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Early Modern Experimental Philosophy

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Abstract: In the mid-seventeenth century a movement of self-styled experimental philosophers emerged in Britain. Originating in the discipline of natural philosophy amongst Fellows of the Royal Society of London, it soon spread to medicine and by the eighteenth century had impacted moral philosophy, political philosophy, and aesthetics. Early modern experimental philosophers gave epistemic priority to observation and experiment over theorising and speculation. They decried the use of hypotheses and system-building without recourse to experiment and, in some quarters, developed a philosophy of experiment. In the eighteenth century, the movement spread to the Netherlands, France, and Germany. Its important role in early modern philosophy was subsequently eclipsed by the widespread adoption of the Kantian historiography, which emphasised the distinction between rationalism and empiricism and had no place for early modern experimental philosophy. The re-emergence of interest in early modern experimental philosophy roughly coincided with the development of contemporary x-phi. There are some important similarities between the two.

Keywords: Bacon, Boyle, experiment, Hume, Kant, medicine, moral philosophy, natural history, natural philosophy, Newton, Royal Society, speculation, Turnbull

Early modern experimental philosophy¹

Experimental philosophers have portrayed themselves as returning to a “traditional vision” (Knobe and Nichols 2008, 3) or “traditional conception” of philosophy, and returning to its “traditional questions” (Knobe 2007a), and to an approach that “is as old as the term ‘philosophy’” itself (Appiah 2008, 2). For these experimental philosophers, observations and experiments can ground philosophical claims and there is no rigid separation – not even a “vocational” partition (11) – between the work of philosophers and that of empirical scientists. This chapter focuses on a historical movement that exemplifies, to a significant extent, what current-day experimental philosophers call the traditional conception of philosophy. Like current-day experimental philosophers, the adherents of this early modern movement called themselves experimental philosophers and pitted themselves against speculative, armchair philosophers. They promoted extensive experiments and observations as the basis for answering a wide range of questions, including questions that have now come under the purview of science as well as those that are still recognizably philosophical and that have often been tackled through armchair reflection. Early modern experimental philosophers regarded experiments and observations as having epistemic priority over substantive claims and theories, and they held that we should firmly commit ourselves only to those substantive claims and theories that are confirmed by observations and experiments. This chapter provides a short history of that movement, including its beliefs, practices, and leading exponents. While early modern experimental philosophy is not the sole historical antecedent of current-day experimental philosophy, it gave rise to some of the most influential and methodologically articulate attempts to employ empirical methods in the acquisition of knowledge and, as we will see in the conclusion of this chapter, it displays some interesting parallels with current-day x-phi.

Early modern experimental philosophy began to emerge in the late 1650s in England. The focal point of this development soon became the nascent Royal Society of London and the disciplinary domain in which the movement was born was natural philosophy, the study of nature. By the early 1660s the term “experimental philosophy” had begun to appear in the titles of books of

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those associated with the Society (Boyle 1999–2000, 3:189–561; Power 1664) and many of its exponents openly identified themselves as experimental philosophers. Experimental philosophy had an immediate impact on British medicine. By the end of the century, it was being applied to medicine on the Continent (Malpighi 1680; Baglivi 1704) and to the study of the human understanding (Locke 1690) – roughly what we now call psychology and philosophy of mind. By the mid-eighteenth century, we find a number of attempts to develop an experimental moral philosophy (e.g., Turnbull 1705; Hume 1739) and we can even trace the influence of experimental philosophy in the fields of politics (Hume 1749, 83–4) and aesthetics (Turnbull 1740).

Of course, the term “experimental philosophy” and its non-English cognates had a prehistory: the term did not appear *ex nihilo* in the 1660s. However, it was in the fledgling Royal Society that its meaning became relatively stable and its use widespread. The process by which this came about is rather complicated (Anstey and Vanzo 2012). Briefly, there were at least two decisive factors. First, natural philosophy had for centuries been understood as a speculative science. It was speculative because its aim was attaining knowledge, rather than guiding action or producing artifacts, and because it did not seek to attain knowledge through practical means, such as experiments and observations, but through demonstrative reasoning from first principles. This is not to say that traditional natural philosophers never mentioned experiments and observations. However, they were typically mentioned to illustrate conclusions that had already been established, rather than as evidence for those conclusions, and were mostly derived from a store of *endoxa*, textual sources, and thought experiments, rather than first-hand experience (see e.g., Reif 1969; Grant 2002). In the wake of the reformist writings of Francis Bacon and developments in the work of natural philosophers such as Galileo Galilei, William Gilbert, and Evangelista Torricelli, natural philosophy gradually came to be regarded as operative or practical in its methods.

Again, and now coming to the second factor leading to the new use of “experimental philosophy,” the new operative approach came to be seen as standing in tension and, in many cases, antagonism with traditional, speculative natural philosophy. The new self-styled experimental philosophers came to define themselves and their methods in contradistinction to those who developed natural-philosophical systems on the basis of principles and hypotheses and with insufficient reference to observations and experiments. The new experimental philosophers championed experiment and observation as the primary means of obtaining knowledge of nature, a necessary preparation for any theorizing, and the source of justification for any substantive claims or theories about the natural world. Many (though not all) of them pitted themselves

against so-called speculative philosophers who, in their view, sought to build “castles in the air” from their unfounded hypotheses. As a result, the term “speculative” began to take on pejorative connotations and speculative knowledge began to be regarded as inferior to practical knowledge. It was not only Scholastic philosophy that came in for criticism but also Epicureanism, Cartesianism, and Thomas Hobbes’ and, later, Gottfried Wilhelm Leibniz’s philosophies.

The evidence for these developments is extensive, though space only allows us to quote from one early protagonist. The theologian Samuel Parker defended experimental philosophy in the following terms in the year he became a Fellow of the Royal Society:

The chief reason therefore, why I prefer the Mechanical and Experimental Philosophie before the *Aristotelean*, is ... because it puts inquisitive men into a method to attain it [*scil.* certainty], whereas the other serves only to obstruct their industry by amusing them with empty and insignificant Notions. And therefore we may rationally expect a greater Improvement of Natural Philosophie from the *Royal Society*, (if they pursue their design) then it has had in all former ages; for they having discarded all particular *Hypotheses*, and wholly addicted themselves to exact Experiments and Observations, they may not only furnish the World with a compleat *History of Nature*, (which is the most useful part of *Physiologie*) but also laye firm and solid foundations to erect *Hypotheses* upon. (Parker 1666, 45)

By the last decade of the seventeenth century, the distinction between experimental and speculative philosophy had become fairly standard in natural philosophy in Britain. John Dunton’s student manual, *The Young-Students-Library* of 1692, captures this well:

Philosophy may be consider’d under these two Heads, Natural and Moral: The first of which, by Reason of the strange Alterations that have been made in it; may be again Subdivided into *Speculative* and *Experimental*.

... we must consider, the distinction we have made of *Speculative* and *Experimental*, and, as much as possible, Exclude the first, for an indefatigable and laborious Search into Natural Experiments, they being only the Certain, Sure Method to gather a true Body of Philosophy; for the Antient Way of clapping up an entire building of Sciences, upon pure Contemplation, may make indeed an *Admirable Fabrick*, but the Materials are such as can promise no lasting one. (Dunton 1692, vi–vii)

1 Experimental Philosophy and Experiments

A distinctive and innovative feature of experimental philosophy was the place that it accorded to experiment in the acquisition of knowledge. Experimental philosophers were not the first to use experiments to study nature. Indeed, they were inspired by important precedents in the work of the likes of Gilbert, Galileo, Torricelli, and the physician William Harvey. Yet none of these men were experimental philosophers in the new sense of the term. To be sure, they were experimental practitioners, but they were not members of this new movement as characterized earlier. For example, Galileo seems to oscillate between traditional and innovative understandings of the roles of experiments and observation. The endless scholarly debates on the nature of his epistemology evidence the difficulty of placing his views within the boundaries of any given tradition, as “every attempt to define a Galilean epistemology appears to encounter counterexamples” (Gómez López 2002, 93, see 91–7). René Descartes also made observations and experiments, criticized those philosophers who neglect experiments, and invited his readers to witness the dissection of a heart before reading the sixth part of the *Discourse on Method* (Roux 2013, 52–3), but he was one of the preferred polemical targets of late seventeenth-century experimental philosophy. Not only did he make substantive claims, such as his denial of empty space, on the basis of *a priori* arguments, he developed entire theories, like his theory of the formation of the Earth, on the basis of scarce empirical evidence (*Principles of Philosophy*, Part 2, §16; Part 4, in Descartes 1996, 8a:49, 203–329). Thus, to be an experimenter was not sufficient to be an experimental philosopher. Nor was it necessary: an adherent of experimental philosophy could act as a propagandist for the movement, or build on observations and experiments performed by others, without replicating them.

Experimental philosophers regarded experiment as the centerpiece of their method for acquiring knowledge of nature. For the more philosophically inclined among them, this naturally led to serious reflection on the nature of experiment itself. Thus, in this period we find the first attempts to develop a philosophy of experiment. Arguably the leading philosophy of experiment that emerged was that of Robert Boyle and Robert Hooke, which derived in part from the writings of Francis Bacon (Anstey 2014).

The most salient feature of the Bacon-Boyle-Hooke view of experiment is the typology of experiments that reflects the various epistemic goals of different types of investigation into nature. Bacon distinguished, in the first place, luciferous from fructiferous experiments. The latter “fruitful” experiments are those aiming primarily to achieve a practical end: for example, the discovery of a new instrument or chymical substance. The former are “light-giving” in so far as

they enable the discovery of underlying causes of natural phenomena. For Boyle, the goal was to discover the ultimate causes of the phenomena under investigation. However, he was content to accept intermediate causes, knowing that a definitive philosophy of nature would take generations to achieve. A more familiar class of experiments was the crucial experiment, an expression coined by Boyle, who was inspired by Bacon's crucial instances, and later popularized by Newton. These are experiments that enable one to choose between two or more competing explanations of a phenomenon. Other types of experiment abounded, but rather than elaborating on them, let us turn to a famous experimental program to help illustrate certain aspects of the centrality of experiments in this new approach to the study of nature. In 1644 Torricelli instructed his disciple Vincenzo Viviani to invert a long, slender, glass pipe, hermetically sealed at one end and filled with mercury, and to place it in a bowl of mercury. What was noticed was that rather than the mercury descending into the bowl, most of it remained suspended in the tube. Moreover, the space above the column of mercury that remained in the tube appeared to be empty. Two questions immediately presented themselves. What is the status of this space in the tube? And what holds the mercury up?

Blaise Pascal was convinced that it was the pressure of the air that held the mercury up and postulated that, if there were less pressure in the air at greater elevations, this could create a variation in the height of the mercury column. He established this with a very famous experiment carried out by his brother-in-law on the Puy du Dôme in 1648. Then, in the late 1650s, Boyle realized that, if he could manipulate the air surrounding the Torricellian apparatus, he might be able to gain a deeper understanding of both the quality of the air that held the mercury up and the status of the space at the top of the tube. He had Hooke construct an air pump that enabled one to extract the air from a large glass receiver into which one could insert a Torricellian apparatus. Using a rack and pinion device, air was extracted from the vessel and a partial vacuum was created. As the air was extracted, Boyle noted that the mercury suspended in the tube began to fall. When he readmitted the air it rose again. Boyle noticed further that there seemed to be a correlation between the amount of air extracted and the drop of the mercury column. It was suggested to him that this might be an inverse proportional relation, so he devised another set of experiments to test this claim. The result of these latter experiments, experiments that did not involve the air pump but rather a J-tube and long pipette, was the first articulation of Boyle's Law: that (at constant temperature) the pressure and volume of the air are in an inverse proportional relation. Boyle explained the suspension of the mercury column and the inverse relation that he had discovered by appealing to a new intermediate cause, namely, the spring of the air (what we now call pressure).

This series of experiments has a number of salient features. First, each experimenter built upon the work and discoveries of their predecessors. Second, instruments and the creation of phenomena that do not naturally occur in nature played a central role. Third, the experiments allowed Boyle (*a*) personally to experience (*b*) singular events, which happened at a specific time and place. The experience of these events was relied upon as (*c*) evidence for a general claim concerning the relation between pressure and volume of the air. This differs from traditional natural philosophers' references to experience, which were mostly (*a*′) based on common opinions, textual sources, or thought experiments about what happens (*b*′) not in specific circumstances, but always or for the most part, and which (*c*′) illustrated, rather than confirmed, general claims.

Fourth, both the status of the space above the mercury column and Boyle's explanation of the cause of the suspension of the mercury were contested, especially by his compatriots Franciscus Linus and Thomas Hobbes. Working from principles of Aristotelian natural philosophy, Linus argued that the column of mercury was held up by an invisible thread-like substance which he called a *funiculus* (Latin for "small rope"). Hobbes, working from his own natural philosophical presuppositions, argued that since vacuums are impossible, the space above the column must be filled with a very fine substance that permeated the glass. What ensued was a philosophico-scientific dispute about experiment construction, interpretation, and about foundational issues in natural philosophy (more detail is given in Shapin and Schaffer 1985).

Of course, the air-pump experiments were not restricted to pneumatics. Boyle's discoveries about the spring of the air enabled him immediately to make a lateral connection with a problem in the physiology of respiration. Boyle was able to solve the long-standing question as to how air enters the lungs: it does so because of a differential in air pressure between the distended lungs and the ambient air. But he did not stop there, for he engaged in a whole new series of experiments on respiration in the air pump, on the transmission of sound and light, on combustion, and other chemical reactions in the evacuated receiver. Nor did the program cease after this first enormously successful series of experiments. Over the following decades he renewed this experimental program and had his laboratory assistant Denis Papin refine the design of the air pump. Moreover, in the first decade of the eighteenth century Francis Hauksbee the Elder, having made significant improvements to the design of the instrument, was able to demonstrate a range of new and exciting phenomena concerning light and electricity with the air pump (Hauksbee 1709).

2 Experimental Philosophy and Experimental Natural History

In the light of the fascinating nature of Boyle's air-pump experiments and the significant advances that they brought about in disparate fields, it is easy to overlook the fact that Boyle himself conceived them as being a small part of a larger overarching project. This is the project of Baconian natural history. Here is how he described them in his *Defence of the Doctrine Touching the Spring and Weight of the Air*:

it was not my chief Design to establish Theories and Principles, but to devise Experiments, and to enrich the History of Nature with Observations faithfully made and deliver'd; that by these, and the like Contributions made by others, men may in time be furnish'd with a sufficient stock of Experiments to ground *Hypotheses* and *Theorys* on.
(Boyle 1999–2000, 3:12)

From the 1660s, the most widespread method by which experimental philosophy was practiced in Britain was the Baconian method of natural history. This was a new form of natural history that, unlike the natural history of the Renaissance, included observations and experiments on all natural phenomena and not merely observations of biological kinds such as plants and animals. Instead it focused on qualities, such as heat and cold, substances, such as the air and mineral water, and states of bodies, such as fluidity and firmness. It involved the collection, ordering and reflection upon experiments and observations pertaining to the subject of the history.

As the passage from Boyle's Preface suggests, experimental philosophers claimed that the compilation of natural histories should precede the establishment of general theories (Boyle 1999–2000, 5:508). They conceived of natural philosophical inquiry as a two-stage process (Hooke 1705, 7), often claiming that we should focus on formulating and evaluating general theories only once a "compleat history of nature" is available (Parker 1666, 45). This might take "little time," as Henry Power thought (1664, 149), or many generations, as Samuel Parker feared. In the meanwhile, the main task of experimental philosophers was gathering facts and organizing them in Baconian natural histories. This task was not wholly disconnected from theory. Experimental philosophers granted that, in order to gather facts through experiments and observations, it is useful to know of the main natural philosophical theories, to put them forward as hypotheses to be tested experimentally, and even to commit tentatively to some of them (see, e.g., Sprat 1667, 107–109, 257). However, they thought that we should only firmly commit to general theories and develop them in detail once we have gathered a large amount of empirical facts that can serve as their basis.

Of course, there were natural philosophers who did not regard their work as coming under the Baconian rubric. A good example is the work on the laws of motion carried out under the auspices of the Royal Society in the late 1660s by Christopher Wren, John Wallis, Christiaan Huygens, and William Neale (see Jalobeanu 2011). However, the vast majority of projects – including Newton’s early work on light and colors (Jalobeanu 2014) – and theoretical articulations of experimental philosophy in the last four decades of the seventeenth century in Britain were conceived as contributions to, or deployed the methods of, this new form of experimental natural history.

Interestingly, some of the early advocates of experimental philosophy on the Continent also conceived of their work broadly within these terms. Thus, the secretary of the Italian Accademia del Cimento described its experiments as an imperfect contribution to “a large *Experimental History*” (Magalotti 1667, sig. +2 4; see Montanari 1980, 539–40; Malpighi 1980, 1100, 1135, 1148–9, 1174, 1182). And in Paris Christiaan Huygens made the following recommendation to Colbert in the early days of the *Académie des Sciences*:

The principal occupation of this assembly and the most useful must be, in my opinion, to work towards a natural history closely following the design of Verulam. This history consists in experiments and in remarks and is the unique method for arriving at an understanding of the causes of all that we see in nature. ... Such a history ... will be a sure foundation on which to base natural philosophy ... (Huygens 1888–1950, 6:95–6; see also 19:268)

There is little evidence, however, that a fully-fledged program of Baconian natural history was ever implemented in the *Académie* in this period.

3 Experimental Philosophy and Medicine

Natural philosophy was not the only domain of knowledge in which this new method was being applied. From the 1660s, many physicians sought to apply experimental methods in therapeutic medicine, and opposition to the entrenched, hegemonic Galenic theory grew apace. Of particular importance here were the chymical physicians, who sought to develop effective chemical remedies and who saw themselves as using the methods of experimental philosophy. An example is the chymical physician Everard Maynwaring, who in the late 1660s described the “compleat” chymical physician as one who “is not only a speculator of truth; but is trained up in Experimental Philosophy, and confirms his notions by Chymical practice and sensible

operations” (Maynwaring 1668, 85). This aspiration continued among many physicians in Britain through to the end of the century (e.g., Colbatch 1696, 142).

Likewise, in Italy, physician Giorgio Baglivi became an enthusiastic advocate of the application of experimental philosophy to medicine. In *The Practice of Physick* he confidently asserts: “Whatever it is that distinguishes the Modern Theory [of medicine] from the ancient Ignorance, ’tis all owing to the Experimental Philosophy of this Age” (Baglivi 1704, 2). Baglivi was particularly taken by the example of the London physician Thomas Sydenham and his emphasis on the writing of natural histories of disease. Baglivi’s emphasis on natural history within medicine (205–30) reflected the widely held methodological preference and practice among natural philosophers for Baconian natural history that we noted earlier. Yet by the end of the century the fortunes of this distinctive form of natural history began to wane.

4 Newtonianism and Experimental Philosophy

There were two reasons for the decline of Baconian natural history in Britain toward the end of the seventeenth century. The first was its inability to produce significant advances in the understanding of nature. As Robert Hooke (1705, 329) put it, “the things so collected [for natural histories] may of themselves seem but like a rude heap of unpolish’d and unshap’d Materials.” More importantly, as the natural historical approach was failing to produce, it was dawning on many that a new method of experimental philosophy had emerged that had generated exciting new knowledge about the cosmos and promised much more. This was Newton’s mathematical natural philosophy as developed in the *Principia* of 1687.

The transition from a natural historical form of experimental philosophy to a Newtonian one is nicely captured in the genre of two books published on the very same subject in consecutive years in the mid-1690s. John Woodward’s *An Essay toward a Natural History of the Earth* (Woodward 1695) is a Baconian natural history of the formation of the Earth. By contrast, William Whiston’s *New Theory of the Earth* (Whiston 1696), published the following year, is written in a mathematical style with lemmata, definitions, and corollaries mimicking Newton’s *Principia*.

Many were convinced that the key development was the application of geometry to natural philosophy, something that they claimed Descartes had failed to do. The Scots Newtonian John Keill pulled no punches about this:

So far was *Des Cartes* from Marrying Physicks with Geometry, that it was his great fault that he made no use at all of Geometry in Philosophy. ... [Descartes] was so far from applying Geometry and observations to natural Philosophy, that his whole System is but one continued blunder upon the account of his negligence in that point. (Keill 1698, 15–16)

Thus, when the first manuals and lecture courses on experimental philosophy began to proliferate in the second decade of the eighteenth century, natural history had virtually no place and the Cartesian vortex theory and Cartesian natural philosophy in general became something of a “whipping boy” of the first-generation pedagogues. The course summaries and lecture notes of Jean Theophilus Desaguliers, William Whiston, and Francis Hauksbee the Elder find no place for experimental natural history, in spite of the fact that they strongly advocate the central tenets of experimental philosophy. Boyle features, not as the writer of natural histories of cold, human blood or the air, but as a seminal contributor to the use of experiment in pneumatics. Desaguliers’ *Lectures of Experimental Philosophy* (Desaguliers 1719) is a case in point. These lectures from c.1713 contain much material from Newton as well as direct borrowings from Boyle’s corpuscular matter theory, and extended discussion of his air-pump and pneumatic experiments, but no reference at all to natural history (Anstey 2015).

The *locus classicus* for the marriage of experimental philosophy and Newtonianism, however, appears in Roger Cotes’ preface to the second edition of Newton’s *Principia*. Cotes was appointed Plumian Professor of Astronomy and Experimental Philosophy at Cambridge in 1707. In his preface to the *Principia*, he distinguishes between three types of natural philosophy: “the whole of Scholastic doctrine derived from Aristotle and the Peripatetics,” “[t]hose who take the foundation of their speculations from hypotheses,” and “those whose natural philosophy is based upon experiment” (Newton 1999, 385–6). Needless to say, Cotes claims that Newton pursues the latter and he goes to great lengths to dismiss the vortical speculations of Descartes and his followers.

5 Experimental Philosophy in Eighteenth-Century Holland and France

In Britain, Newtonianism and experimental philosophy were popularized by pedagogues through their public lectures and publications. The Netherlands followed suit. Experimental methods in natural philosophy were first taken up in the Netherlands in the last decade of the seventeenth century by Buchard de Volder (1643–1709), but it was not until the second decade of the

eighteenth century that experimental philosophy was to become a phenomenon of Dutch intellectual life. In 1715 Willem 's Gravesande visited London, where he met Desaguliers and attended the Royal Society. Around this time 's Gravesande took up Newtonianism and two years later was appointed as Professor of Mathematics and Astronomy at Leiden. Then, in the 1720s, both he and Pieter van Musschenbroek published influential textbooks of Newtonian natural philosophy ('s Gravesande 1720–1721; Musschenbroek 1726), which became leading conduits for the dissemination of Newtonian experimental philosophy throughout the Continent and in Britain.

In France, an open and unabashed commitment to experimental philosophy came surprisingly late. There is no doubt that experiment was a crucial feature of French natural philosophy in the 1630s and 1640s, before the emergence of experimental philosophy in England. One only need turn to the work of Marin Mersenne, Pascal, Jean Pecquet, Gilles de Roberval, and even Descartes (who resided in the Netherlands for much of his philosophical maturity). Moreover, the salons of Henri Louis Habert de Montmor and others played an important role in demonstrating and promoting experiment (Roux 2013, 58–72). However, in the final four decades of the century, it is difficult to find one French natural philosopher who openly identified himself as an experimental philosopher. Many of the neo-Cartesians, such as Jacques Rohault, performed experiments, but they did this with a view to confirming particular principles of Cartesian natural philosophy (see e.g., Rohault 1671 and Easton 2013 on Robert Desgabet). This may well have been a factor in the absence of an identifiable movement of experimental philosophers in France in the latter decades of the seventeenth century. Even Huygens and Edme Mariotte, two of the most gifted experimenters of the *Académie*, are difficult to classify as experimental philosophers, though in Huygens' case there is little doubt that he was viewed as such in England. The philosopher John Locke (1975, 9) regarded Huygens as one of the “Master-Builders” of the age in the same company as Newton and Boyle.

It seems that it was not until the mid-1730s that experimental philosophy was openly embraced in France. From that point, though, the French would become its chief exponents and promoters. A number of factors coalesced to usher in experimental philosophy to France in the 1730s. In 1734, as 's Gravesande had done nearly two decades before, Abbé Nollet, a protégé of the influential savant René Antoine Réaumur, visited England and came under the influence of Desaguliers. He also visited 's Gravesande and Musschenbroek in the Netherlands and returned to Paris a committed experimental philosopher determined to emulate their pedagogical activities. His first lecture course in experimental philosophy was advertised in his *Course of Experimental Natural Philosophy* of 1735 and followed by his *Programme or General Sketch of a Course of*

Experimental Philosophy which appeared in 1738 (Nollet 1735, 1738). Meanwhile, Voltaire, having returned from England and having embraced Newtonianism, began to trumpet the virtues of both. In his *Philosophical Letters*, he paints Francis Bacon as the “Father of experimental Philosophy”:

[N]o one, before the Lord *Bacon*, was acquainted with experimental Philosophy, nor with the several physical Experiments which have been made since his Time. ... In a little Time experimental Philosophy began to be cultivated on a sudden in most Parts of *Europe*. (Voltaire 1999, 51–2)

From the mid-1730s the adoption of experimental philosophy proceeded apace, so much so that by 1739 one writer could speak of experimental natural philosophy [*physique expérimentale*] as that “which is today so *à la mode*” (Anon. 1739, 101). And by the mid-eighteenth century it had become commonplace in France to distinguish between experimental and speculative natural philosophy. The *Philosophical Dictionary* of 1751 states that natural philosophy [*physique*] is

experimental or conjectural. Experimental natural philosophy is certain knowledge; conjectural natural philosophy is often nothing more than ingenious. The one directs us to truth; the other leads us to error. (Anon. 1751, 261; see also Diderot 1754, 53–5)

Institutional endorsement for experimental philosophy came in 1753 with the establishment of the first chair in experimental philosophy, held by Nollet, who was appointed as Royal Professor of Experimental Natural Philosophy at the College de Navarre.

6 Experimental Philosophy and Moral Philosophy

Close ties between experimental natural philosophy and both medicine and religion had existed almost from the outset, but it took far longer for the movement to make inroads into other branches of philosophy. Perhaps the first move in this direction was in the study of the understanding. In the scholastic divisions of knowledge, *intellectus* had normally been a subject within natural philosophy, so it was to be expected that when John Locke wrote his *Essay concerning Human Understanding* (1975, 44), it should be written using the “Historical, plain Method” of the new experimental philosophers. Indeed, it is not unreasonable to view Locke’s *Essay* as the first of many experimental approaches to the understanding that would be published in Britain, France, and Germany until the late eighteenth century (see e.g., Helvétius 1758; Flögel 1778). Locke’s foray into what we now call psychology and philosophy of mind set a precedent

that was to be taken up by many philosophers in the eighteenth century as they began to pursue what Hume (2007, 1:4) called “the application of experimental philosophy to moral subjects.”

It is well known that Hume portrayed his “science of man” as modeled on Newton’s natural philosophy. However, Hume is only one of several Scottish authors who sought to “account for Moral, as the great *Newton* has taught us to explain Natural Appearances” (Turnbull 2005, 1:5). They include Francis Hutcheson (2002, 35), George Turnbull, regent of Marischal College in Aberdeen in the 1720s, his successor David Fordyce (2003), and his pupil Thomas Reid (2010). Hume and Reid, in turn, deeply influenced German philosophers. In the 1760s and the 1770s, numerous German writers praised “observational philosophy” [*beobachtende Philosophie*], as they called experimental philosophy (e.g., Tetens 1913, 56–7), and they followed its method in the study of the mind and morals (Macor 2011).

Given the differences between Hutcheson’s, Hume’s, and Reid’s moral philosophies, it would be hard to outline an even minimal moral theory endorsed by all experimental moralists, although most of them (but not Reid) endorsed sentimentalist views. Their application of Newtonianism to ethics resulted in shared views not on its content, but on its method. Like their natural philosophical counterparts, experimental moralists claimed to “reject every System of Ethics ... that is not founded on Fact and Observation” (Hume 1998, 7), but on hypotheses “not sufficiently confirmed by experience” (Turnbull 2005, 1:8), “imaginary suppositions” (62), or “a general abstract Principle,” that is “afterwards branch’d out into a Variety of Inferences and Conclusions” (Hume 1998, 6). Experimental moralists conceived of ethical inquiry as a two-step process that follows “the fair impartial way of experiment, and of reasoning from experiment alone” (Turnbull 2005, 1:10). The first step is making experiments and observations to establish facts concerning “all our moral powers and faculties, dispositions and affections, the power of comparing ideas, of reasoning or inferring consequences, the power of contracting habits, our sense of beauty and harmony, natural or moral, the desire of society, &c” (53). In this context, “Fact and Observation” (Hume 1998, 7) or “experiment and fact” (Turnbull 2005, 2:472) were often employed interchangeably. The second step is reasoning from experiments to “principles known by experience to take place in, or belong to human nature” (1:63). These included descriptive as well as normative principles, namely, the “Rules for becoming *virtuous* and *happy*” (Fordyce 2003, 5).

How one can get from facts to normative principles is a notoriously thorny issue, which we will not discuss (see Spector 2003). Another issue concerns the so-called experiments that are supposed to establish the facts from which principles must be derived. They are not physical

experiments and, in many cases, not even thought experiments, but introspective mental acts. Turnbull (2005, 1:145–6) provides a representative example:

I am apt to think, that every one shall immediately perceive, that he has a moral sense inherent in him, and really inseparable from him; if he will reflect, “Whether he is not so constituted as to be necessarily determined by his nature, to approve and disapprove of certain affections and actions?”

Like Hutcheson, Turnbull was “apt to think” that everyone else perceives what he did because he held “that what one observed in the self enacted God’s laws” and “design” (Poovey 1998, 184, 192). In the light of the strong links between experimental philosophy and theology, Turnbull’s reliance on God’s design should not surprise. However, not all experimental moralists were theists and even some theists knew how easy it is to mistake individual, idiosyncratic, introspective experiences for those which are shared by most or all people. As Reid noted, “[i]t is his own mind only” that anyone “can examine, with any degree of accuracy and distinctness” (Reid 1997, 13). Nevertheless, Reid believed that we can establish universally true conclusions on the basis of introspection, as long as we proceed with “great caution, and great application of mind” (15). Turnbull too was confident that anyone who introspected carefully would confirm his conclusions, although his “experiments and observations ... focused almost exclusively on himself” (Poovey 1998, 192). Yet, to current-day readers, these so-called experiments look suspiciously similar to the armchair speculations that old and new experimental philosophers claimed to eschew.

Experimental moralists could have avoided this relapse into speculation by following the recommendations of the German experimental philosopher Johann Georg Heinrich Feder (1779–1793, 1:12): that is, by communicating the results of their introspective experiences to one another, so as to provide an empirical basis for generalization; by creating a large store of psychological case studies by writing the history of their “heart,” “character, and passions” (14), along with any relevant biographical details; and by employing “biographies, travel reports” and histories of other cultures as “the foundation of a stable, useful philosophy” (16). Experimental moralists could also have relied on “a cautious observation of human life” and “men’s behaviour in company, in affairs, and in their pleasures,” as Hume (2007, 1:6) recommended, and draw additional information from the imaginative exercises prompted by pictures and poems, as Turnbull (1740, 145–7) noted. Suggestive as they are, these recommendations gave rise to no large-scale, systematic, or cross-cultural empirical study of people’s introspective experiences or

moral intuitions. In the end, early modern experimental moral philosophy was far more speculative than what current-day empirically informed philosophers would wish for.

7 The Eclipse of Early Modern Experimental Philosophy

Early modern experimental philosophy was never universally accepted. It encountered opponents such as Meric Casaubon, Margaret Cavendish, Henry Stubbe, John Sargeant, and even the Newtonian John Keill. Nor was its method regarded as universally applicable. Some authors, like Locke, endorsed experimental philosophy only within certain areas (e.g., natural, but not moral philosophy), whereas others combined their experimentalism with other commitments, like Denis Diderot who endorsed experimentalism (1754) as well as eclecticism (2010). Despite these caveats, the foregoing has shown that experimental philosophy was a very influential development in the early modern period. It provided a framework for the research carried out by scores of authors in several European countries between 1660 and 1800, including highly influential doctrines like Newton's natural philosophy, Locke's theory of the understanding, and Hume's moral philosophy.

In light of this, it is perplexing that the very existence of experimental philosophy as a movement is only known by some specialists and is mentioned rarely, if at all in recent histories of philosophy, let alone in the comments of empirically informed philosophers on the historical antecedents of their views. We do not yet have a comprehensive, in-depth understanding of what caused the demise of experimental philosophy, which appears to have taken place in the first half of the nineteenth century. We can, however, explain why experimental philosophy, still prominent in the nineteenth-century histories by Dugald Stewart (1854) and Thomas Morell (1827), is left out of the standard twentieth-century historiographical narrative of early modern thought.

This narrative portrays the early modern period as dominated by the rationalism of Descartes, Spinoza, and Leibniz and the empiricism of Locke, Berkeley, and Hume. The narrative ends with Immanuel Kant's synthesis of empiricism and rationalism, that crowns the early modern period and opens the door to the new age of post-Kantian idealism.

Typically, the countless manuals and survey courses which follow the standard narrative do not even mention experimental philosophy. They employ the notion of empiricism which, in its traditional form, is often defined in terms of two claims: all concepts have empirical origins and all substantive knowledge is confirmed by experience. The latter claim does capture a central

methodological view of early modern experimental philosophy, as it was characterized at the beginning of this chapter. Nevertheless, there are two notable differences between the historiographical notion of empiricism, in its traditional form, and the commitments of early modern experimental philosophers. First, empiricism is often associated with the rejection of innate ideas. Experimental philosophy as such did not involve any commitment to the empirical origins of our ideas. This was only a concern of some experimental philosophers, like Locke and Hume. Others, like Robert Boyle, who was regarded by many as the experimental philosopher *par excellence*, advocated innate ideas (Boyle 1999–2000, 9:387). Second, the post-Kantian notion of empiricism is standardly associated with the British triumvirate of Locke, Berkeley, and Hume. Locke and Hume certainly endorsed experimental philosophy, but Berkeley never explicitly identified with the movement. A comment in his early *Philosophical Commentaries* seems to capture his view of the relation between the metaphysical position that dominates his philosophy, immaterialism, and the new movement: “Experimental Philosophers have nothing whereat to be offended in me” (Berkeley 1948–1957, 1:51).

The standard narrative was progressively shaped by Kant (Vanzo 2013), Karl Leonhard Reinhold, and Kantian historians of philosophy like Johann Gottlieb Buhle and Wilhelm Gottlieb Tennemann (1798–1819). It is Kant who introduced what we called earlier the traditional form of the notion of empiricism. In the 1770s and early 1780s, before Kant’s first *Critique* was published in 1781 and became influential, many German intellectuals sympathized with experimental philosophy and the philosophies of Hume and Reid. This changed rapidly in the late 1780s and early 1790s, when Kantianism and post-Kantian idealisms became successful. In these years, Kant and his disciples engaged in a debate with advocates of experimental philosophy such as Feder, Hermann Andreas Pistorius, and Christian August Selle (Sassen 2000, e.g., 231–69). The debate popularized the Kantian equation of experimental philosophy with empiricism that was accepted by both parties. Over the 1790s, Kantian and post-Kantian idealisms came to dominate the philosophical scene and their popularity eclipsed experimental philosophy within Germany. As this happened, the pre-Kantian notion of experimental philosophy came to be replaced with the Kantian notion of empiricism within German philosophical debates.

Over the nineteenth and early twentieth centuries, the Kantian account of the history of philosophy spread to the English-speaking world and eventually became standard. This happened slowly, and it was by no means a simple shift from a narrative based on experimental philosophy to the Kantian narrative revolving around empiricism and rationalism. Several alternative narratives had some success in the nineteenth century, such as the account of Victor Cousin and J. D. Morell, George Henry Lewes’ positivist narrative, and the Hegelian narrative popularized by

Albert Schwegler and Johann Eduard Erdmann (see, e.g., Cousin 1840; Lewes 1845–46; Schwegler 1847). It is only at the turn of the twentieth century, once the Kant-inspired narrative became standard in textbooks and classrooms, that the English-speaking philosophical community generally converged on a single historiography – one that was based on the contrast between empiricism and rationalism and failed to pay attention to early modern experimental philosophy. Only in recent years, when criticisms of that account became widespread, did scholars start to appreciate the significance of early modern experimental philosophy as a historical movement quite distinct from the historiographical notion of empiricism.

8 Early Modern Experimental Philosophy and Contemporary x-phi

As will be clear from the foregoing, early modern experimental philosophy is not a version of contemporary experimental philosophy. Rather, it is one of its historically distant relatives within the family of movements that give pride of place to observation and experiment. There are two salient family resemblances, however. First, current-day experimental philosophy emerged as an attempt to replace assumptions about the content of people’s linguistic intuitions with the results of empirical inquiries on the content of those intuitions. Similarly, early modern experimental philosophy emerged as an attempt to replace natural philosophical systems derived from untested general principles with systems built on substantial observational and experimental foundations.

Second, old and new experimental philosophers share similar attitudes toward speculative, *a priori* reflections. Some current-day experimental philosophers seek to identify reliable, universally shared intuitions which provide “a proper evidential foundation” for philosophical analysis, traditionally conceived (Alexander and Weinberg 2007, 61). Similarly, several early modern experimental philosophers, especially among the proponents of the two-stage method of Baconian natural philosophy, thought that empirical research would establish the principles for a strictly demonstrative natural philosophy. Other experimental practitioners, like the Italian naturalist Francesco Redi, steered clear of issues concerning matter theory, metaphysics, and epistemology, and regarded the extension of our knowledge of natural phenomena as an end in itself (Baldini 1980, 427–9, 450). They had the same attitude of those among current-day experimental philosophers who seek to achieve a better understanding of our intuitions and the psychological processes underlying them not in view of a philosophical payoff, but because they regard this as a valuable inquiry for its own sake, and are more engaged in cognitive science than philosophy as it is traditionally understood (Knobe 2007b, 89–91).

Yet crucial differences between early modern experimental philosophy and its contemporary relative remain. In the first place, current-day experimental philosophers can simply borrow practices that are well established within psychology. By contrast, early modern experimental philosophers, especially those engaged in the study of nature, had to develop their own empirical methods of inquiry, though they could partly rely on medical and chymical models (Frank 1980, Newman and Principe 2002). Moreover, the methodology of early modern experimental philosophy emerged at a time when the philosophy of science was in transition from a scholastic conception of the knowledge of nature as a form of *scientia* – a systematic body of demonstrative knowledge (Sorell, Rogers, and Kraye 2010) – to a more fallibilist conception. It included a cluster of attempts to articulate the relation between experiment and theory that preceded the emergence of more familiar methodological stances such as the hypothetico-deductive method. The anti-hypothetical, anti-speculative, and anti-theoretical elements within the early modern movement could only be sustained in the absence of a philosophically sophisticated theory of, say, the role of hypotheses in scientific reasoning. Thomas Reid's comment in 1780, that a mistrust of hypotheses "is the very Key to Natural Philosophy, & the Touchstone by which every thing that is Legitimate & Solid in that Science, is to be distinguished from what is Spurious and Hollow" (Reid 2002, 140), is simply unsustainable after the work of the likes of William Whewell in the nineteenth century.

Another discontinuity, one that has been alluded to but not developed in this chapter, is that from the outset early modern experimental philosophy was in many quarters (though not everywhere, for instance not in Italy) closely allied to religion, whereas this is not the case with contemporary ϕ . In the seventeenth and early eighteenth centuries, many prominent experimental philosophers argued that this new method of knowledge acquisition was both an effective means for developing Christian character, the Christian virtuoso, and that it could be used in Christian apologetics. This is seen most famously in the Boyle Lectures commencing in 1692 and even in the General Scholium of the second edition of Newton's *Principia* of 1713 (Newton 1999, 939–44). One can hardly imagine a book like Joseph Glanvill's *Philosophia Pia: or a Discourse of the Religious Temper, and Tendencies of the Experimental Philosophy* (Glanvill 1671) being published by a practitioner of contemporary experimental philosophy!

Do the discontinuities outweigh the continuities? In our view the question is moot. For it is in the very act of comparing that one can come to appreciate the uniqueness and significance of early modern experimental philosophy and the value and prospects of the contemporary movement.

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