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Locke–Stewart–Mill: philosophy of science at Dartmouth College, 1771–1854

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American colleges began to teach Locke's philosophy of science early in the 18th century. Many religious people, however, rejected the theological implications of Locke's philosophy and in 1769 Princeton College initiated a popular reaction against it. That year, a new president dropped Locke's text from the curriculum and replaced it with a book by Scottish professor, Thomas Reid (1710–1796). Teaching from Reid's book, the new president attempted to reverse Locke's effect on the American view of science by insisting that the study of nature is an essentially religious enterprise, consisting entirely of the collection, classification, and generalization of facts, with no room for conjectural theories (Bozeman, 1977, pp. 5, 7, 23–28, 45, 54–61; Laudan, 1970, pp. 103–131). This reactionary movement, often called *Baconianism* after the 17th century English philosopher, Francis Bacon, spread from Princeton to a large sector of American Protestantism and has had a long life in religious movements such as Fundamentalism and Creation Science (Noll, 1985, 1995). Because this long-lived reaction against Locke enjoyed wide popularity in the early national period, it might be thought that Princeton was typical of American colleges at the time. But, in fact, few colleges joined Princeton in rejecting Locke or adopting Reid.

As an illustration of the way most American colleges dealt with Locke's religious implications, this paper tells the story of the philosophy of science at Dartmouth College from its founding in 1771 until 1854. The first section describes the curriculum from 1771 until 1837 when the faculty taught philosophy of science from books by Locke and the English hymn writer, Isaac Watts (1674–1748). The second section describes the gradual introduction, between 1799 and 1837, of texts by Scottish professor, Dugald Stewart (1753–1828), and English clergyman, Richard Whately (1787–1863), and the subsequent use of these texts until 1854. Finally, an epilogue describes the sudden dropping of these authors from the Dartmouth curriculum under the influence of a book by the philosopher, John Stuart Mill (1806–1873). I conclude from my analysis of texts by Locke, Watts, Stewart, Whately and J.S. Mill, that philosophical teaching about science at Dartmouth was not a rejection of Locke, as it was at Princeton. On the contrary, the trends toward conjecture and, ironically, towards secularization that Locke introduced into the study of nature consistently characterized the Dartmouth philosophy curriculum from its founding until the mid-19th century.

The story of the philosophy of science at early Dartmouth is important because historical writers have systematically missed a key difference between Princeton and other American colleges. Authors as varied as Henry F. May, Sydney Ahlstrom, and George H. Daniels, have rightly emphasized the popular religious reaction against Locke

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associated with Reid's Baconianism. But they wrongly imply that when colleges adopted Stewart they thereby joined this reaction (Ahlstrom, 1955; Daniels, 1968; May, 1976). Further, I believe, they make this mistake because they see Stewart as merely Reid's popularizer. As Ahlstrom put it, "Stewart added little or nothing to his master's system" (p. 261). On some philosophical topics this may well be true, but with respect to the philosophy of science, Stewart was actually Reid's critic and colleges that adopted Stewart instead of Reid were pursuing a very different strategy of dealing with Locke.[1] Instead of rejecting the implications of Locke's philosophy of science, colleges like Dartmouth were accommodating Locke to a 500-year-old religious tradition called *theological voluntarism*.

John Locke's philosophy of science at Dartmouth, 1771–1837

When Dartmouth was founded in 1771, American colleges generally taught philosophical ideas about science and the study of nature from John Locke's *Essay Concerning Human Understanding* (1690) and Isaac Watts' *Logick, or, The Right Use of Reason in the Enquiry after Truth* (1725). In particular, the Yale faculty used Locke and Watts when Dartmouth founder, Eleazar Wheelock, attended (Flower & Murphey, 1977, pp. 281–282, 365–373). Not surprisingly, then, these texts were part of the Dartmouth curriculum from the beginning (Smith, 1878, pp. 59–61). Watts' *Logick* continued in use at Dartmouth for 62 years and Locke's *Essay* 4 years longer. Also part of the Dartmouth curriculum at its founding was Joseph Butler's, *The Analogy of Religion* (1736), which strongly reinforced Locke's view of natural knowledge as built up through hypotheses.

From Locke, Dartmouth students learned that general conclusions about nature, drawn from observation, lack the certainty of science (Locke, 1975, 4.3.26, 4.3.29, 4.12.10). In accord with common usage, Locke usually reserved the term "science" for God's direct knowledge of the hidden workings of nature. According to Locke only this direct knowledge truly deserves the name science. Men must be content with the less than certain generalizations they can draw from observation and whatever hypotheses they can form about nature's inner mechanisms (Locke, 1975, 2.31.6–14, 4.3.10–12). In the *Essay*, Locke said explicitly that these hypotheses are a product of reasoning by analogy and that he valued them, not only as explanations of what we observe, but as aids to memory and guides to new discoveries. Locke also discussed the comparison of hypotheses to see which one is best able to survive exposure to the facts of observation (Locke, 1975, 4.16.12, 4.20.15). Furthermore, the reader is told that any reservations Locke may have about the use of hypotheses are not designed to preclude their use but only to guide it (Locke, 1975, 4.12.13). Most importantly, Locke is actually a promoter of certain hypotheses, such as that of an invisible world of interacting particles, drawn by analogy from visible mechanisms such as the works inside a large clock (Locke, 1975, 4.3.16).

In the *Essay*, men draw their knowledge of nature indirectly from "ideas" or images given to the mind by the physical senses (Locke, 1975, 1.1.8, 2.1.2, 4.1.1–2). But this theory of intermediary ideas promoted doubt about the reliability of what we see and hear. At the same time, Locke's emphasis on the role of hidden mechanisms in producing the phenomena of nature seemed to leave God out of nature's ongoing operation (Locke, 1975, 2.21.1–2, 2.23.7–10, pp. 28–29). In order to combat this skepticism and *deism*, the Irish bishop, George Berkeley (1685–1753), argued that God directly produces what Locke called "ideas" and that hypotheses about invisible entities and hidden mechanisms are no more than useful fictions (Popper, 1953–1954,

pp. 26–36). This way of answering Locke, however, only led to more skepticism. According to Reid and his promoters at Princeton, the only way to turn back this entire skeptical trend is to adopt the Baconian philosophy. But most American colleges took the alternative route laid out by Isaac Watts in his widely used logic text.

Isaac Watts accepted Locke's hypothetical description of nature in terms of invisible entities and hidden mechanisms but he took these hypotheses to be about invisible and hidden modes of God's action. Furthermore, Watts took the so-called laws of nature to be nothing more than regularities in the way God acts. In this way, Watts began to accommodate Locke to a long theological tradition that came to him through the Swiss theologian, John Calvin (McGuire, 1972, pp. 540–541). Proponents of this theology viewed man and the universe as the ongoing action of God. More importantly, theological voluntarists like Calvin and Watts held that this divine action is entirely unrestricted (Watts, 1726, 1.3.3, 1.6.3, 2.3.4, 2.4, 3.3.1). It follows that there can be no learning about nature by any means but observation after the fact and this explains a long historical connection between voluntarist theology and *empiricism*—learning about nature through observation (Osler, 1994). Reid and Watts were both within this broad stream of voluntarist theology and the empirical study of nature. According to Reid, this empirical study should be free of conjecture and unobservable processes. Watts, on the other hand, agreed with Locke that drawing conclusions from observation is, to some extent, a process of making hypotheses about nature and that a proper explanation of nature's operations requires a certain amount of conjecture about the hidden mechanisms behind what men observe.

Thus, while Princeton was spreading Reid's Baconian philosophy to an audience outside the colleges, Dartmouth and other American schools were following Watts in accommodating Locke's innovations to the voluntarist theology. This effort took a great step forward in a book by Dugald Stewart that began to appear at Dartmouth as early as 1799.

Dugald Stewart's philosophy of science at Dartmouth, 1799–1854

When the Dartmouth faculty replaced Locke and Watts it was with texts by Scottish professor, Dugald Stewart, and English clergyman, Richard Whately.[2] Stewart published his *Elements of the Philosophy of the Human Mind* in three volumes, in 1792, 1814, and 1827, respectively.[3] The Hanover, New Hampshire, bookstore, down the road from Dartmouth College, offered Stewart's first volume for sale as early as 1799 and Stewart's early influence at Dartmouth is confirmed by the presence of his first volume in a student library as early as 1813 and a description of the President expounding Stewart in 1815 (*Catalogue*, 1799; *Catalogue*, 1813; Smith, 1878, p. 125). In 1822, the faculty adopted the first two volumes of Stewart's *Elements* as a text and three years later Dartmouth Professor of Intellectual Philosophy, Charles B. Haddock, praised Stewart and his student Thomas Brown before the Phi Beta Kappa society.

> What, with all their personal merits, was the Philosophy of Locke, or the Logick of Bacon, compared with the simple and sublime conceptions of the compass, relation, and destination of the human power, communicated to us by the works of Stewart, or Brown? (1825, p. 13)

A decade later, the faculty also adopted Whately's *Elements of Logic*, first published in 1826. Whately drew his philosophy of science largely from Stewart's writings, but he developed the deductive side of the study of nature more fully than Stewart,

Watts, or Locke. Whately's *Logic* replaced Watts' in 1833 and Locke was finally dropped from the Dartmouth curriculum in 1837.

As a Scottish Presbyterian minister, Stewart adhered to the same theological tradition as Watts (Stewart, 1793, pp. 50–51, 1805, pp. 84–85). Thus, he viewed natural objects and events as governed by God's direct action and not by essences or reified laws of nature. For Stewart, as for other voluntarists, there are no such essences or laws to be known by science, only modes of God's unfettered action. It follows that not even God has that certain knowledge for which Locke reserved the term science. Stewart furthermore ruled out Locke's "ideas" as a basis for our conjectural, human knowledge of nature. According to him, there is no need of such intermediates, since God produces our perceptions directly and correlates them to whatever He is also producing in the way of physical objects and events. But Stewart, like Watts, accepted Locke's notion of invisible mechanisms, not as a substitute for God's role in nature, but as a mode of His action (Stewart, 1792, p. 71).

With regard to hypotheses in the study of nature, Stewart was quite unlike Reid who tried to prohibit conjectural theories and unseen realities. In 1792, Stewart welcomed the atomic theory of 18th-century Croatian Jesuit, Roger Boscovich, because it seemed to show that material contact was not involved in the collision of two objects. This fitted well with Stewart's contention that God causes *all* the effects associated with the collision, rather than the colliding objects affecting one another (Stewart, 1792, pp. 107–108). In fact, Stewart gave such conjectural theories an even broader role in the study of nature than Locke (Stewart, 1792, p. 208, 1814, pp. 299, 423). Criticizing Reid and the Baconian movement that Reid began, Stewart told his readers that:

> Some of the followers of Lord Bacon have, I think, been led, in their zeal for the method of induction, to censure hypothetical theories with too great a degree of severity. Such theories have certainly been frequently of use, in putting philosophers upon the road of discovery. Indeed, it has probably been in this way, that most discoveries have been made; for although a knowledge of facts must be prior to the formation of a just theory, yet a hypothetical theory is generally our best guide to the knowledge of useful facts. (Stewart, 1792, p. 423)

As for the evidence that Newton himself eschewed hypotheses, Stewart explained:

> The indiscriminate zeal against hypotheses, so generally avowed at present by the professed followers of Bacon, has been much encouraged by the strong and decided terms in which, on various occasions, they are reprobated by Newton. But the language of this great man, when he happens to touch on logical questions, must not always be too literally interpreted. It must be qualified and limited, so as to accord with the exemplifications which he himself has given of his general rules.... What, indeed, are Newton's queries, but so many hypotheses which are proposed as subjects of examination to philosophers? And did not the great doctrine of gravitation take its first rise from a fortunate conjecture? (Stewart, 1814, pp. 299–300)

Not only do effective methods of studying nature have a conjectural component, as Stewart argued as early as 1792, but Stewart showed in his second volume (1814) that these conjectural methods arrive at less than certain conclusions.[4] If there are no essences or autonomous mechanisms or laws of nature to be discovered, if we study only the free activity of God, seen and unseen, then it follows that what we call the laws of

nature are no more than symbols that we create to stand for observed regularities in the Creator's past action. Nothing guarantees that God will continue to act in this way in the future, or that God has not acted differently on past occasions that we have simply failed to observe. Furthermore, since nothing exists in nature but individual events and objects that God is freely producing, these laws point to nothing but collections of events and objects. This is what Stewart called his *nominalism*.[5] Given this view of the scientific product, Stewart sees no objection to the formation of conjectural and hypothetical laws that summarize our incomplete observation of nature (Stewart, 1814, p. 261). Stewart further explains that, "the probability of a hypothesis increases in proportion to the number of phenomena for which it accounts, and to the simplicity of the theory by which it explains them" (Stewart, 1814, p. 311)—an idea that was current among contemporary scientists such as Boscovich (Olson, 1975, pp. 52, 119). In fact, according to Stewart, the only certainty available to us is the certainty of mathematical deduction, but this is empty of empirical content (Stewart, 1814, pp. 114, 134, 233).

On this basis Stewart was widely influential in promoting the use of hypotheses and conjectural theories with several generations of students.[6] About the time that Stewart was introduced into college curricula, Americans engaged in pursuits such as biology, chemistry, and geology began to move away from the mere collecting, classifying, and generalizing of data to the making and testing of hypotheses and the use of conjectural theories to explain their observations (Daniels, 1968, pp. 63–68, 102–200).[7] Also, beginning in 1820, a flurry of books was published that built directly on Stewart's concept of the study of nature. Thomas Brown (1820), Richard Whately (1826), John Herschel (1829), David Brewster (1831), William Whewell (1837, 1840), and John Stuart Mill (1843) all learned natural philosophy from Stewart's text and it is these authors who are usually given credit for beginning the modern era of "natural" science as (1) a conjectural process of making and testing hypotheses about the natural world, and (2) a secular enterprise without religious goals and assumptions.

Initially the most important of Stewart's followers was Richard Whately, whose *Logic* was adopted by the Dartmouth faculty in 1833. Whately was first a student and then a professor at Oxford University at a time that Stewart's books played an important role in the curriculum. Whately's teachers and colleagues at Oxford found fault, however, with Stewart's low opinion of deductive logic. In their view, the medieval use of deduction was defective only in that it began with generalizations that had not been properly drawn from observation but from premises that were either apprehended in the manner of Plato, by intuiting God's plan, or in the manner of Aristotle, by abstraction from a "good example" (Corsi, 1987, pp. 90–110, 127). Bacon thought he had a better method: generalizing gradually from a large quantity of facts. Certainly this was a method more consistent with the voluntarist view that the Creator was not to be restrained by either eternally existing blueprints or indwelling essences. Focusing on this discovery process, however, Bacon paid little attention to the deductive side of the medieval idea of science and, after Bacon, most writers, including Locke and Watts, considered deductive logic to be of little or no use in the study of nature (Whately, 1834, author's preface, introduction, 1.1, 1.4). Reid and Stewart even argued that drawing conclusions from observation had replaced deduction as a mode of investigation. But Whately pointed out that both were needed: *induction* to arrive at valid generalizations, and *deduction* to arrive at new conclusions from these generalizations (Whately, 1834, 4.1, 4.2.1–5). Whately then went on to summarize what was known at the time about drawing valid conclusions from given premises. In doing so, he is generally credited with reviving the study of deductive logic after a long period of neglect (Edwards, 1967,

pp. 287–288). Together, then, Whately and Stewart presented to Dartmouth students and faculty something very much like the modern idea of a natural science but thoroughly joined to a voluntarist theology. Thus, what Dartmouth and other American colleges had attempted by combining Watts and Locke was now fully accomplished by Stewart and Whately.

With things going so well, it is a bit surprising to find Stewart and Whately suddenly dropped from the Dartmouth curriculum in 1854 and an entirely new set of philosophy texts, by American authors, in place by 1864.[8]

Epilogue and conclusion

To understand the rapid transition away from Stewart and Whately, I believe we must take into account the effect of J.S. Mill's *A System of Logic Ratiocinative and Inductive* (1843) on the Dartmouth faculty. For some years, Americans had known of a proposal by French philosopher, Auguste Comte, to separate science and the study of nature from all religious goals and assumptions (Cashdollar, 1989, pp. 93–141). Noting with horror this emerging *positivism* about nature, Dartmouth Professor of Intellectual Philosophy, Charles B. Haddock, warned an audience as early as 1842 that "We are seduced to ascribe all things to the laws of the universe, as though these laws themselves were to be ascribed to nothing" and "It may be … that there is something in the study of second causes that is … unfavorable to the recognition of the agency and government of the invisible God" (Haddock, 1846, p. 23). The very next year, J.S. Mill published in his *Logic* a philosophy of science that met Comte's criteria. Mill saw that the basic philosophy of the modern scientific enterprise was already in the texts by Stewart and Whately.[9] In fact, he viewed the voluntarist theology in Stewart's text as merely a stage on the way to the modern view of science (Mill, 1973, p. 12). Thus, Mill discarded Stewart's religious goals and assumptions as optional and unnecessary but retained the nominalism and empiricism that Stewart had drawn from the voluntarist tradition (Mill, 1973, 1.6.1, 2, 2.2, 2.3.3, 2.6, 3.1.1, 3.5.6, 3.5.8, 3.5.11, 3.6, 3.7, 3.13.7, 1974, 4.1.3, 4.7, 5.3.3). In his words:

> To adopt a distinction familiar in the writings of the Scotch metaphysicians … the causes with which I concern myself are not *efficient*, but *physical* causes. Of the efficient causes of phenomena, or whether any such causes exist at all, I am not called upon to give an opinion. (Mill, 1973, p. 326)

In my view, it was the treatment of Stewart and Whately in Mill's book that led the faculty to drop these authors from the Dartmouth curriculum. There is, for example, an 1846 edition of Mill's *System of Logic*, inscribed "Social Donation from the Graduating Class of 1832", in the Dartmouth College library. Another early edition in the Dartmouth library is inscribed with the name of Haddock's successor, Clement Long, and a date "Jan. 1, 1848". Reading the *System of Logic*, it must have been clear to Long that, by adopting the voluntarist view, the Dartmouth faculty had unknowingly taken a big step in the direction of J.S. Mill's secular philosophy of science (Long, 1853, p. 13). But awareness of this unintended result only came with Mill's book and only after Mill's book was published did Stewart and Whately disappear from the curriculum. Until then, it was Locke's view of science as accommodated to the voluntarist theology by Watts and Stewart that characterized the philosophy of science at Dartmouth.

Thus, even the way this curricular era came to an end shows that philosophical teaching about science at Dartmouth during the early national period was not a rejection

of Locke, as it was at Princeton. On the contrary, the trends toward conjecture and, ironically, secularization that Locke introduced into the study of nature consistently characterized the Dartmouth philosophy curriculum from its founding until the mid-19th century. Locke's text was in continuous use for the first 66 years of the school's operation and when the Dartmouth philosophy faculty replaced texts by Locke and Watts with those by Stewart and Whately, these actually reinforced and extended Locke's view of the legitimacy of hypotheses and hidden mechanisms in the study of nature. Thus, when Dartmouth and other colleges adopted texts by Stewart and his followers, they were not thereby joining Princeton in rejecting Locke's innovations but, rather, they were furthering the spread of these innovations in both known and unknown ways.

Notes

1. Stewart and his teacher, Reid, were well aware of their differences. The first volume of Stewart's *Philosophy of the Human Mind* (1792, p. 71) contains pointed criticisms of some of Reid's positions and in Reid's unpublished papers there is a "vigorous critique" of Stewart's book (Robinson, 1989, pp. 405–422).
2. Once available, Stewart's book was more broadly used in colleges than Reid (Porter, 1874, pp. 451–452) and also more widely owned by American readers (Lundberg & May, 1976).
3. My quotes are all taken from Stewart's *Collected Works* edited by Sir William Hamilton and published 1854–1860. No changes were made in volumes 2 or 3 after their publication. The first volume was modified slightly in a second edition of 1804 and Hamilton incorporated further changes, presented in the third volume.
4. While conjecture remains his process of scientific discovery, in some places Stewart appears to want a way to turn our hypotheses into certain knowledge of laws of nature (Stewart, 1814, pp. 46, 246, 261, 307).
5. Today it might be called his "vocalism" to emphasize that, in his view, even concepts are limited to individual things and events.
6. On Stewart's influence see Kubitz (1932), Olson (1975), Flower and Murphey (1977), Corsi (1987, 1988), and Yeo (1993).
7. Most continued, however, to pay lip service to the popular reaction against Locke.
8. In the intervening decade a number of alternative texts were briefly tried, including Reid.
9. About a third of the references in Mill's first edition are to Stewart and Whately and more were added in subsequent editions (Mill, 1843, p. 1229). Furthermore, the *Logic* is full of implicit quotations from Stewart and ''Mill had the works of Whately and Stewart in mind when he was writing'' (Corsi, 1987, pp. 135–136).

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