlined in Newton's *Opticks* had a particularly significant influence on eighteenth-century moral philosophers. Adam Smith is also frequently regarded as a Newtonian thinker.[2] Like many of his contemporaries, Smith appropriated Newton's method in his own works; this methodological appropriation is particularly evident in *Lectures on Rhetoric and Belles Lettres* and *History of Astronomy*. The method described in these works is often referred the 'Newtonian method'.

Existing scholarship on Smith typically treats the so-called Newtonian method as a single method, and Smith's reception of Newton's methodology in *History of Astronomy* and *Lectures on Rhetoric and Belles Lettres* has often been regarded as fundamentally equivalent. Consequently, previous studies have paid little attention to the differences in Smith's appropriation of Newton's method between these two works.[3] A more comprehensive study reveals a significant distinction, as Smith applies Newton's method for different purposes across his works. In *History of Astronomy*, it functions as a method of philosophical enquiry for scientific investigation. In contrast, in *Lectures on Rhetoric and Belles Lettres*, it operates as a didactic method for composing and presenting academic discourse. It is a misinterpretation to regard Smith's reception of Newton's methodology in these works as equivalent. This distinction has broader implications for Smith scholarship; it demonstrates that the expression 'Newtonian method' does not refer to a single methodological model in Smith's works, but rather denotes two distinct methodological functions: philosophical enquiry and didactic method. Previous interpretations have conflated the method of discovery of principles with that of communication of an already established system. Furthermore, the term 'Newtonian method' is used by Smith only once, specifically in *Lectures on Rhetoric and Belles Lettres*. In this instance, the term appears solely in lecture notes recorded by one of his students. The term does not appear in any of Smith's published works. Nevertheless, Smith's Newtonian method has often been oversimplified as a method of explaining a wide range of phenomena from a small number of well-known principles.[4]

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1 The widespread adoption of Newton's method among eighteenth-century moral philosophers is sometimes referred to as 'moral Newtonianism.' See: Élie Halévy, *The growth of philosophic radicalism*, trans. Mary Morris (London, 1928), 6.

2 Andrew S. Skinner, 'Adam Smith: Science and the Role of the Imagination' in William B. Todd (ed.), *Hume and the Enlightenment: Essays presented to Ernest Campbell Mossner* (Edinburgh, 1974), 164–188.

3 Skinner, *A System of Social Science Papers Relating to Adam Smith*, 2nd edition (Oxford, 1996), 42. https://doi.org/10.1093/acprof:oso/9780198233343.001.0001; Roy H. Campbell and Andrew S. Skinner, *Adam Smith* (London, 1982), 90–92.

4 Sasaki (2001) shows that the method of uniting phenomena through a small number of well-known principles is a common feature of Smith's Newtonian method in both

Smith derived from Newton more than a mere mode of expression.[5] This paper contends that the Newtonian method presented as a didactic method in *Lectures on Rhetoric and Belles Lettres* is methodologically equivalent to René Descartes' method.[6] It further demonstrates that both differ fundamentally from Newton's method of philosophical enquiry in *History of Astronomy*. In *Lectures on Rhetoric and Belles Lettres*, Smith characterizes the Newtonian method as the most ingenious and persuasive of all didactic methods. He further identifies Descartes' philosophy as a precursor to the Newtonian method. However, as Smith notes, Descartes' philosophy had come to be widely rejected with the rise of Newtonianism in the eighteenth century. In the seventeenth century, natural philosophy was predominantly influenced by Cartesian rationalism. Descartes aimed to explain natural phenomena deductively. However, because this system relied primarily on hypotheses derived from reason rather than observation and experimentation, it faced increasing criticism. Newton introduced a methodological framework that combined analysis, which established general principles inductively from observation and experiment, with synthesis, which applied those principles deductively to explain phenomena. The considerable success of Newton's physics—particularly the theory of universal gravitation—demonstrated the superiority of this methodology over Descartes' philosophy. As a result, in the eighteenth century, Newtonianism replaced Cartesian rationalism as the leading methodological paradigm in natural philosophy. This raises a significant question: why does Smith treat the highly esteemed Newtonian method and the already discredited Descartes' method as methodologically equivalent? Scientific thought underwent a profound transformation from Cartesian rationalism to Newtonianism. However, Smith may have recognized that, whereas the method of philosophical enquiry underwent remarkable development, no comparable development occurred in the didactic method. Consequently, interpreting Smith simply as a Newtonian philosopher may give rise to considerable interpretative ambiguity. It may even be possible to argue that Smith should not be regarded merely as a critic of Descartes.[7] This interpretation also makes it possible to present Smith not merely as a follower of Newton, but rather as a philosopher with a profound understanding not only of the nature of the scientific method but also of logic and rhetoric in his own age.[8]

Lectures on Rhetoric and Belles Lettres and *History of Astronomy*. See: Sasaki Kensuke, *The Formation of Economic Methodology: The Conflict between Theory and Reality 1776–1875* (Sapporo, 2001), 9.

5 Thomas D. Campbell, *Adam Smith's Science of Morals* (London, 1971), 31.

6 This paper is one of a series of studies by the author examining the positive aspects of Adam Smith's evaluation of Descartes within the context of Smith's Newtonianism.

7 For a positive assessment of Descartes in Smith, see: Kyosuke Misawa, 'Reconsidering Adam Smith's Critique of Descartes' Vortex Hypothesis in History of Astronomy,' *Annual Bulletin of the Japanese Society for Eighteenth-Century Studies*, 41 (2026), 133–146, https://doi.org/10.69439/jsecs.41.0_133.

8 While Misawa (2026) examines, from the perspective of the history of science, the contribution of Descartes' vortex theory on the eve of the Newtonian Revolution in *History of Astronomy*, the present article considers the methodological differences between Newton and Descartes in *History of Astronomy* and *Lectures on Rhetoric and Belles Lettres*. See: Misawa, Reconsidering Adam Smith's Critique of Descartes' Vortex Hypothesis.

To clarify the relationship between the method of philosophical enquiry and the didactic method, this paper advances three points based on Newton's method of analysis and synthesis articulated in *Opticks*. Examining Smith's methodology through the framework of analysis and synthesis may provide a first step toward reconsidering the conventional understanding of Smith's Newtonianism. The argument proceeds through the following three claims: First, Newton's method of philosophical enquiry combines analysis and synthesis. Analysis derives a small number of familiar principles inductively from observation, while synthesis explains diverse phenomena deductively through geometrical demonstration. Second, Descartes' method of philosophical enquiry was synthetic and lacked an analytical process grounded in observation. It explained celestial phenomena deductively from the laws of impulse, which were postulated through imaginative speculation as familiar principles. Third, Descartes' method and the Newtonian method are both synthetic as didactic methods. Thus, these methods are methodologically equivalent in their didactic function. These methodological frameworks are illustrated in Tables 1 and 2 below.

	Analysis	**Synthesis**	**Induction**	**Deduction**
Newton's Method of Philosophical Enquiry (HA[9])	○	○	○	○
Descartes' Method of Philosophical Enquiry (HA)	× (speculation)	○	×	○
Newton's Didactic Method (LRBL[10])	×	○	×	○
Descartes' Didactic Method (LRBL)	×	○	×	○

Table 1: Comparison of characteristics between Newton and Descartes' didactic methods and respective methods of philosophical enquiry, as illustrated in Smith's literature

Newton's Method of Philosophical Enquiry (HA)	**Analysis**: The investigative process of deriving general principles inductively from observation of reality. **Synthesis**: The demonstrative process of explaining phenomena deductively from familiar principles. **Induction**: The method of deriving general principles by observing reality. **Deduction**: The method of explaining particular phenomena from general principles.
Descartes' Method of Philosophical Enquiry (HA)	**Speculation**: The process of speculating about familiar principles within the imagination. **Synthesis**: The demonstrative process of explaining phenomena deductively from familiar principles. **Deduction**: The method of explaining particular phenomena from general principles.
Newton's Didactic Method = Descartes' Didactic Method (LRBL)	**Synthesis**: The demonstrative process of explaining phenomena deductively from familiar principles. **Deduction**: The method of explaining particular phenomena from general principles.

Table 2: A breakdown of the shared characteristics of Newton and Descartes' didactic methods and the differences between their respective methods of philosophical enquiry

9 HA = *History of Astronomy*.

10 LRBL = *Lectures on Rhetoric and Belles Lettres*

Previous research on the didactic method in *Lectures on Rhetoric and Belles Lettres* has primarily focused on the Newtonian method.[11] Scholars have investigated the Newtonian method in relation to the intellectual foundations of Smith's four rhetorical modes of discourse: didactic, demonstrative, deliberative, and judicial.[12] These four rhetorical modes have been interpreted from two principal perspectives: the relationship between the Newtonian method and the method of Aristotle, and that between the Newtonian method and Descartes' method. Because prior scholarship has not explicitly examined the methodological significance of the didactic mode, multiple interpretations have emerged. One perspective maintains that Smith's Newtonian method essentially represents the method of Aristotle, rhetorically embellished.[13] Others contend that opposing Newtonian and Aristotelian methods is misleading.[14] Some have further traced connections with Aristotelian methodology to better understand the *History of Astronomy* and the relationship this work and the Newtonian method in *Lectures on Rhetoric and Belles Lettres*.[15] Therefore, even the relationship between the Newtonian method and the method of Aristotle in *Lectures on Rhetoric and Belles Lettres* has not yet received a coherent or widely accepted interpretation. The relationship between the Newtonian method and Descartes' method in *Lectures on Rhetoric and Belles Lettres* likewise remains unresolved. Some scholars have proposed that the Newtonian method is equivalent to Descartes' method.[16] Others have warned against the risks of treating the two methods as equivalent.[17] A primary reason for these divergent interpretations is the absence of a clearly defined criterion for comparing the Newtonian method with Descartes' method. Accordingly, the central objective of this paper is to clarify Smith's methodological reception of Newton and Descartes by taking the methodological elements of both the didactic method and the method of philosophical enquiry as the basis for comparison.

A second significant area of research addresses Smith's reception of Newton's methodology in both *History of Astronomy* and *Lectures on Rhetoric and Belles Lettres*.[18] This reception has

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11 Campbell and Skinner, *Adam Smith*, 73–5; In Japan, a substantial body of research has been accumulated on this subject. However, despite their significant contributions to the study of Adam Smith's Newtonianism and methodology, these works have received relatively little attention outside Japan. As a result, few studies outside Japan have engaged with Smith's Newtonianism and methodology based on these contributions. Accordingly, this paper also discusses the results of a detailed review of these Japanese studies.

12 Wilbur Samuel Howell, *Eighteenth-Century British Logic and Rhetoric* (Princeton, 1971); Shinohara Hisashi, *Adam Smith and Common Sense Philosophy* (Tokyo, 1986) 37–8.

13 Nagao Shinichi, *Newtonianism and the Scottish Enlightenment: The Metaphor of the Imperfect Machine* (Nagoya, 2001), 313.

14 Tadakoshi Chikakazu, *History of Astronomy and Adam Smith's Moral Philosophy* (Tokyo, 1995), 59.

15 Tanaka Shoji, *Adam Smith's Empiricism: A Practical Example of British Empiricism* (Tokyo, 2016), 32.

16 Mawatari Shoken, *The Methodology of Economics: From Smith to Friedman* (Tokyo, 1990), 20.

17 Tadakoshi, *History of Astronomy and Adam Smith's Moral Philosophy*, 57.

18 Kyosuke Misawa, 'Adam Smith on Newtonian Method and Imaginary Law of Economic Phenomena', *Communications in Economics and Mathematical Sciences*, 4 (2025), 6–23. Misawa (2025) classifies Smith's reception of Newtonian methodology into two distinct

often been examined through the lens of the method of analysis and synthesis articulated in *Opticks*.[19] Several studies highlight the influence of experimental philosophy, grounded in analysis and synthesis, on Smith's engagement with Newtonian methodology.[20] However, it has also been noted that neither *History of Astronomy* nor *Lectures on Rhetoric and Belles Lettres* provides a clear account of the method of analysis and synthesis. Indeed, some scholars have argued that Smith's method is purely synthetic.[21] Others have suggested that, although Smith adopts the empirical orientation of Newtonian methodology, he does not clearly distinguish between inductive and deductive reasoning.[22] Furthermore, many methodological aspects of Smith's reception of Newtonianism, both as a method of philosophical enquiry and as a didactic method, remain insufficiently clarified when considered in relation to Descartes' method. Nevertheless, previous research has tended to isolate and emphasize a single common feature shared by *History of Astronomy* and *Lectures on Rhetoric and Belles Lettres*. As a result, even when the method of analysis and synthesis in *Opticks* is considered, the overall structure of Smith's engagement with the methodological elements of Newtonianism remains insufficiently clarified.[23] By examining Smith's didactic method and his method of philosophical enquiry from the perspective of Newton's method of analysis and synthesis, this study identifies a previously unrecognized methodological distinction in Smith's reception of Newtonianism.

The following sections examine Newton's and Descartes' didactic methods and methods of philosophical enquiry in Smith's two works from the perspective of Newton's methods of analysis and synthesis. The paper is organized as follows: Section 2 traces the origins of Smith's methods of philosophical enquiry and the didactic method in his Edinburgh Lectures. This section also provides an overview of the intellectual contexts of rhetoric and logic at the time. Section 3 examines Newton's method of analysis and synthesis, considering its relationship to eighteenth-century rhetoric and logic. Section 4 discusses Smith's reception of

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forms: the Newtonian method of philosophical enquiry in *History of Astronomy*, as a method for discovering natural laws, and the Newtonian didactic method in *Lectures on Rhetoric and Belles Lettres*, as a method for explaining those laws.

19 Stefano Fiori, 'Adam Smith on Method: Newtonianism, History, Institutions, and the "Invisible Hand"', *Journal of the History of Economic Thought*, 34 (2012), 411–435.

20 Skinner, 'Adam Smith: Philosophy and Science', *Scottish Journal of Political Economy*, 19 (1972), 307–19, https://doi.org/10.1111/j.1467-9485.1972.tb00527.x.

21 Gideon Freudenthal, 'Adam Smith's Analytic-Synthetic Method and the System of Natural Liberty', *History of European Ideas*, 2 (1981),135–154, https://doi.org/10.1016/0191-6599(81)90036-X.

22 Henry J. Bittermann, 'Adam Smith's Empiricism and the Law of Nature', *Journal of Political Economy*, 48 (1940), 487–520; Ibid., 703–734.

23 Sergio Volodia Marcello Cremaschi, 'Adam Smith, Newtonianism and Political Economy', *Manuscrito*, 5 (1981), 117–34; Leonidas Montes, 'Smith and Newton: Some Methodological Issues Concerning Economic Equilibrium Theory', *Cambridge Journal of Economics*, 27, (2003), 723–747, https://doi.org/10.1093/cje/27.5.723; Ibid., 'Newton's real influence on Adam Smith and its context', *Cambridge Journal of Economics*, 32 (2008) 555–576, https://doi.org/10.1093/cje/bem056.

Newton's method as a method of philosophical enquiry in *History of Astronomy*. It focuses on its relation to Descartes' method. Section 5 reassesses Smith's Newtonian method as a didactic method for communicating scientific knowledge in *Lectures on Rhetoric and Belles Lettres*, again in relation to Descartes' method. The concluding section highlights the significance of these findings for understanding Smith's dual reception of Newton's method.

2. The Method of Philosophical Enquiry and the Didactic Method

This section examines the intellectual background that shaped the development of philosophical enquiry and the didactic method in the eighteenth century. These methods are contextualized within the broader frameworks of contemporary rhetoric and logic; this discussion seeks to clarify how Smith redefined these two methodological domains, namely the enquiry into scientific knowledge and its communication. The discussion traces major intellectual movements in eighteenth-century academia that influenced Smith's Edinburgh public lectures and his lectures on logic and rhetoric at the University of Glasgow. Ultimately, this will demonstrate that Smith's methodology was not merely a straightforward adoption of the scientific method, but rather a distinctive system that integrated the traditions of rhetoric and logic.

The origins of Smith's method of philosophical enquiry and the didactic method can be traced to his public lectures on rhetoric in Edinburgh, delivered upon the recommendation of Henry Home, Lord Kames. The success of these lectures led to Smith's appointment as professor of logic at the University of Glasgow. According to his student John Millar, Smith's logic lectures featured a distinctive curriculum. Initially, Smith addressed traditional scholastic logic and the metaphysics of the school only to the extent necessary to satisfy students' curiosity with respect to an artificial method of reasoning. He then devoted the majority of his lectures to an overview of the faculties of the mind. Building on this foundation, Smith proceeded to teach rhetoric, which can be described as the method for composing academic discourse.[24]

In addition to his lectures on logic, Smith continued to teach rhetoric even after assuming the professorship of moral philosophy. The content of these lectures is preserved in student notes discovered by John M. Lothian, commonly known as the *Lectures on Rhetoric and Belles Lettres*. Smith's lectures on both logic and rhetoric can be regarded as foundational to his interpretation of the didactic method, particularly what is now termed the Newtonian method, in the *Lectures on Rhetoric and Belles Lettres*.

Another work in which Smith elaborates on Newton's method is the essay *History of Astronomy*, included in *Essays on Philosophical Subjects* and believed to have been composed during the same period. Regarding this manuscript, Joseph Black and James Hutton, the editors of *Essays on Philosophical Subjects*, explicitly state that it should be regarded as follows:

[24] Adam Smith, *Essays on philosophical subjects*, ed. William P. D. Wightman and J. C. Bryce (New York, 1980), 273–4.

> not as a History or Account of Sir Isaac Newton's Astronomy, but chiefly as an additional illustration of those Principles in the Human Mind which Mr. Smith has pointed out to be the universal motives of Philosophical Researches.[25]

This indicates that Smith grounded his method of philosophical enquiry, as well as his didactic method, in a psychological perspective rooted in the principles of the human mind that underlie his theory of human nature.

The intellectual background of the method of philosophical enquiry and the didactic method was significantly shaped by the close relationship between rhetoric and logic.[26] In the logic derived from the Aristotelian tradition, both the method of philosophical enquiry and the method of communicating knowledge were encompassed within a single framework in which philosophical enquiries consisted of the deductive examination of truth. In contrast, developments in logic from Francis Bacon and John Locke onward led to a distinction between the method of philosophical enquiry and the method of communication, with increasing priority given to the former. Empirical and experimental forms of analysis became central to philosophical enquiry, while the method of communication came to be treated within the domain of rhetoric. The didactic method was introduced as a new means of conveying systems of knowledge, supplementing the three traditional forms of rhetoric derived from the Aristotelian tradition—the demonstrative, deliberative, and judicial modes—which employ probable reasoning often structured in syllogistic form. Within this revised rhetorical framework, arguments were required to be grounded in truth, while probable reasoning was required to rest on scientific grounds.

In *Lectures on Rhetoric and Belles Lettres*, Smith classified discourse into four modes—demonstrative, deliberative, judicial, and didactic—drawing upon the ancient rhetorical tradition within the context of eighteenth-century rhetoric. Consequently, the Newtonian method in *Lectures on Rhetoric and Belles Lettres* should be understood as a form of the didactic method within this rhetorical framework. In eighteenth-century terms, the Newtonian method is to be interpreted primarily as a rhetorical method rather than a scientific one.

In contrast, the method of philosophical enquiry exemplified by Newton's astronomical system in *History of Astronomy* should also be understood within its contemporary context. Rather than being interpreted solely as a scientific method, it should ultimately be situated within the broader tradition of logical methodology, which encompasses both the Aristotelian tradition of ancient logic and subsequent developments in logic from Bacon and Locke onward.[27]

The following sections examine Newton's methods in *Opticks* and *Principia*, demonstrating that induction and deduction play fundamental roles in Newton's method of analysis and synthesis. Through these two methodological frameworks, this study further examines the respective forms of Smith's logical and rhetorical reception of the Newtonian method in *History of Astronomy* and in *Lectures on Rhetoric and Belles Lettres*.

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25 Ibid., 105.

26 Howell, *Eighteenth-Century British Logic and Rhetoric*.

27 The logical traditions of the time consisted of both the Aristotelian tradition and a new logic influenced by Bacon and Locke. See: Shinohara, *Adam Smith and Common Sense Philosophy*, 37–8.

3. Newton's Methods of Analysis and Synthesis

The following section elucidates the methodological foundations of the analytic-synthetic method Newton developed in *Opticks*. Specifically, I examine how Newton's methodological framework operates. This involves the relationship between induction and deduction, the connection between hypotheses and experiment or observation, and the pursuit of rigorous demonstration rooted in the geometrical method.

In Query 31 of Newton's *Opticks*, he discusses the well-known methodological process of analysis and synthesis.[28] In this context, analysis refers to the method of deriving general conclusions by induction from experiments and observations. According to this framework, objections to conclusions derived by induction are admissible only when they are based on experiments or other certain truths:

> This Analysis consists in making Experiments and Observations, and in drawing general Conclusions from them by Induction, and admitting of no Objections against the Conclusions, but such as are taken from Experiments, or other certain Truths.[29]

Synthesis is the method of explaining phenomena through the principles discovered by analysis:[30]

> And the Synthesis consists in assuming the Causes discover'd, and establish'd as Principles, and by them explaining the Phænomena proceeding from them, and proving the Explanations.[31]

Therefore, Newton maintained that the method of analysis must methodologically precede that of synthesis.[32]

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28 Nagao (2001) defines analysis as the method of establishing several general principles as the starting point of a system and deriving these principles from empirical phenomena, while synthesis is understood as the process of explaining individual facts and formulating new propositions. See: Nagao, *Newtonianism*, 313.

29 Sir Isaac Newton, *Opticks: or, A Treatise of the Reflections, Refractions, Inflections & Colours of Light*, 4th edition (London, 1730), 404.

30 This methodological commitment is also evident from the very fact that he published the *Philosophiæ Naturalis Principia Mathematica* as a work on the mathematical principles of natural philosophy. It may also be suggested that the title of the *Principia* was chosen with Descartes's *Principles of Philosophy* in mind.

31 Newton, *Opticks*, 404–5.

32 Ibid., 404; Halévy (1928) emphasizes the importance of the Newtonian method as a foundation for deriving a small number of simple laws from phenomena through a synthetic

4. Smith's Reception of Newton's Methodology as a Method of Philosophical Enquiry

This section clarifies the overall structure of Smith's methodological reception of Newton's method of philosophical enquiry in *History of Astronomy*. Specifically, it compares the methodologies employed in constructing the astronomical systems of Descartes and Newton. This comparison elucidates the distinctive character of philosophical enquiry as it developed from a merely synthetic method, marked by an insufficiently analytic process, into the method of analysis and synthesis.

4.1. The principles which lead and direct philosophical enquiry

At the outset of *History of Astronomy*, Smith identifies the three sentiments of 'wonder, surprise, and admiration,' describing them as the principles that lead and direct philosophical enquiry.[33] On the basis of these sentiments, Smith develops his account of the method of philosophical enquiry. Smith argues that wonder is excited by what is new and singular and from every extraordinary and uncommon object.[34] Surprise is provoked by what is unexpected, while admiration is stimulated by what is great or beautiful.[35] Although Smith observes that these sentiments are frequently confused in ordinary usage, he emphasizes that each has a distinct meaning.[36] Furthermore, he asserts that these sentiments mutually support and enliven one another.[37]

The complex interaction among these sentiments plays a role in stimulating philosophical enquiries. Smith explains that we are not surprised by objects of any kind that are expected or foreseen since the idea of such objects has already been formed in the mind.[38] In contrast, the appearance of an unexpected object generates a strong sense of surprise. Surprise thus arises when an object causes a sudden and intense change in the mind.[39] Over time, this surprise is moderated by the effects of habit and custom.[40]

Smith further contends that the human mind derives pleasure from discovering resemblances among different objects through observation.[41] Human beings possess a natural propensity to refer any particular object to the species or class of things with which they are most familiar.[42]

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and deductive procedure. See: Élie Halévy, *The growth of philosophic radicalism*, trans. Mary Morris (1901; London, 1928), 6.

33 Smith, *Essays on philosophical subjects*, 33.

34 Ibid.

35 Ibid.

36 Ibid., 33–4.

37 Ibid., 34.

38 Ibid.

39 Ibid., 35.

40 Ibid., 37.

41 Ibid., 38–9.

42 Ibid.

Through the discovery of common resemblances among different objects, the assignment of general names, and abstraction from particular instances, the mind forms general concepts. This process reveals a close relationship between induction and deduction.

Smith explains the mechanism through which repeated experience operates within the imagination. Whenever something entirely new or singular presents itself to us, we reflect upon the class or species to which the idea of that object belongs. During this process, together with the accompanying emotions and movements of the mind, we experience wonder. This sentiment continues until we recall a class of objects resembling the novel object. Once it is observed that such objects are regularly produced in the same order of succession, we connect these ideas within the imagination. Smith refers to this mental process as the association of ideas.[43] As a consequence, the imagination acquires a habitual disposition to pass from one idea to another.[44] This enables us to anticipate events before they occur, according to the ordinary course of things.[45] However, whenever an event appears in an order different from that to which the imagination has become accustomed, it excites surprise again. This is because the imagination is not yet accustomed to the order. Yet once two apparently disconnected phenomena can be united by discovering new intermediate events and a chain of connection between them, wonder disappears altogether.[46] In this way, Smith reveals a natural human propensity underlying philosophical enquiries: the inclination to comprehend phenomena through the imagination.

Smith recognized that the capacity of the imagination differs markedly between philosophers and ordinary people. In short, what has become familiar to the imagination through habit and custom, and therefore appears to philosophers as the natural order of events, may nevertheless remain an unfamiliar order of succession for ordinary people. For this reason, Smith maintained that philosophers must conduct philosophical enquiries on the basis of familiar facts shared by people in general. Only in this way can the imagination of ordinary people be led to comprehend the order governing natural phenomena. Thus, Smith may be understood as illustrating, through the history of astronomy, the mechanism by which philosophers discover a chain of intermediate events connecting apparently disconnected phenomena. Through this process, they construct 'the science of the connecting principles of nature' by beginning with familiar facts.[47] These principles connect phenomena within the imagination through chains of intermediate events. In this way, newly discovered

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43 Ibid., 41.

44 Misawa (2026) points out that Smith illustrates this operation of the imagination by referring to Descartes' laws of impact as an example. Misawa, Reconsidering Adam Smith's Critique of Descartes' Vortex Hypothesis.

45 Smith, *Essays on philosophical subjects*, 41–2.

46 Ibid.

47 Ibid., 45; Sasaki (2001) argues that the principles of connection in Smith's astronomy can be classified into two types: geometrical figures and natural causes. He further shows that, for the general acceptance of a system, it must satisfy several criteria: (1) the familiarity and simplicity of the principles of connection; (2) consistency with observed facts; (3) internal coherence of the system; and (4) the overall simplicity of the system. See: Sasaki, *The Formation of Economic Methodology* (Sapporo, 2001), 9.

phenomena are integrated into an established system of knowledge, thereby facilitating the gradual acquisition of scientific knowledge. Through this process, the imagination simplifies the effects of motions actually occurring in the world. Smith refers to this imaginative mechanism, by which the mind connects phenomena in thought, as the 'imaginary machine.'[48,49]

In the method of philosophical enquiry, Smith emphasizes the importance of connecting familiar facts formed through the imagination with familiar facts derived from observation of reality. Considering the role of the imagination, the following discussion examines the respective methods of philosophical enquiry employed by Descartes and Newton.[50]

4.2. Descartes' problem and the method of philosophical enquiry

First, Descartes' method of philosophical enquiry is examined.[51] Descartes needed to explain, without straining the imagination, how immensely heavy bodies, such as Earth and the other planets, could revolve rapidly around the sun within the Copernican system.[52] Notably, Nicolaus Copernicus attempted to address this problem but could not overcome the prejudices of his contemporaries.[53] In contrast, Johannes Kepler's theory contributed to the idea that, since there was an apparent gap or discontinuity between the planets' constant motion and their supposed inertness, a chain of intermediate events must connect these otherwise incompatible properties. However, Kepler did not provide a clear conception of the nature of this connecting chain.[54]

It was Descartes who united the train of intermediate events within the imagination in a form that appeared familiar:

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48 Smith, *Essays on philosophical subjects*, 66.

49 Tanaka (2013) argues that the central theme of *History of Astronomy* is the search for principles of connection that can reconcile events which appear to contradict preceding phenomena beyond what can be empirically demonstrated through particular experiences. See: Tanaka Shoji, *A Study of Adam Smith's Epistemology* (Tokyo, 2013), 63.

50 Whereas the present paper approaches the relationship between Descartes and Newton from a methodological perspective, Misawa (2026) examines it from the perspective of the history of science, arguing that the astronomical worldview embodied in Descartes' vortex theory constituted a necessary precondition for the Newtonian Revolution. See: Misawa, Reconsidering Adam Smith's Critique of Descartes' Vortex Hypothesis.

51 The following discussion derives an account of Descartes' method of philosophical enquiry by drawing on Misawa's (2026) analysis of the historical development of Descartes' vortex hypothesis in *History of Astronomy*. See: Misawa, Reconsidering Adam Smith's Critique of Descartes' Vortex Hypothesis.

52 Smith, *Essays on philosophical subjects*, 91.

53 Ibid.

54 Ibid., 91–2.

> Descartes was the first who attempted to ascertain, precisely, wherein this invisible chain consisted, and to afford the imagination a train of intermediate events, which, succeeding each other in an order that was of all others the most familiar to it, should unite those incoherent qualities, the rapid motion, and the natural inertness of the Planets.[55]

Descartes identified the laws of impulse as the most familiar connecting principles that link together a series of intermediate events.[56] By means of these laws of impulse, Descartes succeeded in providing a synthetic explanation of the rapid motion of massive bodies, which had constituted a major difficulty in the Copernican system. However, the conclusions derived from Descartes' method of philosophical enquiry remained merely probable. This was because, in order to explain various phenomena by the laws of impulse synthetically, there existed an infinite variety of possible combinations of impacts. Accordingly, Descartes did not necessary to demonstrate, with precision, the rotational motions of his astronomical system—the vortex theory—by means of a geometrical method.[57]

The principal reason why Descartes' vortex theory retained explanatory ambiguity lay in his method of philosophical enquiry. Smith suggests that these difficulties came from Descartes' 'inexperience in the study of Astronomy'.[58] Smith describes him as an 'ingenious and fanciful philosopher'.[59] Descartes, without careful observation or sufficient attention to previous observations, based the laws of impulse on speculation:

> Des Cartes, as was said before, had never himself observed the Heavens with any particular application. Though he was not ignorant, therefore, of any of the observations which had been made before his time, he seems to have paid them no great degree of attention; which, probably, proceeded from his own inexperience in the study of Astronomy.[60]

Descartes' method of philosophical enquiry lacked the procedure by which a small number of familiar principles are derived through an analytical process grounded in observation of reality. This synthetic method was based on the laws of impulse, which were treated as a small number of principles derived through imaginative speculation. Instead, it sought to explain a wide range of celestial motions synthetically by means of the laws of impulse, which were postulated through imaginative speculation. It could not offer precise explanations of celestial phenomena. For those who preferred systematic explanations that united

55 Ibid., 92.
56 Ibid., 98.
57 Ibid., 95.
58 Ibid., 97.
59 Ibid., 92.
60 Ibid., 97.

empirically observable familiar facts with familiar facts constructed by the imagination—as exemplified by the imaginary machine—such an account was inherently difficult to accept. However, the method of philosophical enquiry was still developing at the time. Accordingly, the imprecise explanations of celestial motions provided by Descartes' philosophy, being readily satisfying the imagination, were received with pleasure by his contemporaries.[61]

4.3. Newton's problem and the method of philosophical enquiry

The discussion now turns to Newton's method of philosophical enquiry in *History of Astronomy*. Alongside the unresolved problems left by Descartes' vortex theory, Newton faced a significant challenge in providing a physical explanation for the constant irregularities in planetary motion observed by astronomers such as Giovanni Domenico Cassini. To address this, Newton identified gravity as one of the few familiar principles that could precisely explain these irregularities, as an empirically observable principle derived from the interaction of bodies:

> Sir Isaac Newton first attempted to give a physical account of the motions of the Planets, which should accommodate itself to all the constant irregularities which astronomers had ever observed in their motions.... After this quality, there is no other, with which we are so well acquainted, as that of gravity. We never act upon matter, but we have occasion to observe it.[62]

On this basis, Newton demonstrated the role of the mechanical principle of gravity. He showed that it functions as a principle of connection capable of uniting a wide range of planetary motions.[63] Moreover, he discovered that the results of observations corresponded exactly to the theoretical calculations derived from this principle through geometrical demonstration.[64]

Smith demonstrates that Newton's method of philosophical enquiry enabled the precise explanation of not only general celestial phenomena but also rare and seemingly accidental events, such as comets, through geometrical demonstration. Previously, many astronomers had interpreted these phenomena only probabilistically. Such explanations became possible by connecting them with the familiar mechanical principle whose effects are of gravity observable in our daily life. This stands in contrast to earlier philosophers, including Aristotle. They divided the world into sublunary and superlunary realms. They explained phenomena in these two realms by appealing to different principles of motion. By Descartes' time, Tycho Brahe's observations had already undermined the strict distinction between the celestial and terrestrial realms that had previously been accepted on empirical grounds. Nevertheless,

61 Ibid.
62 Ibid., 97–8.
63 Ibid., 98.
64 Ibid., 99.

Descartes did not employ observational facts. Instead, he constructed the vortex theory by adopting the laws of impulse, postulated through speculative reasoning within the imagination, as familiar principles.[65,66]

Unlike Descartes, who did not employ an analytical process grounded in observation and induction, Newton developed a method of philosophical enquiry that incorporated such a process.[67] As a result, the synthetic method, which explains phenomena deductively by means of a small number of principles derived through induction and demonstrated geometrically, achieved a far greater degree of precision. Furthermore, the mechanical principle of gravity, adopted as a connecting principle in Newton's system, was neither difficult for the imagination to follow nor remote from experience. Rather, it was one of the most familiar principles, accessible through observation.[68] From this perspective, Smith holds Newton in the highest esteem. He credits Newton with discovering a vast chain of the most important and sublime principles. All the phenomena that had previously been observed in the superlunary region were brought into close connection through the single principle of gravity, whose operation we experience in our daily lives in the sublunary world.[69] Such a system, exemplified by the imaginary machine, which united empirically observable familiar facts with familiar ideas constructed by the imagination, was precisely the kind of system that most gratified the imagination.

5. Smith's Newtonian Method and Descartes' Method as a Didactic Method

Smith presents the Newtonian method as the most ingenious among didactic methods for conveying the system of science. At the same time, however, Smith refers to Descartes' method as the precursor to this Newtonian method. This is noteworthy because Descartes' philosophy had already been widely discredited at the time. The reason for Smith's assessment has not yet been sufficiently clarified in previous scholarship. This section seeks to elucidate the distinctive character of the Newtonian didactic method in *Lectures on Rhetoric and Belles Lettres* by comparing it with Descartes' method.

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65 Ibid., 102–3.

66 It may be suggested that this passage exhibits a logical structure analogous to the comparative analysis of the method of Aristotle and Descartes' method in relation to the Newtonian method in Lecture 24 of the *Lectures on Rhetoric and Belles Lettres*. For further details, see Section 5.

67 Nagao (2001) argues that Smith's methodology may be understood as a broad form of the Newtonian method, in which the methodology of Aristotle's Posterior Analytics is combined with Newton's Rules of Reasoning in Philosophy and with Newton's axiomatic mode of explanation. See: Nagao, *Newtonianism*, 325.

68 Smith, *Essays on philosophical subjects*, 104.

69 Ibid., 105.

In Lecture 24, Smith discusses the didactic method of conveying a system of science by comparing the Newtonian method with those of Aristotle and Descartes. Smith begins by characterizing the method of Aristotle as a way of explaining each subject by identifying whether its principles are identical to or different from those of other subjects.[70] In comparison, the Newtonian method starts with a few established principles and explains various phenomena by connecting them through the same chain. These principles are already known or demonstrated. The method of Aristotle and the Newtonian method do not involve induction based on experiment or observation. Smith, therefore, presents the Newtonian method as a means of explaining a wide range of phenomena synthetically from a few principles:

> or in the manner of Sir Isaac Newton we may lay down certain principles known or proved in the beginning, from whence we account for the several Phenomena, connecting all together by the same Chain. This Latter, which we may call the Newtonian method, is undoubtedly the most Philosophical, and in every science whether of Morals or Natural philosophy etc., is vastly more ingenious and for that reason more engaging than the other. It gives us a pleasure to see the phenomena which we reckoned the most unaccountable all deduced from some principle (commonly a well-known one) and all united in one chain, far superior to what we feel from the unconnected method where everything is accounted for by itself without any reference to the others.[71]

Smith points out that when a writer employs the Newtonian method to explain a system, the reader can connect the various arguments and thereby derive pleasure from understanding them, whereas the method of Aristotle is limited to explaining phenomena by assigning either distinct or common principles to each. The Newtonian method is esteemed for its ingenuity in presenting an exposition that facilitates the reader's comprehension. Therefore, Smith regards the Newtonian method as the most excellent among the various forms of the didactic method.

However, immediately after offering such a high evaluation, he introduces Descartes' philosophy, stating that Descartes had attempted a method similar to the Newtonian method:

> the Cartesian Philosophy (for Des-Cartes was in reality the first who attempted this method)[72]

In exploring Descartes' method, Smith acknowledges both its precedence and its historical similarity to the Newtonian method. Smith thereby suggests indirectly that the two methods share the same basic didactic structure. At the time, Descartes' philosophy was increasingly

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70 Adam Smith, *Lectures on Rhetoric and Belles Lettres*, ed. Andrew S. Skinner and John Cameron Bruce (New York, 1983), 145.

71 Ibid., 145–6.

72 Ibid., 146.

rejected, while Newtonian natural philosophy was becoming dominant. This raises the question of what Smith intended by making such a comparison. If the method employed in Descartes' philosophy is understood to precede the Newtonian method, then the Newtonian and Descartes' methods may be regarded as methodologically equivalent. Accordingly, both methods can be defined as modes that account for phenomena synthetically through a few principles. In other words, although the rise of Newtonianism transformed the method of philosophical enquiry, it did not bring about a corresponding development in the didactic method. Nevertheless, both methods served as effective didactic methods by appealing to the imagination through a small number of familiar connecting principles.

6. Conclusion

Smith's reception of Newton's method differed according to the particular purpose of each work. This study has clarified how the method of philosophical enquiry in *History of Astronomy* differs from the didactic method in *Lectures on Rhetoric and Belles Lettres*. In *Lectures on Rhetoric and Belles Lettres*, Smith presents the Newtonian method as a didactic mode for communicating a system of scientific knowledge. By contrast, in *History of Astronomy*, he exemplifies the method of philosophical enquiry through Newton's astronomy.

Furthermore, this paper compares Smith's reception of Newton's and Descartes' methods. The comparison is based on Newton's methods of analysis and synthesis. This study has demonstrated that, in methodological terms, the Newtonian didactic method is structurally equivalent to both Descartes' didactic method in *Lectures on Rhetoric and Belles Lettres* and Descartes' method of philosophical enquiry exemplified by the vortex theory in *History of Astronomy*.

The characteristics of the Newton's and Descartes' methods of philosophical enquiry in *History of Astronomy* may be summarized as follows: According to Smith, Newton's method of philosophical enquiry combines analysis and synthesis. In the analytical stage, a small number of familiar principles are derived inductively from observation of reality. In the synthetic stage, these analytically established principles are employed to explain a wide range of phenomena deductively through geometrical demonstration. The principle of gravity, derived through the analytical method, was grounded in empirical observation and served as a familiar principle of connection for the imagination. Consequently, Newton succeeded in uniting terrestrial and celestial phenomena into a single coherent system. By contrast, Descartes' method of philosophical enquiry was synthetic and lacked an analytical process grounded in observation of reality. Rather than deriving a small number of familiar principles inductively through observation and experiment, Descartes adopted the laws of impulse, which were postulated through imaginative speculation and treated as familiar principles of connection. He then sought to explain a wide range of celestial phenomena deductively from these principles. Although his method readily accommodated the imagination and succeeded in uniting many celestial motions into a coherent system, it lacked an analytical foundation. As a result, its explanations remained merely probable and could not attain precision. Nevertheless, insofar as it explained phenomena deductively from a small number of

familiar principles, Descartes' method was methodologically similar to the later Newtonian didactic method. It differed fundamentally, however, from Newton's method of philosophical enquiry because it lacked an analytical process grounded in induction through observation.

While their methods of philosophical enquiry differ, Descartes' method and the Newtonian method in *Lectures on Rhetoric and Belles Lettres* are methodologically equivalent as didactic methods. Both are synthetic methods that explain a wide range of phenomena deductively from a small number of familiar principles. As didactic methods, both seek to communicate a scientific system by uniting phenomena through a single chain of familiar principles.

As a method of philosophical enquiry for scientific investigation, it appears that Smith regarded Newton's method more highly than Descartes' method. This is because it enabled a more precise explanation of phenomena based on observational facts, whereas Descartes' method provided only probable explanations based on speculation. However, Smith recognized that, as the didactic methods for communicating a system of scientific knowledge, there was no methodological difference between the Newtonian method and Descartes' method. This suggests that, although scientific thought underwent a profound transformation from Cartesian rationalism to Newtonianism, Smith recognized that no comparable development had occurred in the didactic method. Consequently, Smith cannot be regarded simply as either an unquestioning advocate of Newtonianism or a critic of Descartes. Rather, he should be regarded as a philosopher with a profound understanding of the nature of the scientific method, as well as of logic and rhetoric, in his own age. Smith identified the role of the imagination both in the method of philosophical enquiry and in the didactic method, thereby demonstrating the mechanism through which the imagination advances scientific investigation. He further illustrated how a coherent system should be constructed and showed how to compose scholarly discourse that communicates a system of scientific knowledge more effectively to a wider audience.

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