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ÉMILIE DU CHÂTELET
Feminism, Epistemology and Natural Philosophy

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Introduction

It is not hard to find examples of robust feminism in early modern philosophy, especially in philosophy that connects with ethical and social-political questions, but also in epistemology, metaphysics and natural philosophy (e.g. Broad and Detlefsen 2018; Thomas 2018). Émilie Du Châtelet (1706–1749) produced much excellent philosophical work in her lifetime, including works in natural philosophy—physics, optics and experimental work on the nature of fire—metaphysics and value theory, broadly conceived. Throughout her lifetime, and across all forms of her philosophical engagement, she displayed, in both the explicit written word and in her actions, an acute understanding of the ways in which her work was impacted by her being a woman. From her discussion of the long-term impact upon women’s minds of limited early opportunities in education (Detlefsen 2017; Gardiner 1984) to her exclusion from institutions such as the Académie Royale des Sciences (Detlefsen forthcoming), Du Châtelet was alert to the obstacles as a result of her gender to her full participation in public intellectual life in France in the mid-eighteenth century, including in the sciences.

This essay examines some aspects of Du Châtelet’s feminism as expressed in her natural philosophy—the closest early modern analogue to contemporary science. One broad way in which feminism is manifest in the philosophy of science is the myriad of ways in which science has been theorized by feminists, for example, by bringing feminist insights to epistemology in science. A second broad way in which feminism is manifest in science is on display when women engage in science, producing first-rate scientific work. My goal is to start with one of Du Châtelet’s contributions to feminist theorizing about epistemology, including proper modes of knowing in science (an example of the first broad approach just noted), and then show how her theorizing in this way led to her top-drawer innovations in the scientific enterprise (an example of the second broad approach just noted).1

The chapter unfolds as follows. First, I examine Du Châtelet’s early contributions to a topic in epistemology now known as the ethics of belief. Du Châtelet’s entrance into this topic starts with her concerns about human bias when it comes to thinking about women, but she also extends her ideas to bias in science. In the next section, I introduce a debate that was at the forefront in various scientific communities in early modern Europe, including in Du Châtelet’s milieu in mid-eighteenth-century France, namely the debate between speculative and experimental philosophy. I focus on this debate in part because it exposes the failure on behalf of many scientific practitioners to abide by the dictates of the kind of ethics of belief, which Du Châtelet espouses.
Moreover, this debate exposes a strange (to us) chapter in the history of science, a chapter in which many of those who embrace a commitment to experimental natural philosophy—experimental science—eschew the use of hypotheses in scientific practice. I then turn to a consideration of how Du Châtelet practices ethical belief formation in her own scientific practice as found in her masterwork, *Foundations of Physics* (hereafter *Foundations*). Specifically, I show how she refigures the landscape in the on-going debate between experimental and speculative natural philosophers because of her commitment to minimizing bias in her thinking. As a result, and as I argue in the final section of this chapter, Du Châtelet occupies a central role in the history of the integration of hypotheses into scientific practice, much out of step with her own time, and much in line with science as it would emerge in our contemporary world.

**Du Châtelet and the Ethics of Belief in Theory: Bias, Women, Science**

As a highly talented woman with especially notable abilities in mathematics and metaphysics, it is little wonder that Du Châtelet would be alert to biases against women and their intellectual capacities that might arise from a failure to examine such biases, that is, it is little wonder that she would be alert to ethical failures with respect to belief formation about the nature of women. Among her earlier writing—from the second half of the 1730s before she turned her attention full-force to metaphysics and physics—are those in value theory, including her Preface to her translation to Bernard Mandeville’s *Fable of the Bees* and her posthumously published *Discourse on Happiness*. In both texts, she offers forceful discussions about the unexamined beliefs that many people hold about women, and the cost to women’s lives, especially their intellectual lives.

In her Preface to *Fable of the Bees*, for example, she writes:

> Let us reflect briefly on why for so many centuries, not one good tragedy, one good poem, one esteemed history, one beautiful painting, one good book of physics, has come from the hands of women. Why do these creatures, whose understanding appears in all things equal to that of men, seem for all that, to be stopped by an invincible force on this side of a barrier; let someone give me some explanation, if there is one. . .. As for me, I confess that if I were king. . . I would allow women to share in all the rights of humanity, and most of all those of the mind. Women seem to have been born to deceive, and their soul is scarcely allowed any other exercise. . ..

> I am convinced that many women are either ignorant of their talents, because of flaws in their education, or bury them out of prejudice and for lack of a bold spirit. What I have experienced myself confirms me in this opinion . . ..

> I hold myself to be quite fortunate to have renounced in mid-course frivolous things that occupy most women all their lives, and I want to use what time remains to cultivate my soul . . ..

*(Zinsser 2009: 48–49)*

In *Discourse on Happiness*, she acknowledges again the constraints women labor under as a result of institutional forces, especially the lack of education which deprives women of their natural ability to think well (Zinsser 2009: 357), and in the *Discourse* she expands on the meaning and power of prejudice. She writes, for example, that our very happiness relies upon our ability to free ourselves from prejudice, and she pointedly notes that responsibility for freeing ourselves from prejudice lies with the individual believer:

> [A] source of happiness is to be free from prejudices, and the decision rests with us to rid ourselves of them. We all have a sufficient share of intelligence to examine things that others want to
oblige us to believe.... Prejudice is an opinion that one has accepted without examination, because it would be indefensible otherwise. Error can never be a good thing, and it is surely a great evil in the things on which the conduct of life depends.

(Zinsser 2009: 352, emphasis added)

Du Châtelet’s (surely overstated) claim in the first passage quoted earlier that women have not contributed to the intellectual goods of history leads her to an analysis of why this is the case. Women have been deprived of a first-rate education, they have been so deprived because they are assumed to be naturally, essentially different from men in that their souls are prone to focus on deception and frivolity, and this prejudice has conditioned women’s lives both in the form of social institutions that offer few options for women’s intellectual activity and in the form of women internalizing these prejudices about themselves. Du Châtelet speaks from first-person knowledge of these prejudices about the nature of women, and of her own liberation from these internalized prejudices. Fundamental in this account is the unexamined, untested assumptions and prejudices about women’s natures. That is, fundamental in this account is a collective, societal failure2 to hold beliefs that have been duly examined, and that are thus ethically held. The second passage quoted shifts focus to the individual’s responsibility to use their wholly adequate intellectual capacities to examine, question, and where relevant reject, prejudices which are shown through examination to be false. This is at the core of an ethics of belief: the individual’s ethical responsibility to be responsible in the methods of belief formation, such that those beliefs that one does hold are not clearly erroneous beliefs.

Du Châtelet may start with unethically formed and thus unethically held beliefs about women, their natures and talents, but she extends her ethics of belief to other facets of human intellectual life as well, including science. In 1740, she published what we now understand to be her masterful contribution to the history of natural philosophy, even if we are still coming to grips with the depth and breadth of her extraordinary contributions to our history of science in that text.3 She opens the work, in the Preface, by indicating that it is intended as a textbook for her son—even though it is far more ambitious in intent and accomplishment than that, going well beyond in philosophical and technical sophistication, as well as in originality, the standard popularizations of Newton, sometimes significantly simplified “for the ladies” (Hutton 2004a, 2004b; Zinsser 1998). Writing to her son, she begins:

I have always thought that the most sacred duty of men was to give their children an education that prevented them at a more advanced age from regretting their youth, the only time when one can truly gain instruction. You are, my dear son, in this happy age when the mind begins to think . . .

You must early on accustom your mind to think, and to be self-sufficient. You will perceive at all times in your life what resources and what consolations one finds in study, and you will see that it can even furnish pleasure and delight . . .

Guard yourself, my son, whatever side you take in this dispute among philosophers [Newton and Descartes], against the inevitable obstinacy to which the spirit of [national] partisanship carries one; this frame of mind is dangerous on all occasions in life; but it is ridiculous in physics [and] the search for truth . . .


Once again, Du Châtelet underscores the importance of education, especially in youth, but there is also the importance of an ethics of belief coursing through these paragraphs. She implies that one’s own mind and one’s own thoughts can and ought to belong to oneself in the sense that they can and ought to be within our self-control and free from inappropriate external influence. This
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is implied by her urging her son to accustom his mind early on to be “self-sufficient”, and her later cautioning that he avoid falling prey to believing something due to a nationalist sentiment. Du Châtelet also indicates that there are ethical duties associated with the cultivation of such minds. It is a parent’s duty to develop such a mind in her child. But also implicit in this passage is the idea that individual thinkers have an ethical duty to make use of their well-educated minds both to cultivate their own happiness and more importantly, perhaps, to avoid falling prey to factors—such as nationalist sentiments—which negatively influence the pursuit of truth.

It is true that the idea of an ethics of belief entered into Western philosophical thought under that moniker only in the late nineteenth century. The idea was made famous by William K. Clifford in his paper “The Ethics of Belief” (Clifford 1879), in which he stated a stark, robust and unforgiving principle: “It is wrong always, everywhere, and for anyone, to believe anything on insufficient evidence”. He adds: “It is wrong always, everywhere, and for anyone to ignore evidence that is relevant to his beliefs, or to dismiss relevant evidence in a facile way”. And: “It is never lawful to stifle a doubt; for either it can be honestly answered by means of the inquiry already made, or it proves that the inquiry was not complete”. Any other method of belief-formation and belief-holding is “one long sin against mankind” (Clifford 1879: 346).

But while the theory receives its name—“the ethics of belief”—only in Clifford’s paper, the concept appears frequently throughout the early modern period. Perhaps most famously, both Descartes and Hume endorse an ethics of belief, and in both cases, this is tied with science. In Descartes’ case, his arguments for an ethics of belief show up most notably in the Fourth Meditation, where he argues that blame for human errors in matters of mathematics and in the metaphysical foundations of physics lies squarely with humans, that is, due to our overreach in how we hold our beliefs. If only we withheld our assent in the case of beliefs that we don’t hold clearly and distinctly, because we have not yet subjected them to proper examination, we would not go wrong. But we do assent to beliefs held without proper examination; we do hold beliefs on the basis of insufficient evidence. As a result, we err, and when we err in mathematics and metaphysics, we have set rotten foundations for our sciences (Descartes 1964–1976, IX: 42–50).

In Hume’s case, his arguments for an ethics of belief show up most notably in his chapter “On Miracles” of his Enquiry Concerning Human Understanding (Hume 1993), where he interrogates the human tendency to ignore countless previous examples of nature’s laws when faced with a single counter example—a tendency that we especially find when religious iconography and poor early education come together. To use an example not used by Hume himself, but which captures his point, a marble statue of Jesus bleeding at the palms can lead the ill-educated to ignore all previous examples of marble that does not bleed in favor of declaring a miracle. These are troubling tendencies to be contrasted with the laudable mindset of the appropriately skeptical scientist. No scientist would declare a miracle in the face of evidence that counters a hitherto believed law of nature. Rather, the scientist, as an ethical belief seeker, would take such confounding evidence as an opportunity to gain more knowledge about the natural world. Moreover, the scientist’s epistemetic attitude is a model for us all.

Du Châtelet is in this early modern tradition of philosophers who connect belief formation with ethical responsibility, and she carves out her own territory on this issue. All three thinkers—Descartes, Hume and Du Châtelet—have authoritarian targets in their crosshairs, albeit different targets in each case. Descartes targets the Scholastics and their scientifically-unhelpful metaphysics. Hume targets religious authorities. Du Châtelet targets broad-based societal prejudices about women and their natures, as well as nationalistic prejudices related to scientific practices. What all three do have in common is a fiercely held commitment to education for all humans, as the source both of evidence and of self-ownership of the mind, amongst the surest guards against authorities who would use the gullible to propagate untruths, whether they be untruths about the natural world, or untruths about the social world, including women, their natures and social roles.
So, Du Châtelet starts with feminist concerns about people’s failure to be ethical belief formers and holders, having experienced first-hand the deleterious effects of such beliefs upon her own life. She then extends these concerns more broadly to epistemology and guarding against bias in science. What does her commitment to an ethics of belief in science do for her?

**Speculative and Experimental Natural Philosophy**

Du Châtelet’s admonishment to her son in the Preface to her *Foundations* is not just a theoretical posture for her. Indeed, she herself is admirably even-handed and skeptically minded when it comes to her scientific work and attitudes. If I were to speculate, I might wonder if her status as a woman—both as one who bore the brunt of prejudices against her intellectual capacities and as one who was kept on the outside of powerful scientific institutions—is especially key in her skeptical attitude toward the status quo. Whatever the source, she follows her own advice to her son, specifically by “guarding herself against the inevitable obstinacy to which the spirit of national partisanship” might carry her in the dispute among Newtonian and Cartesians. To show one especially powerful example of this, I turn to one way of characterizing scientific culture in early modern Europe that has gained some currency lately. This is Peter Anstey’s framework (Anstey 2005), according to which those engaged in natural philosophy in the seventeenth and eighteenth centuries distinguished between two camps, namely speculative and experimental natural philosophers.

Anstey offers this meta-narrative as a replacement of the old rationalist-empiricist framework, which dominated Western research of philosophy in the early modern period for a significant portion of the nineteenth and virtually all of the twentieth century. Anstey believes that his meta-narrative more faithfully tracks the ways in which the early modern actors themselves saw their work. I must confess a wariness of any grand narrative, for—and, indeed, the following account of Du Châtelet only serves to underscore this point—they can result in an obscuring of the true diversity of thought. Still, Anstey’s theory does capture something important about the zeitgeist of the scientific community in early modern Europe, and at the least, his theory captures something important about Du Châtelet’s immediate intellectual milieu.

In one early paper on the distinction between speculative and experimental natural philosophy, Anstey’s focus is on early modern England, and he argues that the distinction “is found in many different English writers in the latter half of the seventeenth century” (Anstey 2005: 215). In that paper, he aims to establish:

...five strong claims regarding this distinction:

1. This distinction is in evidence, in some form or another, from the late 1650s until the early decades of the eighteenth century.
2. This distinction provides the primary methodological framework within which natural philosophy was interpreted and practiced in the late seventeenth century.
3. This distinction is independent of disciplinary boundaries within and closely allied to natural philosophy.
4. This distinction crystallized in the 1690s when opposition to hypotheses in natural philosophical methodology intensified.
5. This distinction provides the terms of reference by which we should interpret Newton’s strictures on the use of hypotheses in natural philosophy (Anstey 2005: 216).

As evidence for the distinction, Anstey provides a wide range of examples from natural philosophers in seventeenth-century England, and here are two, which underscore the fourth point...
regarding hypotheses in Anstey’s list, the point I shall return to near the end of this section of the chapter, and throughout the next section. Isaac Newton writes:

Experimental Philosophy reduces phenomena to general Rules & looks upon the Rules to be general when they hold generally in Phenomena . . .. Hypothetical Philosophy consists in imaginary explications of things & imaginary arguments for or against such explications . . .. The first sort of Philosophy is followed by me, the latter too much by Cartes, Leibniz and some others.


And William Wotton writes:

I do not here reckon the several Hypotheses of Des Cartes, Gassendi, or Hobbes, as Acquisitions to real Knowledge, since they may only be Chimaera’s and amusing Notions, fit to entertain working Heads. I only alledge [sic] such Doctrines are raisied upon faithful Experiments, and nice Observations . . .

(Wotton 1694: 244)

Anstey expands on his conclusions reached in this early paper in subsequent publications aimed at showing the thoroughgoingness of this distinction in early modern European natural philosophy (e.g. Anstey 2014; Anstey and Vanzo 2012).

Whatever could be said in general about a pan-European trend on this question, it is certainly the case that Voltaire, in his laudatory Elements of Newton’s Philosophy, draws a very bright line between the old (French) way of hypotheses, exhibited by Descartes, and the new (British) way of hard-headed experimentalism. Throughout his text, he contrasts Descartes and Newton along the lines roughly articulated by Anstey to Newton’s benefit and Descartes’ detriment. This is an interesting moment in mid-eighteenth-century France for my purposes, and for two reasons. First, while he himself does not fall in with nationalistic prejudices about his own nation, Voltaire does believe that the British are the leaders of the scientific game on the role of experiment, and that the French, bogged down in fanciful hypotheses, had better catch up. Du Châtelet is far more subtle and nuanced in her thinking on this point, and I return to this in the final section of the chapter. Second, for decades, Du Châtelet’s thought was assimilated to Voltaire’s thought, and she was seen as merely derivative of this man with whom she lived and worked for years (e.g. Barber 1967). This evidence-free claim has since been debunked by close examination of her own work, and her scientific methodology, including on this point about hypotheses, is a case in point. Both points connect with her following a robust ethics of belief.

On the divide between speculative and experimental natural philosophy and the supposed hostility of experimental natural philosophy to the use of hypotheses, Voltaire writes: “Note that all experience and calculation ruin almost all Descartes’ ideas when this great philosopher bases these ideas only on hypotheses. These are bright and misleading perspectives the brightness of which diminishes as we approach them” (Voltaire: 337, notes to lines 50–57). And when accepting Newton’s theory of gravity, whilst also rejecting Descartes’ theory based upon vortices, Voltaire writes:

It is true that they [those who embrace vortex theories of gravity] have given no proof of this assertion: there is not the slightest experience, not the slightest analogy in the things we know, which can establish the slightest presumption in favor of this whirlwind of subtle matter; thus from this lack of empirical evidence alone, this system is a pure hypothesis; it must be rejected. It is, however, by this alone that he [Descartes] has been accredited. This vortex was conceived without effort, a vague explanation of things, given by pronouncing this claim
of subtle matter, and when philosophers felt the contradictions and absurdities attached to this philosophical fiction, they thought of correcting it rather than abandoning it.

(Voltaire [1738] 1992: 401)

In fact, by the time Du Châtelet put pen to paper in order to tackle the natural philosophy related to gravity in her Foundations,6 Descartes’ star had faded in her immediate intellectual circle, eclipsed by Newton’s natural philosophy. Voltaire’s attitude throughout his Elements of Newton’s Philosophy captures the attitude, which Du Châtelet has in mind when she cautions her son to resist partisanship in science and to think for himself.

Three points are worthy of note as background to an investigation of what Du Châtelet herself goes on to do with her own resistance of such partisanship, and with her own skepticism of attitudes of those in her intellectual milieu. First, as Anstey has well documented, the speculative versus experimental debate in natural philosophy was not just about scientific methodology and epistemology. Many other factors inflected this debate. For example, Du Châtelet’s milieu is a case in point; nationalism and partisanship play a notable role in this debate. Second, this first point only serves to underscore the lesson I extracted from Du Châtelet’s Preface, in which she addresses her son. For in her cautioning her son against such prejudices, she is urging he harness his education to make his mind self-sufficient, which implies the kind of self-ownership of the mind, which undergirds the kind of skepticism and independence of mind requisite for ethically developing a belief system. Her ethics of belief, that is, is meant to guard against such partisanship. Finally, to the modern mind, it is frankly odd to align the use of hypotheses with the non-empirical, non-rigorous speculative side in the debate within natural philosophy. If anything marks the scientific method as we know it today, it is surely the posing and testing of hypotheses. Indeed, the history of the nature and fate of hypotheses is central in the emergence of modern science, and perhaps the most crucial chapter in that history in Europe is the one that stars Du Châtelet.

Du Châtelet and the Ethics of Belief in Action: Refiguring the Scientific Landscape

The stark alignment suggested earlier between speculative natural philosophy and the embrace of hypotheses on the one hand, and experimental natural philosophy and the rejection of hypotheses on the other hand is too stark. Anstey knows this, as do many scholars of early modern science. One complicating factor is the wide range of meanings one can attach to the notion of the hypothesis. I. Bernard Cohen, for example, in his exhaustive survey of the ways in which Newton uses the term throughout his corpus identifies nine distinct—and often widely divergent—meanings of the term (Cohen 1969). The nebulousness of the concept of a hypothesis during this period is part of what makes the history of hypotheses so rich and interesting. A second complicating factor, perhaps emerging from this first factor, is the ambivalence shown toward hypotheses by those practicing science in the early modern period, including those who align themselves on the experimental side of the (supposed) divide. As Anstey argues, some of these thinkers are apologetic in their use of hypotheses, while some are looking for ways of reconciling experimentalism and the use of hypotheses (Anstey 2005: 224ff). Du Châtelet fits into the latter category, and her systematic, sustained and intentional effort to show just how hypotheses and experimental science ought to be reconciled is, I contend, the watershed moment in the history of hypotheses in European science. Under Du Châtelet’s guidance—largely free from partisanship because of her following her ethics of belief—hypotheses arrive as central and respectable in modern scientific method.

To see how strikingly modern Du Châtelet’s view of hypotheses is, I will here present the core elements of her theory of the nature and role of hypotheses when they are properly used in science. Detailed, and historically contextualized, examinations of her views on hypotheses have
already enjoyed attention among philosophers (e.g. Detlefsen 2019; Kawashima 1993; Reichenberger 2016; Suisky 2019). This account is laid out in detail in her chapter 4: “Hypotheses” of her Foundations. In that chapter, she is clear that—despite how individuals might depict their own work—hypotheses are not uncommon in many scientists’ practice, and that this is a good thing:

And so good hypotheses will always be the product of the greatest men. Copernicus, Kepler, Huygens, Descartes, Leibniz, and even Newton himself, have all devised useful hypotheses to explain complicated and difficult phenomena. The example of these great men, and of their successes, should make us see that those who wish to ban hypotheses from philosophy, intend harm to the interests of science.

(IP §71)

Among her targets who “intend harm to the interests of science” by banning hypotheses are surely those who latch excessively onto Newton’s famous claim in the General Scholium to his Principia that he “feigns no hypotheses”. Indeed, uncritically taking on board such a principle would undermine entire sciences, for example, “without hypotheses . . . there would be no astronomy now” (IP §57). She underscores the necessity to science of hypotheses, and she gives reasons for their necessity:

Hypotheses are . . . sometimes very necessary . . . in all cases when we cannot discover the true reason for a phenomenon and the attendant circumstances, neither a priori, by means of truths [identified as principles of knowledge in §53] that we already know, nor a posteriori, with the help of experiments.

(IP §60)

And: “[P]hilosophers frame hypotheses to explain the phenomena, the cause of which cannot be discovered either by experiment or by demonstration” (IP §56). On this point, Du Châtelet is remarkably in step with Descartes. Both thinkers believe that underlying principles that explain all phenomena in the world are underdetermined, and that the only way to understand exactly how these principles give rise to the precise world that we have is to posit hypotheses to further specify underlying causes and principles.

Still, she is cautious about the potential overuse of hypotheses—overuse that might invite “fables and dreams” (IP §55) into science. When this happens, hypotheses are the “poison of reason and the plague of philosophy” (§55, Du Châtelet, quoting Newton), and on this front, Du Châtelet’s target is surely those who take Cartesianism to an extreme by postulating a range of untestable speculations about the structure of the subvisible world. Right away, we see Du Châtelet hewing to a middle path between the two extremes we saw depicted by the characterization earlier of the experimental-speculative divide in early modern natural philosophy.

But the real power of her view comes to the fore when we see the constraints she proposes in order to ensure hypotheses do not become “fables and dreams”. Among these constraints are the following. First, empirical testing is key: “when a hypothesis is once posed, experiments are often done to ascertain if it is a good one, experiments which would never have been thought of without it” (IP §58). Second, she adheres to the principle of falsification, according to which one falsifying piece of evidence, experimental or otherwise, requires that we reject the hypothesis: a hypothesis “becomes false when it is found to contradict a well-established observation” (IP §67). Third, the fruitfulness of a hypothesis increases with more and more data that supports it, or with more and more observations that can be explained by it: a hypothesis should “not only [explain] the phenomenon that one had proposed to explain with it, but also that all the consequences drawn from it agree with the observations” (IP §58). Finally, the scientist, when posing and evaluating
hypotheses, ought to take a stance of epistemic modesty and caution. On this point, she turns specifically to the hypothesis that explains the phenomena of gravity through an appeal to vortices. This is Descartes’, and Leibniz’s, hypothesis, and it was a hypothesis held in disregard in her intellectual circles because Newton’s view—which seems to endorse action at a distance—was so highly esteemed instead. To this wholesale rejection of the hypotheses of vortices, she writes that a hypothesis “can be true in one of its parts and false in another” (IP §65), which results in her acknowledgment that “it cannot be legitimately concluded that a vortex, or several vortices, conceived of in a different way, cannot be the cause of these movements” (IP §65). She concludes with this overall characterization of the proper role of hypotheses in science, once again, a characterization that has a strikingly contemporary ring to it:

So, hypotheses are only probable propositions, which have a greater or lesser degree of probability according to whether they satisfy a larger or fewer number of the circumstances that accompany the phenomena that we want to explain by means of the hypotheses. And since a very high degree of probability encourages our agreement so as to have nearly the effect upon us as certainty, hypotheses eventually become truths for us if their probability increases to such a point that this probability can morally pass for certainty . . . . In contrast, an hypothesis becomes improbable in proportion to the number of circumstances found for which the hypothesis does not give a reason. And finally, it becomes false when it is found to contradict a well-established observation.

(IP §67)

With Du Châtelet’s chapter on hypotheses in her Foundations, a new chapter in scientific methodology finally emerged in full-blown form.

Du Châtelet’s Role in the Emergence of a Modern Conception of Hypotheses

As the brief precis of Du Châtelet’s theory of hypotheses offered earlier shows, and against a context of her circles where we saw the rejection of hypotheses as counter-productive to experimental philosophy, we can see how critically minded she is with respect to at least some ways of thinking prominent at her time. As a result, she shakes up the alignment between speculation and hypotheses on the one hand, and experimentalism and the rejection of hypotheses on the other hand. Rather, in her carefully-considered view, there is no natural tension between experimental philosophy and the use of hypotheses, properly conceived and constrained. This understanding of the centrality of hypotheses to science is de rigueur in science today, but it was not so in Du Châtelet’s time and place. That she reached this view is at least in part as a result of abiding by her commitment to an ethics of belief, and that she articulated this view fully and powerfully for the first time puts her at the center of one of the most important chapters in scientific methodology in our history.7

A close look at her close look at Descartes, Newton and their followers on the question of hypotheses shows that she was attune to—unlike many—the fact that Descartes abides by many of the strictures that Du Châtelet puts on the proper use of hypotheses (Detlefsen 2019), and the fact that many Newtonians make overuse of hypotheses in methodologically problematic ways. Much of her Foundations aims to show how a proper methodology, including proper use of hypotheses, can correct for the excesses and timidities of scientists across national divides (Brading 2019). Her importance in the history of scientific methodology is underscored by the fact that several entries in the extraordinarily influential text, Diderot’s and d’Alembert’s Encyclopédie, ou dictionnaire raisonné des sciences, des arts et des métiers (1751–1772), are reproductions of Du Châtelet’s
own ideas. The entries in the *Encyclopédie* include the entry on “Hypothesis”, which just is Du Châtelet’s fourth chapter of the *Foundations* replicated almost verbatim (Koffi 2008). Du Châtelet’s importance in the history of science—an importance that emerges at least in part from her hard-headed, critically-minded commitment to an ethics of belief—was once known, and then egregiously erased, an error that we today are beholden to correct, should we wish to learn from her own model and become as ethical as we can in our histories and our beliefs about those histories.

Related chapters: 1, 2, 12, 15.

**Notes**

1 Other approaches to Du Châtelet’s feminist philosophy of science which scholars have explored include her strategizing in the *vis viva* debate in order to engage with the Secretary of the Royal Academy of Sciences, Jean-Jacques, d’Ortous de Mairan given her exclusion from the Academy (Detlefsen forthcoming; Kawashima 1995; Rey 2017, 2019; Terrall 1995), her discussion of human freedom (Jorati 2019) especially with respect to gender and as it interacts with determinism due to her physics (Hagengruber 2017) and her strategies regarding research and publishing surrounding her *Dissertation on Fire* (Kawashima 2005).

2 This kind of insight, namely that institutional and structural norms can have an influence on individuals and ought to be included in explanations for human behaviors, is plentiful in the early modern period, especially among the disenfranchised. While clearly recognized hundreds of years ago, the idea is perhaps most fully and explicitly theorized only in recent years by Sally Haslanger (2016).

3 While Du Châtelet was highly regarded for her mathematical and scientific abilities during her lifetime, shortly after her death, her revered reputation was quickly lost (Allen 1998). In English language work on her thought, early divergent views held by William Barber and Ira O. Wade over whether she is merely derivative of her close collaborator Voltaire (Barber 1967) or an intellectual force in her own right (Wade 1941) have since given way to Wade’s position. Early papers that establish Du Châtelet’s originality and prowess in physics (Iltis 1977; Janiak 1982) have paved the way for the cascade of research on Du Châtelet’s thought, including papers (e.g. Brading 2018; Detlefsen 2013; Gessell 2019; Hagengruber 2011; Janiak 2018) and several book-length studies (e.g. Brading 2019; Le Ru 2019; Reichenberger 2016).

4 Remarquez que toute expérience et tout calcul ruine presque toutes les idées de Descartes quand ce grand philosophe ne les fonde que sur des hypothèses. Ce sont des perspectives brillantes et trompeuses qui diminuent à mesure qu’on en approche. Tous les autres philosophes ont cherché des solutions de ce problème de la nature; mais l’expérience a renversé aussi leur conjectures.

5 Il est vrai qu’ils n’ont donné aucune preuve de cette assertion: il n’y a pas la moindre expérience, pas la moindre analogie dans les choses que nous connaissons en peu, qui puisse fonder une présomption légère en faveur de ce tourbillon de matière subtile; ainsi de cela seul que ce système est une pure hypothèse, il doit être rejeté. C’est cependant par cela seul qu’il e été accrédié. On concevait ce tourbillon sans effort, on donnait une explication vague des choses en prononçant ce mot de matière subtile, et quant les philosophes sentaient les contradictions et les absurdités attachées à ce roman philosophique, ils songeaient à le corriger plutôt qu’à l’abandonner. See also Voltaire ([1738] 1992: 699–700). For praise of Newton for avoiding the use of hypotheses, see Voltaire ([1738] 1992: 729). For a direct comparison of the two to Descartes’ disadvantage and Newton’s advantage, see Voltaire ([1738] 1992: 733–734).

6 On Du Châtelet’s innovations with respect to the science of gravity, see Brading (2018) and Janiak (2018).

7 Du Châtelet’s broader bringing together of valuable ideas from across a wide range of scientific and philosophical points of view has been well-examined in secondary literature, for example by Locqueneux (1995).

8 For a masterful explanation for why women and their philosophical accomplishments were erased from the history of philosophy, see O’Neill (1998).

**References**


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