The Modest Genius: Mathematics, Certainty and the Creation of the Public Newton

Alessio Mattana

Introduction: The Immodest Genius?

That Newton was a genius is something of a cliché in eighteenth-century studies. Regularly acknowledged but rarely discussed in its complexity, this praise dates back at least to the publication of *Philosophiae Naturalis Principia Mathematica* in 1687. In the *Ode on This Splendid Ornament of Our Time and Our Nation* that prefaced the *Principia*, astronomer Edmond Halley, the man who had lobbied to publish Newton's masterpiece in the first place, portrayed him as the chosen one who had unlocked "the treasure chest of Hidden Truth," an achievement that ensured that "No closer to the gods can any mortal rise."[1]

Presbyterian minister Henry Grove was one of the many who exclaimed that Newton's intelligence was such that it made him "appear like one of another species."[2] As the noun "genius" was just beginning to identify exceptionally bright people in the early eighteenth century, Newton was amongst the first to have been bestowed this qualifier.[3] Upon his death in 1727, Newton became so adored that his genius could only be qualified as divine. Examples abound. Richard Glover's rapt verses: "To Newton's genius, and immortal fame / Th'advent'rous muse with trembling pinion soars;" James Thomson's arresting imagery of the muses being "Astonish'd into Silence" at Newton's ascension to the stars; and, of course, Alexander Pope's famous intended epitaph, "Nature and Nature's laws lay hid at night / Then God said 'Let Newton be!' and all was

light.’”[4] Newton’s image as a God-sent genius illuminating nature’s innermost secrets made his British contemporaries proud. Only they had lived, after all, with a man *qui animi vi prope divina*—that is, whose vigor of mind was almost divine, as the inscription to the commemorative monument in Westminster Abbey read.[5]

Notwithstanding the wide acclaim from Newton’s contemporaries, relatively few scholars have examined the social construction of Newton’s genius and its significance for the British culture of the age.[6] More generally, and in spite of its relevance to eighteenth-century Britain, little critical work has engaged with the processes and the reasons behind the construction of Newton’s public persona, both by himself and by others.[7] In this article, I wish to examine an essential, yet overlooked, facet of Newton’s public image as a genius: his modesty.

Focusing on Newton’s modesty is both an obvious and a problematic choice. It is obvious because, from his death onwards, Newton was often reckoned to have been not only extraordinarily intelligent, but also remarkably modest. In the ode that the Royal Society commissioned to Scottish poet Allan Ramsay to mourn the natural philosopher, for example, Newton is depicted as both the “God-like *Man*” who “mounts the Sky” and as a being blessed with unrivaled humility:

> Thro’ ev’ry Maze he was the Guide,
> While others crawled, he soar’d above;
> Yet Modesty, unstain’d with Pride,
> Increas’d his Merit and our Love.[8]

While sparing in his lifetime, praises for Newton's modesty increased regularly after his demise. In Fontenelle's *An Account of the Life and Writings of Sr. Isaac Newton*, the English translation of the 1728 *Éloge de M. Neuton* (a work based on the notes provided by Newton's executor John Conduitt), readers would find that, since a "meek disposition naturally promises Modesty," the philosopher's allegedly docile demeanor portended high levels of modesty. Even though his genius distinguished him from every other mortal, Newton "never talked of himself, or with contempt of others, and never gave any reason even to the most malicious observers to suspect him of the least notion of Vanity."[9] When Conduitt, in the same year, introduced Newton's posthumous *The Chronology of the Ancient Kingdoms Amended* (1728), he noted that the philosopher had characteristically presented his arguments with a "modesty, that was natural to Him and always accompanies such superior talents," and that "sets a becoming example to others, not to be too presumptuous in matters so remote and dark."[10]

What makes this problematic, however, is that such obituaries would have felt audacious, if not downright outrageous, to many prominent members of the scientific community. What they, and many of Newton's acquaintances, vividly remembered was his abrasive arrogance and cavalier attitude. Here, too, examples abound. When Newton's 1673 theory of refraction was criticized by Christiaan Huygens, one of the best mathematicians of his day, Newton's response was so curt and patronizing that Henry Oldenburg, then secretary of the Royal Society, had to excuse him for being a "man of great candor."[11] When in 1686 Robert Hooke suggested that the inverse-square law upon which much of Newton's *Principia* rested had been lifted from Hooke's own research, he made a sworn lifelong enemy in Newton who, from that point on, would not miss any

opportunity to belittle Hooke's intellectual achievements, either when conversing, or by removing references to him in the works he published.[12]

Newton's ill treatment of Hooke was a pattern of things to come, as astronomer John Flamsteed soon found out. In 1694, Newton enlisted Flamsteed to provide him with astronomical positions of the moon, which he needed to address the long-standing problem of the "lunar theory," which entailed the inequalities of the moon's orbit, as well as the effects of its perturbations on other planetary motions. Newton expected Flamsteed to set aside his own proposed work on a general catalog of stars to devote his energy to the astronomical observations Newton needed, a request so preposterous that in a letter to fellow astronomer John Caswell, Flamsteed retorted that "I know no obligations I lay under to spend all my time to serve Mr. N." (Westfall, 545). Within a year, Flamsteed, who strove to be recognized as a natural philosopher, sent Newton hundreds of lunar positions. Yet, his failure to comply immediately with Newton's demands, as well as his subsequent criticism of Newton's own observations, resulted in references to his works being effaced from the second edition of the *Principia* that was being prepared in 1713, and in his being grouped amongst the "forreigners about Mathematical things" who must not dare correct Newton's calculations (Westfall, 582). More troubling, though, was that Newton abused his authority as president of the Royal Society (a role he kept from 1703 to his death) to publish Flamsteed's star catalogue *Historia coelestis* (1712) without the consent of the author, and with a number of spurious additions to boot. The case soon became so serious that a warrant was eventually issued to Newton to hand Flamsteed all the remaining copies that had been illegitimately printed (Westfall, 540–48, 686–96).

What even as generous a commentator as Richard S. Westfall defines as Newton's "tyrannical will to domineer" is nowhere more apparent than in the calculus priority dispute with the German polymath Gottfried Wilhelm Leibniz (696). When Newton, egged on by the young Scottish mathematician John Keill, commenced his attacks—at times in the first person, albeit anonymously, as with the *Commercium Epistolicum* (1715), more often via his army of fervent Newtonians—his aim was to annihilate the reputation of his opponent by casting him in the light of an impostor who robbed him of the invention of calculus (what Newton called the method of fluxions). As Alfred Rupert Hall puts it in his comprehensive account of the quarrel, Newton "arrogantly believed" that he could establish the development of Leibniz's mathematics, and thus find grounds for his charge of plagiarism, but he did so without ever looking at the evidence to the contrary, which would have been readily available to him. In effect, Newton constructed an "imaginary chronology" that conveniently put him as the inventor of calculus at the expense of Leibniz.[13]

More shall be said about Newton's pride in the next sections. What is relevant here is that even foreign (though not necessarily impartial) observers like Voltaire and Fontenelle, who had access to firsthand sources and could talk to people who had known Newton personally, would go as far as to suggest that modesty was a more defining feature of his persona than his intellectual prowess. Speaking of the mysterious nature of matter, Voltaire observed that "perhaps there never was any thing more modest than Sir ISAAC NEWTON's Opinion," especially when compared to the "presumptuous" flight taken by "Mr. Leibnitz."[14] Newton, Voltaire argued, avoided pronouncing himself on this particular issue due to his modest demeanor, and this was exactly what qualified him as a

115 superior philosopher. Fontenelle wholeheartedly agreed. Newton was not the sole "first-
116 rank" genius; Descartes was similarly regarded. But genius alone was not enough where
117 modesty was lacking. Indeed, the key difference between Descartes and Newton was that
118 the former would often take "a bold flight" to reach "at once . . . the Fountain of All
119 things," while the latter, "more cautious, or rather more modest, began by taking hold of
120 the known" and readily acknowledged his shortcomings (Fontenelle, 17).

121 Why was Newton described as modest when, in fact, he was the opposite? The
122 heterogeneity of the references to his alleged modesty complicates the search for a
123 straightforward answer. To offer an answer to this question, it is necessary to disentangle
124 the several strands in the concept of modesty in late-seventeenth to early eighteenth-
125 century Britain and examine what present-day commentators have written about it. In so
126 doing, I will argue that the modesty that characterized Newton was primarily a social
127 construction imposed by others. Newton's intellectual stature made his figure amount to
128 prized symbolic capital, but realizing this capital required downplaying his glaringly
129 immodest behavior. This lack of modesty manifested itself in several ways, the most
130 important of which was, I also argue, his using mathematics as the keystone of his natural
131 philosophy. While, as I will discuss in the next sections, the self-devised calculus in the
132 *Principia* is a protean creature that defies generalizations, many of Newton's
133 contemporaries perceived that his was a mathematics-laden philosophy with dogmatic
134 edges that threatened accepted religious and social harmony. Depicting Newton as
135 modest while presenting his ideas divested of mathematics was the means to smooth such
136 edges. This, I will also claim in the final sections, was mainly possible only after the
137 philosopher's death, as in his lifetime Newton hardly budged from his belief that

mathematics was essential to his philosophy. Only after his decease could Newton's ideas be presented without the mathematics that had been crucial for his discoveries, and his figure concurrently sanctified as that of a genius whose modesty made him fit for being a role model of proper social behavior.

<A>**From the Modest Witness to the *Hypotheses Non Fingo***

The best place to begin exploring the intricacies of Newton's modesty, arguably, is from the concept of the "modest witness." In their landmark study *Leviathan and the Air-Pump* (1985), Steven Shapin and Simon Schaffer famously described the modest witness as an experimental practitioner "whose narratives could be credited as mirrors of reality" rather than as subjective opinions.[15] They identified Robert Boyle as the prototypical modest witness. Boyle achieved this self-fashioning as an unbiased experimenter, Shapin and Schaffer argue, by refraining from enforcing his ideas on other observers and by presenting his experimental findings as unadulterated by private interest. This moral posturing took place through a variety of rhetorical strategies, such as reporting all experiments, successes and failures alike; writing experimental accounts in a plain style allegedly devoid of all figures of speech; and distinguishing matters of fact from the linguistic expressions used to account for them (65–69).

The modest witness has been an influential concept, one that commentators have regularly returned to for its effectiveness in accounting for the social and rhetorical dimensions of seventeenth-century experimental culture. Still, to my knowledge, nobody until Laura Miller, in her recent *Reading Popular Newtonianism*, has considered whether Newton qualifies as a modest witness, and even then, only cursorily. This is interesting,

given that Newton was already active in the scientific community in the late 1660s and early 1670s, the years when Boyle's ascendancy in English experimental culture was at its peak, and that he approved of many of Boyle's discoveries and theories (Shapin and Schaffer, 199–200). What are the grounds for this omission?

One likely answer is that Newton's approach was different from that typically employed by early Royal Society practitioners. Not only were the latter's experiments intentionally theatrical to muster support for their experiments while Newton's were not, as Laura Miller has noted, but also, in a more essential sense, Newton's approach to knowledge-making was different from Boyle's, especially in Newton's use of mathematics and its implications on understanding matters of fact about nature.[16] Boyle was wary of taking mathematical certainty as a benchmark in "Physical Enquiries;" as he wrote, "It is often sufficient that our determinations come very near the matter, though they fall short of a Mathematical Exactness" (Shapin and Schaffer, 67). As Shapin pointed out in a more recent contribution, the rationale for such a statement is that Boyle found mathematics dangerous in that it excluded too many people—anyone who did not master its language—and produced results that carried with them too much certainty, which Boyle did not believe was always attainable in enquiries on natural phenomena.[17]

Some care is needed here not to overextend Boyle's wariness of mathematics to the whole of the Royal Society. As Peter Dear has shown, although the likes of Boyle were skeptical of mathematics, the early Royal Society was home to a number of mathematicians—not the least of which was the influential John Wilkins, who, in 1660, described the budding institution as directed towards the promotion of "physico-Mathematicall-Experimentall Learning."[18] Moreover, "mathematics" could mean very

different things in the seventeenth century, as Matthew L. Jones has persuasively argued. While many felt that mathematics was solipsistic, distracting its users from the goal of creating knowledge for the benefit of the broader society, mathematician-philosophers, like Descartes, Pascal and, later, Leibniz, conceived of, and practiced, mathematics as a way to cultivate virtue and, especially for Pascal, as a means to appreciate the limits of human understanding.[19]

Still, it would be incautious to suggest that these philosophers, or any of the early Royal Society practitioners at that, were unaware of what Dear calls the "privileged reputation for certainty that attached to mathematical demonstration" (31), and of how matters of fact about the natural world were established by mathematics. Indeed, Boyle's distrust of mathematics was couched on its tending to a "universal and necessary assent" that he believed had no room in experimental enterprises (Shapin and Schaffer, 24). As also suggested by Boyle's repeated charges against Thomas Hobbes for his dogmatic use of geometry, it was less mathematics per se than the overconfidence it produced in the mathematician that proved dangerous. In this sense, there was a stark divide between the matters of fact about nature produced by "modest" and "humble" practitioners like Boyle, and claims by Hobbes who did not seek assent from his peers (136).

In the early Royal Society, mathematics could prove problematic in that it enforced an excess of assuredness, which was quite at odds with the dialogic nature of the institution. The prominent early Royal Society practitioners' reliance on hypotheses implies that an excessive trust in mathematics imperiled the advancement of science as a collective enterprise. Conjectures worked as discursive devices that enabled the discovery, presentation, and interpretation of new experimental facts without having to

impose one's own ideas upon other gentlemen practitioners who had different ideas. In this regard, it is instructive to look at two of the manifesto texts of the early Royal Society, Boyle's own *The Sceptical Chymist* (1661) and Robert Hooke's *Micrographia* (1665). In the latter's "Preface to the Royal Society," Hooke apologizes for those parts of his book that read like "positive Expressions," pleading to have them "understood only as *Conjectures* and *Quaeries*."[20] Similarly, in *The Sceptical Chymist*, Boyle has his narrator Carneades advance arguments that "shall not be thought of the most cogent sort," a requirement linked to the wish that he "will be thought to have disputed civilly and modestly enough for one that was to play the antagonist and the sceptic."[21]

For Boyle and Hooke, being modest meant using hypotheses to defuse all risks of excessive assuredness. Hypotheses worked to promote a peaceful exchange of opinions among peers. He that desires to convince and not to "provoke" fellow participants in experiments, Boyle clarifies in *The Sceptical Chymist*, "must make some amends by his civility to their persons," a goal attainable, in practice, by saying "as little as he can to displease them, when he says that they are in error" (4–5). This view remained so influential that in the late 1670s, Robert Plot, another fellow of the Royal Society and secretary from 1682 to 1684, was still careful to avoid being charged with dogmatism by characterizing his claims about the virtues of mineral water wells in Oxford as humble conjectures: "What has been said," Plot clarifies, "has not been *magisterially* imposed, but modestly only, and timerously conjectur'd."[22]

While the likes of Boyle, Hooke, and Plot heavily relied on conjectures to produce knowledge with little disruption to the harmony of their experimental community, Newton was always rather adamant that natural phenomena admitted only of

mathematical explanations, and that hypotheses were not to be used when determining matters of fact about physical phenomena. Early Royal Society members were fully familiar with this difference, and with the assertiveness of the young Newton, thanks to the "New Theory about Light and Colors" letter sent in 1672.[23] In this communication, in which Newton's prismatic experiments are first described, the findings (among which the key one that "Light is not similar, or homogeneal, but consists of difform Rays, some of which are more refrangible than others") are expounded in the form of a "doctrine" that is "comprehended and illustrated" through a series of propositions (3075–77, 3081). The contrast between Newton's assertive lexis of mathematics and the modest language of conjecture favored by early Royal Society practitioners is glaring. Unsurprisingly, when asked to review the letter for the Society, Hooke, although "pleased with the niceness and curiosity" of Newton's observations, politely expressed some reservations because he could not consider Newton's discovery "so certain as mathematical demonstrations."[24] That this was less Hooke's personal view than an institutional position within the society is confirmed by the expurgation of a passage of Newton's communication that extolled the "certainty" of his discoveries and his having made the science of colors "mathematicall, . . . not an Hypothesis but most rigid consequence."[25] As Mordechai Feingold notes, it was probably Oldenburg who removed this sentence just before a public reading at the society's assembly, quite possibly to make Newton's position less offensive to the sensibilities of the members.[26]

The "New Theory" controversy shows that, at a time when early Royal Society practitioners sought to tone down their findings by presenting them as conjectural interpretations of experimental evidence, Newton adopted the opposite position, stating

that he would never "mingle conjectures with certainties" (Newton, 3085). Newton's experimental claims were grounded in the certitude offered by mathematics, and throughout his career he advocated this view. The very first sentence of *Opticks* (1704), his first major publication in English, makes explicit the design to explain the properties of light by "Reason and Experiments" rather than by "Hypotheses," the book then proceeding to present a set of preliminary "Definitions and Axioms."[27] In the famous General Scholium to the second edition of *Principia* published in 1713, Newton overtly demanded conjectures to be eschewed as the requirement for understanding natural phenomena. It is here that the famous motto "*hypotheses non fingo*" first appears—a pronouncement that, contrary to the choice made by the first translator Andrew Motte in 1729, should be rendered as "I don't feign hypotheses" (rather than "I don't frame hypotheses"), so as to preserve the verb *fingere*, from which the noun *fictio* derives.[28] The etymological difference is a pivotal one, for Newton makes hypotheses the product of the imagination, and imagination, in turn, represents the faculty that adulterates the sensory data provided by "the evidence of experiments" (*Principia*, 795). Imagination allegedly debases the phenomena observed through experiments; since nature speaks in mathematics, Newton argues, experimental knowledge must be validated only through its language, which is the polar opposite of the subjectivity of imagination. Whoever forms hypotheses is relinquishing his ability to produce facts about nature and instead indulging in chimeras.

It is interesting to note here that Newton did not necessarily do what he preached. It is now well known that Newton *did* feign hypotheses. The queries that accumulated at the end of successive editions of *Opticks* very much read like a collection of conjectures,

the most famous of which being that of the "aether" as the mechanical means through which gravity might operate. Regardless of his actual practices, however, Newton's discursive aim was, as Alan E. Shapiro puts it, to "demarcate the conjectural from the certain." The hypotheses that Newton claimed he wanted to eschew were "conjectural causal explanations" that could not be tested with observational data, such as, for example, the vortices Descartes imagined to explain attraction between heavenly bodies.[29] To this end, as I. Bernard Cohen has shown, Newton had devised a mode of presentation in the *Principia* that allowed him to explore the conjectural implications of his philosophical ideas as if they were a form of "dreaming" separated from his claims about nature (Newton, 1999, 61). The distinction is, to an extent, nebulous, but Newton evidently felt it was enough to safeguard the claim that knowledge about nature should always be based on the objectivity of mathematically verifiable assertions, rather than on entirely subjective, and thus unverifiable, hypotheses.

In this sense, the *hypotheses non fingo* worked as a rhetorical tool allowing Newton to make other people's opinions into a detrimental presence, especially those of his intellectual competitors. In the midst of the calculus dispute with Leibniz, Roger Cotes, one of Newton's protégés and editor of the second edition of the *Principia*, accused the German philosopher and the French Cartesians of producing unverifiable explanations to natural phenomena, that is, of "patching up a most absurd figment of their imagination" that held no resemblance to nature. Doing so, Cotes continued, was the result of "overly indulging" their fantasy, thus shrewdly implying that only mathematics allowed an observer to penetrate into what Newton and Cotes respectively called "the Nature of Things" and "the laws of things."[30] Even if Newton was always prudent to state

that descriptions of natural phenomena could always be improved through more accurate observations, he remained categorical throughout his life that mathematics was essential to produce accurate knowledge about nature, so much so that he stated, somewhat paradoxically, that his "principles of philosophy" were "not, however, philosophical but strictly mathematical" (*Principia*, 793).

By pointing to how mathematics granted access to the secrets of nature, Newton obviously meant *his* own unique brand of mathematics, and not those developed by either Descartes or Leibniz. As Niccolò Guicciardini explains, Newton's mathematics were peculiar in that he usually began analyzing a geometrical problem by turning it into algebra, and then turning to what he called synthesis, that is, "a geometrical construction and a geometrical demonstration that this construction is what is required in order to reach a solution of the problem considered."[31] Matthew Wickman perceptively notes that this "ambivalent" mathematics, which was geometric and algebraic at once, made Newton's self-devised calculus very different from both Descartes's static geometry, which Newton had studied as a young undergraduate in Cambridge, and, most importantly, the differential calculus of Leibniz.[32] While both philosophers had the insight that infinitesimals provided a tool to understand complex phenomena, Newton's fluxions method was not meant as an abstract tool but as a kind of geometry in motion that Newton understood to be a faithful representation of nature. The several kinds of fluxions—be they "Surfaces . . . generated by the motion of Lines, Solids by the motion of Surfaces, Angles by the Rotation of their Legs, Time by a continual flux"—were to Newton all "founded upon Nature, and are every Day seen in the motion of Bodies" (quoted by Wickman, 48–49). So, while Newton used the adjective "mathematical" as

shorthand to identify his unique method, he also wished to convey that nature spoke in the particular language of mathematics he had identified, and none else.

Of course, claiming as much—or, as put in query 31 of *Opticks*, claiming that "as in Mathematicks, so in Natural Philosophy"—meant, in practice, that the large number of readers who had not mastered Newton's particular concoction of geometry and calculus had no right to have their say on how nature worked (*Opticks,* 404). This was an opportunistic choice, as revealed by Newton himself, who conceded that, while mathematics was essential to his natural philosophy, the main takeaways from *Principia* could have been conveyed in a prose language understandable by the many. It is well known that the third and last book of *Principia*, entitled "The System of the World," had initially been written "in popular form, so that it might be more widely read" (*Principia*, 793). Just prior to its publication, it was rewritten afresh in the forbidding mathematical style of the former two volumes, much to Halley's desperation, who had hoped to spread Newton's ideas to a wider audience from the very beginning.[33] But Newton was of another opinion. As his close friend and popularizer William Derham would reveal in 1733, Newton had "designedly made his *Principia* abstruse" in order to "avoid being baited by little Smatterers in Mathematicks" and, eventually, to be understood only by "able Mathematicians, who he imagined, by comprehending his Demonstrations, would concur with him in his Theory."[34] He must have succeeded if, by 1730, even advocates of the "Great *Sir Isaac Newton*" had to acknowledge that the *Principia* "was but for The Few: both the Manner and Matter of it placing it out of the Reach of the Generality even of Learned Readers."[35]

<A>**Defining Modesty in the Early Eighteenth Century**

From what has been discussed so far, it appears that Newton was far from modest. His assertiveness was compounded by his commitment to mathematics, which tended both to force agreement (rather than seek mutual assent) and drastically restrict access to debates in natural philosophy. His tendency to impose his brand of mathematics onto natural philosophy departed not only from then-current models of experimental knowledge-making (a point first made by Zev Bechler many decades ago), but also, more importantly, from accepted social and cultural values that prized an unpretentious approach, particularly on the part of philosophers.[36]

While true that Newton was not a "modest witness" in the way Boyle was, according to Shapin and Schaffer's traditional account, it is also true that his mathematics-based approach to knowledge-making resulted in a high level of "transparency," given that (theoretically, at least) his philosophical claims did not depend on unverifiable subjective hypotheses, but on the objectivity of mathematical calculations. This approach is strikingly reminiscent of the definition of modesty provided by Donna Haraway in *Modest-Witness@Second-Millennium.Femaleman-Meets-Onco Mouse* (1997). In this seminal book, Haraway presents the modest witness as having an unmarked, transparent body that enables him to refrain from adding personal opinions to his observations of nature. Transparency, Haraway argues, is what enables the modest witness to act as "the legitimate and authorized ventriloquist for the object world." By effacing his subjectivity, the modest witness endows himself "with the remarkable power to establish the facts" of nature as if these were self-evident phenomena, rather than something dependent on human interpretation.[37]

Haraway's argument has been justly lauded by commentators for its pointing to the rise of a modern scientific witness who has the ability to let nature "speak" without subjective interferences. In the words of Al Coppola, Haraway's modest witness thus "marks the emergence of the definitive subject position of modernity, a man who is somehow no man: the unmarked, ungendered, neutral observer who simply sees what is obviously, manifestly already there."[38] Tita Chico adds that the modest witness "embodies, paradoxically, a privileged absence, a model of spectatorship that conveys authority through its claim to be free from the limitations of self-interest."[39] These definitions reinforce the impression that, in Haraway's sense, Newton could be defined as a modest witness of nature: his trust in the objectivity of mathematics and the related urge to avoid hypotheses and eschew all subjective interpretations seems to make him much more "transparent" than Boyle, who felt that the polite dialogue between different subjectivities was the means to establish matters of fact about nature collectively.

Intriguingly, however, Newton is all but missing from Haraway's *Modest Witness*, nor do Coppola and Chico mention him in relation to modesty (or lack thereof). The reason for such a blatant omission might well be that definitions of modesty in the early eighteenth century emphasized a degree of self-restraint that, though crucial to social life, was alien to Newton. This was no minor shortcoming on Newton's part, as we can see by looking at *Fictions of Modesty*, the landmark study in which Ruth Bernard Yeazell addresses the complexity of the concept. Yeazell builds on the idea that, apart from the broad sense of "generalized respect for others," modesty meant different things for men and women in eighteenth-century Britain.[40] Yeazell mainly considers the construction of feminine modesty, and one of the pieces of evidence for the gendering of

modesty at the basis of it is a 1709 issue of *The Tatler*, in which Isaac Bickerstaff (Joseph Addison, on that occasion) reports a conversation on the topic with a group of ladies. In the very first lines, Bickerstaff argues that modesty in a woman is always to be advised, since it helps her being "careful in her economy, and chaste in her affection"; while for men modesty is the "greatest obstacle, . . . both in love and business."[41] As the argument unfolds, however, it appears that Bickerstaff is not as dismissive of modesty in men as Yeazell contends. Modesty in men is, indeed, detrimental "if it suppresses his virtue, and hides it from the world, when he has at the same time a mind to exert himself," but this does not mean that men could do without it. Quite the contrary, as the similitude drawn by Bickerstaff reveals. Modesty in men is like shade in a portrait: too much and it hides one's features; too little, though, results in "a wild heap of colours." As other discussions on modesty in *The Spectator* would also show, masculine modesty was all about fine balance: too much overshadows one's virtue and stifles one's initiative, but too little is dangerous as well, in that it begets impudence and vanity, both detrimental to life in society.[42] As Steele puts it in another excerpt from *The Spectator*, "Nothing can atone for the want of Modesty, without which Beauty is ungraceful, and Wit detestable."[43]

This interpretation is in line with Samuel Johnson's later definitions of the adjective "modest" and the adverb "modestly" in *A Dictionary of the English Language* (1755). Though belated, Johnson's definitions are useful because they are based on quotations from earlier authors like Addison, Swift, Pope, and Dryden. In the *Dictionary*, we thus find that the "modest" person (unmarked by gender) is less about what one is than what one is not. This is why Johnson finds that the modest person is best defined by antonyms: "1. Not arrogant; not presumptuous; not boastful; . . . 2. Not impudent; not

forward . . . 3. Not loose; not unchaste . . . 4. Not excessive; not extreme." When used appropriately, Johnson implies, modesty doubles up as the quality softening the rough edges of one's character and bringing into relief those parts that make a person best suited for social intercourse.

There were distinct religious overtones to these definitions too. As mentioned, immodesty could lead to vanity. Widely read books of religious instruction, such as Robert Warren's *The Devout Christian's Companion* (1710), regularly cautioned that "true religion is ever modest and reserv'd in its Demeanor, when it appears in publick, jealous of doing any thing that may savour of Vanity and Ostentation."[44] As it turned out, philosophers were often charged with vanity and ostentation. This was no light accusation. According to William Cave's vastly popular *Primitive Christianity*, which was first published in 1673 and reached a sixth edition by 1702, modesty is that virtue that seems to offer "no real entertainment" in the lives of philosophers, "being generally *animalia gloriae*, Creatures puffed up with wind and emptiness, and that *sacrific'd* only to their own praise and honour"—that is, the very opposite of what the Gospel teaches and, Cave adds, a stark contrast to what primitive Christians used to practice prior to their religion being corrupted by worldly affairs.[45]

Such references to the lack of modesty of philosophers were far from uncommon at the beginning of the eighteenth century, and Newton's *Principia* must have contributed to exacerbating these positions. Its publication championed the idea that mathematically demonstrable principles could also be found in religion and moral philosophy. This belief rapidly gained ground, as testified by texts of Newtonian inspiration, such as George Cheyne's *Philosophical Principles of Natural Religion* (1705), and satirical works, such

as Daniel Defoe's *The Consolidator* (1705), where a fictional lunar philosopher is mocked for supposedly determining something as elusive as the human soul "Spherically and Mathematically."[46] Cheyne's ambitious arguments and Defoe's satirical slashes both imply that, following the publication of the *Principia*, mathematical principles akin to those Newton allegedly found were increasingly sought in neighboring fields.

To many observers, this lack of modesty, with its wide-ranging theological ramifications, was clearly inspired by Newton's success. In a sermon delivered at Cambridge in August 1699 and entitled *The Vanity and Danger of Modern Theories*, divine Richard Marsh responded to then-rampant speculations on the origin of earth by pointing to the way mathematics was being used to subvert biblical accounts. Such dangerous speculations, Marsh noted, had been allowed to gain ground due to the widespread use of "*Mathematical* Learning."[47] As a counterpoint to philosophers who employed mathematics, whom Marsh falls just short of calling infidels, the divine mentions an unnamed "Noble Person," one "who knew as much of Nature, as any whatever" and should be imitated for his "Modesty," which had been obtained "after a strict and rational Search into the Mysteries either of Nature or Revelation" (2–3). The unnamed noble man Marsh hints at must have been Boyle, for the "Modesty in Philosophy" he mentions stood for the religious embracing of the limits of human knowledge that, as Courtney Weiss Smith has recently argued, was integral to Boyle's experimental practices.[48] Modesty was the hallmark of the Christian virtuoso, as his inquiries on nature never challenged the belief that man-made knowledge could not attain the same degree of certainty manifested by divine revelation.

Modesty was synonymous with curbing one's assuredness in knowledge about nature, and this often translated into avoiding laying down first principles, which could only be established by God with his infinite knowledge. No absolute certainty was admissible for the modest philosopher, as Boyle himself explained in the proemial letter to a set of experimental essays:

> I . . . speak so doubtingly, and use so often, perhaps, it seems, it is not improbable, and such other expressions, as argue a diffidence of the truth of the opinions I incline to, and that I should be so shy of laying down principles, and sometimes of so much as venturing at explications. (Shapin and Schaffer, 67)

Among the impious mathematicians Marsh lambasted in his sermon, Descartes is the only one mentioned by name. Though never directly summoned, however, the several disparaging references to the laws of gravity give us no reason to doubt that Newton was also in Marsh's mind, and not as a Boyle-like epitome of modesty. Nor was Marsh alone in this belief. Some writers at the time saw a direct link between the use of mathematics in natural philosophy and the risks for revealed religion; an example is a 1712 article in *The Hermit*, a short-lived periodical that from the very first issue had set out to defend Christian faith against "the Pretence of Reasoning" and the "revival of the ancient Heresies," where readers would find that "Modesty in our Opinions" is necessary because there is "nothing Certain to depend upon" other than what is revealed by God.[49]

This, I might add, does not mean that Newton was perceived as an atheist. On the contrary, he was widely regarded as a highly devout person who publicly upheld the

active role of God in "maintaining His creation."[50] Still, and even though his antitrinitarianism was only known by a chosen few, Newton's affinities to mystical and esoteric traditions made his contemporaries uncomfortable. As Rob Iliffe has shown, between 1684 and 1688, the same years in which the *Principia* was being readied for publication, Newton applied his mathematics to studying the migration of ideas from ancient Egypt to Greece via Orpheus and Pythagoras, as well as to interpreting the "ancient heliocentric vestal form of worship." In these studies, Newton went as far as to deny that the Egyptian theology at the basis of the Orphic, Pythagorean, and Epicurean philosophies were irreligious (Iliffe, 200, 204). These, as well as those related to Newton's later interest in applying mathematics to determine ancient chronology, were borderline heretical propositions that needed to be kept hidden as much as possible. Newton himself must have been aware that aspects of his thought were religiously controversial. After all, as I. Bernard Cohen has argued, the so-called "Newtonian style," the mode of presentation of ideas in the *Principia*, was designed to enable him to discuss physical concepts "without divulging any of his fundamental beliefs about God and nature or about the world in general" (Newton, 1,999, 61).

Still, to cultivated readers who kept abreast of the public debate on natural religion, this Newton-powered reappraisal of religious values under the banner of reason hardly went unnoticed. The editor of the *Hermit* was one such attentive observer, as his venomous reference to "the Whims of Mankind that take the name of Reason" testifies.[51] Well-informed coffeehouse readers no doubt noticed that the article in the *Hermit* was a rejoinder to claims made by Newton's close associates like Samuel Clarke, who, in one of his 1705 Boyle Lectures, had preached that the "constant and sincere observance of all

the Laws of Reason and Obligations to Natural Religion, will unavoidably lead a Man to Christianity."[52] These kinds of back-and-forth exchanges were manifestations of the deistic controversy in England, which, as James E. Force showed in 1990, played out as "a basic epistemological polarity" between natural and revealed religion. As it happened, Newton was identified by some contemporaries (for one, the influential divine George Hickes) as a deist, hardly a compliment at the time.[53]

As Robert Markley argues, Newton was an exceptional case in the English context because he first saw mathematics as a comprehensive instrument to represent "increasingly complex conceptions of the order of creation." Such an instrument could be applied to virtually all fields, to the point that, in the final years of his life, Newton himself ventured to use astronomical calculations and the average duration of ancient kingdoms as grounds to revise those parts of biblical history that he thought Athanasius had corrupted in the fourth century (Markley, 136), without necessarily implying that he was dismantling revealed religion.[54] Indeed, Newtonians like William Whiston and Samuel Clarke systematically tried to find a middle ground between revealed and natural religion by finding correspondences between the two, effectively trying to "knit reason and revelation" (Force, 53). While Markley is right in taking exception to historians of science who contend that Newton's mathematics was an attempt to shift the grounds of religious belief from revelation to "an external, objective, self-consistent, and authoritative system of representation," a position that Newton would have never endorsed, it cannot be denied that many of Newton's contemporaries were afraid that a commitment to mathematics as the benchmark for knowledge-making could provoke such a shift. These fears must have been neither occasional nor promptly assuaged, as

implied by 1735 *Grub Street Journal* author who attempted to vindicate the status of revealed religion vis à vis mathematics by arguing that the Christian religion "is capable of demonstration; and has been often demonstrated," only to specify: "Not mathematically, I confess."[55]

Mathematicians were perceived as quintessentially immodest and borderline heretical due to their unfaltering confidence in their understanding and tendency to rationalize phenomena that were to be accepted with a leap of faith. The Presbyterian minister Henry Grove, who had written enthusiastically about Newton's genius in *The Spectator*, felt compelled to specify that even the great philosopher, though capable of paying "at once a more devout and rational Homage to his Maker" than anyone else, could not expect to know too much: "How narrow is the Prospect even of such a Mind?," Grove rhetorically asked, trying to mediate between the enthusiasm derived from Newton's mathematical philosophy and the alarming arrogance of those who felt they knew more than others.[56]

These debates involving modesty, religion, and mathematics were ultimately reflected in journalistic discussions on proper behavior in a genteel society. A notable instance is Eustace Budgell's advice for the British youth published in *The Spectator* in 1711. Budgell, a character with suspect deist acquaintances, encouraged modesty as the quality that promotes peaceful social intercourse among genteel people by defusing any excess assuredness in interlocutors. When someone seeks conflict due to their being overly confident,

> give your Reasons with the utmost Coolness and Modesty, two Things which scarce ever fail of making an Impression on the Hearers. Besides, if you are neither Dogmatical, nor shew either by your Actions or Words, that you are full of your self, all will the more heartily rejoice at your Victory.[57]

By modesty, Budgell means the ability to steer clear from disputes as much as possible by being "never positive," that is, by avoiding winning an argument at all costs. The ability to make one's point not too forcefully, thus dodging unnecessary dispute, was crucial at the gentleman dinner table, which, as Craig Calhoun observes, was the site where, in the first decades of the eighteenth century, power was managed through a "reasoned, progressive consensus formation."[58] Dinner-table conversations were regulated by politeness, which privileged generalist learning and shunned specialist and technical learning on the count that the former was inclusive and the latter divisive and exclusive.[59]

Modesty operated as an antidote to the positiveness of the specialists who did not expect to be contradicted. Among the latter, Budgell significantly mentioned mathematicians, a prime example of immodesty due to their unwillingness to take "little less than Demonstration in the most common Discourse," which results in being "Dogmatical" and "full of your self."[60] This was no little defect. According to Budgell, want of modesty effectively excludes a person from society: "A Man without Modesty," he claimed in a later *Spectator* issue, "is lost to all Sense of Honour and Virtue."[61] Basically, modesty seems to have acted as a passport into society. It would be upon these grounds that in 1743 Henry Baker, the natural philosopher who had achieved fame with

573 *The Universe: A Philosophical Poem Intended to Restrain the Pride of Man* (1727),
574 reminded the young Newtonian and mathematician Martin Folkes that "knowledgeable
575 people are modest and . . . ignorant people are arrogant: therefore consider Things with
576 Modesty and Candour."[62]
577
578 **Mathematics and the Making of the Modest Newton**
579 While Newton's forceful ways and his commitment to mathematics might have made him
580 at odds with accepted religious and social values, his figure retained enormous strategic
581 importance for Britain. The relevance of his intellectual achievements, especially those
582 related to the *Principia*, was clearly perceived by Newton's followers, who, from Halley
583 onward, engaged in what Feingold calls a "propaganda campaign," and Larry Stewart
584 labels "the formation of consensus over the philosopher's lasting reputation in the wider
585 society."[63] As it often happens with thinkers whose ideas prove revolutionary, the result
586 was a bifurcation between "two Newtons" (to borrow Massimo Mazzotti's formulation):
587 one being the historical character, the other the public person.[64] Regardless of the
588 personal beliefs held by the historical Newton, his bright genius, whose reputation
589 reached neighboring countries as a manifestation of Britain's intellectual power, meant
590 that the public Newton was prized symbolic capital that had to be carefully preserved and
591 nurtured.
592 The exploitations of the public Newton were varied, from the Low Church
593 thinkers who sought to advance their latitudinarian agendas described by Margaret C.
594 Jacob, to the advocates of Britain's dominance in the context of the Anglo-French wars
595 examined by John Bennett Shank.[65] Adding complexity to this process was that Newton's

"God-like status," as Steven Snobelen calls it, was at least in part a self-propagated image.[66] Over the last twenty years of his life in particular, Newton scrupulously cultivated his social persona in order to become indispensable to British society and cutting a commanding intellectual figure in Europe. What Rob Iliffe calls the narrative of Newton being "a disembodied mind in communion with natural or divine truth" proposed by his popularizers, was a studied pose at odds with biographical records.[67] Newton strategically mixed self-reclusion with highly selective access to his own person and documents so that he could cast around himself "the aura of a virtuous person locked in his own titanic struggle with truth."[68] The culmination of this process was, first, Newton's appointment as warden of the Mint in 1696 and then master three years later, a role he retained until his death. He was elected president of the Royal Society in 1703 and was knighted by Queen Anne in 1705, and by the end of his life, he had appeared in hundreds of portraits and sculptures, a feat that would only find equivalents amongst the royalty and the highest ranks of the aristocracy.[69] Such an imposing social presence made it virtually impossible for anybody living in the first quarter of the century to ignore him, especially as a host of favorable commentators duly praised his abilities outside the domain of scientific works, be it for the controversial Great Recoinage of 1696, or for his late inquiries on ancient chronology, at times with precious little regard to how successful these feats were.

The national relevance of Newton—his being, in the words of popularizer Henry Pemberton, "the boast of the nation"—made the public assimilation of his philosophical ideas a point of primary importance.[70] Newtonian ideas *needed* to be assimilated in the early eighteenth century, because gentlemen and gentlewomen were increasingly

expected to be "literatured" in the sense, used by Gerald Maclean, of being "well read and well versed in something of national significance" (8). But while knowledge of his brand of high-level mathematics was critical to Newton's scientific followers who sought to construct his enduring image as the most intelligent of men, to the members of polite society, who were well-educated but by no means scholars, Newton's mathematical ability could simply be taken for granted. What these people increasingly needed was to know more of their famous countryman who had discovered universal gravitation and the wonders of lights and colors, and who had quickly surged to the same rank of the foremost intellectual heroes of the nation. The reason for this interest appears from sources like the letter Alexander Pope sent to John Conduitt, in which the poet insisted on the relevance of Newton for the prestige of the whole country. In the letter, Pope vindicates having Newton's genius belong not to a restricted philosophical community, which was European in scope and tended to communicate in Latin, but to British society at large. "It takes very much from the praise of S^{r} I. N., and I fear unjustly," Pope contends, "to imagine that any Prince's reign can *make* Newtons, however it might *incourage* or *admire* them." Newton is here being claimed as a patrimony of the British citizenship, and only then of the European philosophical community. This is why Pope wishes that Conduitt's intended biography were "inlarged with some Memoirs and Character of him, as a private man." Narrating the story of Newton's life and manners, Pope believed, would inspire fellow citizens, who he takes to be as the ideal audience for Newton's work and biography.[71]

Pope's letter to Conduitt gives us a glance of the strategic importance that Newton had for Britain. His figure was symbolic capital that his compatriots wanted to maximize,

and to do so, it was crucial to make Newton as relatable as possible. The intellectual will of the philosopher who had curtly demanded that his philosophical contributions be assessed only by the selected few who understood his forbidding mathematics was less and less significant following his demise, perhaps to the point, first made by Robert E. Schofield, that knowledge of what the real Newton thought was "irrelevant" to his compatriots, since Newton "was not a Newtonian in any one of the many versions [of Newtonianism] which can be identified" anyway.[72] This aspect was all the more crucial after Newton's death, and Pope had noticed that to exploit Newton's scientific genius fully and make him into a prime symbol of the cultural prestige of Britain, his public image had to be amended. This did not solely involve religion, as Scott Mandelbrote has perceptively noted when he wrote of the "sanitization" that sought to obscure Newton's antitrinitarianism with the goal of turning his philosophy into "a weapon that could from time to time be deployed by the Church."[73] Newton's figure also needed to be made accessible to the polite society of well-educated, yet generalist readers and conversationalists. Newton could no longer be exclusively claimed by the few experts able to grasp his advanced mix of geometry and calculus. The educated public of ladies and gentlemen uninitiated in, and wary of, the complexities of mathematics, wanted their share of Newton too.

The primary means of doing so was by turning Newton into an embodiment of modesty, the characteristic associated with virtuous public behavior, which Newton had conspicuously lacked in his lifetime. Biographical anecdotes on Newton's arrogance could be silently revised over time (as they were), but a more pressing problem was the mathematics inherent in his philosophy, which Newton had always upheld, but which,

after his death, awkwardly stood in the way of making him into symbolic capital. His commitment to mathematical exactness made Newton's figure incompatible with modesty in the accepted sense of being moderate and able to exchange ideas without being confrontational, and which was, as we have seen, an essential quality for public life. For these reasons, many of the popularizers and commentators who glorified Newton's figure decided that dispensing with the more mathematical elements of his ideas was one of the ways to make the philosopher's public image more modest, and thus better suited to become a symbol of British greatness. In practice, what happened was the gradual erosion of the belief that mathematics was essential to understanding Newton's philosophy.

For scrupulous popularizers who had been close to Newton in his lifetime, this meant facing the clash between social expectations and faithfulness to their master's philosophical beliefs. As early as 1716, Whiston, another one of Newton's protégés, undertook the task of divulging "in a more easy Method" the philosophical ideas of the "Great Man," with the overt aim to bring Newton's philosophy "within the Reach and Comprehension of those, who are but indifferently perhaps exercis'd in the Mathematicks, and communicate the Knowledge thereof as far as may."[74] Newton's assistant (and then famous public demonstrator) Jean-Theophilus Desaguliers added that the "Truth" of the "Newtonian Philosophy," although indeed "supported by Mathematicks," could be fruitfully communicated without it.[75] All in all, this was in line with Newton's own admission that he could have written the third book of *Principia* in a language understandable by the many, but chose not to. Following their master, neither

Whiston nor Desaguliers was ready to sacrifice mathematics at the altar of the public Newton, most likely because the philosopher was still alive.

It was with a work published after Newton's death, Pemberton's widely read *A View of Sir Isaac Newton's Philosophy* (1728), that a shift started to be noticeable. Pemberton, who had overseen the publication of the third edition of the *Principia* two years earlier, silently amended Newton's position that mathematics was the means of establishing facts about nature with certainty. In contrast to his master, Pemberton conceded that even "proofs in natural philosophy cannot be so absolutely conclusive, as in the mathematics." It is necessary

> to steer a just course between the conjectural method of proceeding, against which I have so largely spoke; and demanding so rigorous a proof, as will reduce all philosophy to mere skepticism, and exclude all prospect of making any progress in the knowledge of nature.[76]

Whiston, Desaguliers, and Pemberton (and, later, Colin MacLaurin) represented a group of disciples concerned not only with promoting Newton's image but also with training a new generation of post-Newtonian mathematicians. That is why Pemberton clearly states his aim to encourage "such young gentlemen as have a turn for the mathematical sciences" (preface), an invitation that might well have proved vital to spur interest in mathematical techniques applied to cutting-edge scientific enterprises later in the century. Still, Pemberton's concession that the conjectures "against which I have so largely spoke" were necessary betrays some uneasiness with a philosophy that risked damaging

Newton's public image if one kept faithful to his original claim that only mathematically proficient scholars should engage with natural phenomena. As Pemberton acknowledges in the dedication, there are "more Admirers of your wonderful Discoveries, than there are Mathematicians able to understand the first two Books of your Principia." With an eye to the public, the popularizer thus emphasized the moral attributes of Newton, presenting the philosopher as distinguished by the "moral endowments of his mind," which were "as much to be admired as his other talents" of a more scientific cast (preface).

Popularizers less concerned with offering a faithful account of Newton's mathematical philosophy than Pemberton did not have to perpetuate their master's intellectual legacy, so they were free to insist that readers should simply ignore the mathematics in the *Principia*, as this was superfluous to the spread of Newton's ideas and, perhaps, even harmful. This was achieved by suggesting that Newton himself considered mathematics unnecessary. A pioneering instance of this tendency is John Harris's *Astronomical Dialogues* (1719), which stages a conversation between a gentleman and a lady, the latter being "frighted and deterred from beginning with *Geometry*, and the *abstracted Mathematicks*." Cannot these subjects be taught, she asks, "to Gentlemen, or even to our Sex" in an "easy and delightful way?" To which the polite narrator responds that "doubtless" the mastery of any science cannot be gained but by one who "can communicate it to another in plain and easy Words, and render it intelligible to any common Capacity and inquisitive Genius."[77] Newton, Harris entailed, was no doubt one of the affable philosophers.

It was with popularizations explicitly directed to the polite reader that the status of mathematics was more plainly identified as an obstacle to becoming acquainted with

Newton's ideas. As the excerpt from the *Astronomical Dialogues* shows, this process had also to do with the rising interest of women readers in scientific subjects, what Carolyn Merchant defines as "the attempts by bourgeois entrepreneurs to capture a wider female audience."[78] Authors like Harris chose to leave mathematics out, perhaps on the assumption that women readers would not have been able to handle high-level calculus and geometry. This was hardly the case, as highly proficient women could solve the mathematical problems of Newtonian fluxions (for example, the readers of the *Ladies' Diary* were perfectly able to do so).[79] Still, as John Mullan has compellingly shown, a woman's ignorance was often considered as the necessary backdrop against which the celebration of Newtonian science could be set.[80]

Albeit also tainted by sexism, Francesco Algarotti's view in *Il Newtonianismo per le Dame* is more general in scope, and it is noteworthy that this work was translated by the intellectually accomplished Elizabeth Carter.[81] In the preface to the English version, the narrator resolutely affirms that "Lines and mathematical Figures are entirely excluded, as they would have given these Discourses too Scientific an Air"; by the same token, mathematical terms are "as much as possible avoided."[82] This is not due to thee assumed inability of women to deal with abstract forms, as Mullan implies (48). Rather, the narrator apologizes because his "Arguments are unhappily incontestable Experiments." To make up for this, the author guarantees that those opinions that "do not carry such a Certainty in them, as to make the Conversation grow languid," will have the lion's share of the dialogues (Algarotti, iv). Via Carter's translation, Algarotti's narrator seems to be invested in advocating a broader social tenet: that of propriety in conversation, intended by Algarotti less as a mark of etiquette than as a tool for

producing usable, but by no means specialized, knowledge for gentlemen and gentlewomen. Whoever talks mathematics in a conversation with a lady or a gentleman exhibits a lack of modesty, an excess of specialist language that betrays the attempt to monopolize knowledge and thus exclude fellow members of society from ideas of public relevance. The obvious conclusion is that such talk must be avoided at all costs in environments where people socialize.

This is why Algarotti's is declaredly "a Work of Philosophy and Politeness." His invitation to enter the Newtonian "age of Realities" is described as a means to "polish and adorn Society" (xi, xvi). No distinction is drawn between proper philosophical knowledge and civility, for the two are blended in the name of the good of society, as long as authors present their ideas modestly. This is the reason why the gentleman narrator in *Newtonianism for the Ladies* avoids mathematics when introducing the marchioness to the secrets of the Newtonian philosophy. The first point of learning, the narrator maintains, is "not to be too arrogant, but perceive our own Weakness." And this, he specifies, is "a Point of Modesty" little practiced "by those Gentlemen who with the Vulgar gain the Reputation of Philosophers" by spending their time censuring other types of philosophy. Luckily, Algarotti writes, Newton could never be accused of being as immodest as some of his fellow philosophers, for what he had done was nothing more than modestly submitting his own "Opinion" to the public (13, 204–05).

<A>**Conclusion: Newton as the Worthy Example**

Algarotti's popularization exemplifies the twofold process whereby in texts directed to a non-expert audience. To make Newton into an example of proper behavior that others

779 could follow, Newton's supposed moral qualities were emphasized while mathematics
780 was made ancillary. The particular way in which this process unfolded depended on the
781 audiences that writers catered to. One obvious target of texts such as Harris's and
782 Algarotti's was women readers, who, as mentioned above, were increasingly relevant in
783 the early eighteenth-century book market and had thus to get "sold" on Newton. Making
784 Newton modest was useful to marketing the philosopher to women; his candor and
785 aversion for disputes could be emphasized to make him modest in the ways that, as
786 Yeazell has explained, women were expected to behave according to conduct books from
787 the late seventeenth century onward. Newton's modesty had thus a gendered element to
788 it, and, with chastity being a central element to the "modesting" of women, one
789 immediately thinks of Voltaire's remark that Newton had died a virgin. But there was a
790 broader sense, which this contribution has explored, in which the modest Newton
791 popularizers and commentators modeled was neither the modest witness à la Boyle nor
792 an exemplification of feminine demureness, but rather the prime example of a citizen
793 interested in public good.

794 Since his death in 1727, Newton was portrayed as the genial, yet humble
795 philosopher who had retained his "modesty" in spite of having "the whole world" that
796 "conspired against it." These words, which come from the English version of
797 Fontenelle's *Éloge*, make a compelling point: Newton's modesty, although impressive
798 indeed, was commensurable with that of other people, differently from his supernatural
799 intellectual powers, which, by contrast, were unique and thus impossible to match.[83] This
800 meant that Newton's modesty could be imitated and cultivated by his readers, and his
801 peaks of humbleness reached by even the least scientifically inclined person, given

enough time. As Fontenelle mentions at the end of his eulogy, Newton "was not distinguished from other men, by any singularity either natural or affected" (33).

It was Newton's modesty, the story went, that had brought him to diffuse his revolutionary discoveries about nature to the public. The rationale behind Fontenelle's claim is that knowledge is a public good that needs to be made available to the whole of humankind. This was to be an influential, longstanding position. By 1737, the year Voltaire's *Elements of Sir Isaac Newton's Philosophy* appeared in English, knowledge of nature was believed to have left the arcane repositories of philosophy to turn into the collective property of the public, and this lofty goal was perceived to have been achieved thanks to the decisive contribution of Newton, the hero who had transformed complex natural knowledge into "a Good, to which all Men have an equal Right: all are for knowing their Good, which few have Time or Patience to calculate."[84]

While Voltaire's description (and, to an extent, Fontenelle's) was no doubt affected by the intellectual climate of the French Enlightenment, their description of Newton as an example of proper civic behavior became stereotypical in the British society of the second half of the century. The prideful philosopher who had sought to exclude from philosophical debate anyone who did not understand and pay homage to his mathematical philosophy, would be now regularly evoked as a role model to settle disputes stemmed from arrogance, as a commentator in the *Lloyd's Evening Post* in 1758 implied when taking on an anonymous slanderer:

> Sir Isaac Newton has been no less remarkable for his modest manner of expressing himself, than for his deep penetration and perspicuity; his Queries are

> rather axioms dressed up in such form, and where he says, *I suppose*, *conceive*, or *it is probable*, some men, with much less reason, have been guilty of the arbitrary phrases, *It is certain*, *there is no doubt*, *it is well known*, and such like conclusive expression. . . . Had he stopt here, he had been modest, and followed the worthy example set him by Sir Isaac Newton.[85]

Nobody who had known Newton personally would have agreed with this assessment, but most of those people were no longer alive. By the second half of the eighteenth century, Newton's personal beliefs had been virtually effaced and replaced by a biography of alternative facts that make the posthumous Newton belong more to mythology than history. Journalists especially made a habit of sanctifying Newton, along with Boyle and Locke, as a model citizen characterized by a natural modesty, an exception among "men of fame" because of his ability to give his opinions "with *candour* and *modesty*, instead of the *positive*, *dogmatical* way, too pregnant among many of them."[86] Almost one hundred years after the publication of the first edition of *Principia*, they underlined that his "eminent" learning had come "joined with his singular modesty" which made "such superior knowledge not disgusting to his inferiors";[87] and, in the same years, they emphasized the "enlightening Powers" of his philosophy that were said to have always been put to the service of a "warmest Zeal for the Public."[88]

These portrayals not only made Newton into an example of public civic behavior, but did so without mentioning mathematics. The grounds for this choice are that knowledge produced in specialized disciplines like mathematics did not benefit the whole of society. This position is well summarized by the *London Chronicle* journalist in 1765

who, taking Newton as the example of proper civic behavior, contends that the "glory of knowledge" never arises "from learning and talents of the mind only," but from the use that is made of them: the luster is provided by modesty, which "exalts more than anything else" because it makes even the highest knowledge available to the public. The "utmost extent of knowledge" is not simply useless without modesty; it is straight-up detrimental to society. So, the question is not what one knows, but whether knowledge will benefit fellow citizens, for simply being "learned" makes one into a "mere bubble of vanity, blown up with the froth of himself, and a sport to the puffs of flattery, in short, a mere *animal of glory*."[89] Notwithstanding Newton's lifelong commitment to his forbidding brand of mathematics to the exclusion of the vast majority who did not understand it, by the second half of the century, his public image had been restyled so as to make mathematics unnecessary to the cult of his figure. The public Newton could be venerated with no knowledge of the method of fluxions or the inverse square law. What mattered to many, it turned out, was that Newton's modesty had been as crucial to his success as his genius.[90]

Notes

[1]Edmund Halley, "Ode on This Splendid Ornament of Our Time and Our Nation" ["In Viri Præstantissimi D. Isaaci Newtoni Opus Hocce Mathematico-Physicum"], from Isaac Newton, *Principia Mathematica Philosophiae Naturalis* (1687), ed. and trans. I. Bernard Cohen and Anne Whitman (Berkeley: California Univ., 1999), 379–80. This is the text used for all allusions to the *Principia*.

[2]*The Spectator* 635 (20 December 1714).

[3]Richard Yeo, in "Genius, Method, and Morality: Images of Newton in Britain, 1760–1860, *Science in Context* 2 (1988): 257–84, claims that the changes in the public image of Newton mainly occurred from the mid-eighteenth century. I put the date earlier. On the use of "genius" in the early eighteenth century, see Alexander Marr, et al., *Logodaedalus: Word Histories of Ingenuity in Early Modern Europe* (Pittsburgh: Univ. of Pittsburgh, 2018), 207–09.

[4]Richard Glover, "A Poem on Sir Isaac Newton," in Henry Pemberton, *A View of Sir Isaac Newton's Philosophy* (London: S. Palmer, 1728), and James Thomson, *A Poem Sacred to the Memory of Sir Isaac Newton* (London: J. Millan, 1727), 5.

[5]The inscription was widely quoted in eighteenth-century publications. One of the first printed occurrences seems to be in the *Grubstreet Journal* 22 (22 April 1731).

[6]Patricia Fara, *Newton: The Making of Genius* (London: Pan Macmillan, 2002), and Mordechai Feingold, *The Newtonian Moment: Isaac Newton and the Making of Modern Culture* (New York: New York Public Library, 2004), see especially 143–67.

[7]Apart from Fara, *Newton*, see Robert Iliffe, "'Is He Like Other Men?': The Meaning of the *Principia Mathematica*, and the Author as Idol," in *Culture and Society in the Stuart Restoration: Literature, Drama, History*, ed. Gerald Maclean (Cambridge: Cambridge Univ., 1995), 159–78.

[8]Allan Ramsay, *An ode. To the Memory of Sir Isaac Newton; Inscrib'd to The Royal Society of London, for the improving of Natural Knowledge* (Edinburgh, 1727), 2–3.

[9]Bernard Le Bovier de Fontenelle, *An Account of the Life and Writings of Sr. Isaac Newton* (London: T. Warner, 1727), 33. See Simon Schaffer, "Fontenelle's Newton and the Uses of Genius," *L'Esprit Créateur* 55.2 (2015): 48–61.

[10]Isaac Newton, *The Chronology of Ancient Kingdoms Amended* (London: J. Tonson, 1728), vii.

[11]*The Correspondence of Henry Oldenburg*, ed. and trans. Rupert A. Hall and Marie B. Hall, 13 vols. (Madison: Univ. of Wisconsin, 1973), 9:571.

[12]See Richard S. Westfall, *Never at Rest*: *A Biography of Sir Isaac Newton* (Cambridge: Cambridge Univ., 1981), 512.

[13]Alfred Rupert Hall, *Philosophers at War: The Quarrel between Newton and Leibniz* (Cambridge: Cambridge Univ., 2002), 183, 190.

[14]François-Marie Arouet de Voltaire, *The Metaphysics of Sir Isaac Newton: Or, a Comparison Between the Opinions of Sir Isaac Newton and Mr. Leibnitz*, trans. David Erskine Baker (London: R. Dodsley, 1747), 60–61.

[15]Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (Princeton: Princeton Univ., 1985), 65.

[16]Laura Miller, *Reading Popular Newtonianism: Print, the Principia, and the Dissemination of Newtonian Science* (Charlottesville: Univ. of Virginia, 2018), 3–5.

[17]Steven Shapin, "Robert Boyle and Mathematics: Reality, Representation, and Experimental Practice," *Science in Context* 2 (1988): 23–58.

[18]Quoted by Peter Dear, in *Discipline and Experience: The Mathematical Way in the Scientific Revolution* (Chicago: Univ. of Chicago, 1995), 2.

[19]Matthew L. Jones, *The Good Life in the Scientific Revolution: Descartes, Pascal, Leibniz, and the Cultivation of Virtue* (Chicago: Univ. of Chicago, 2006), 9–11, et passim.

[20]Robert Hooke, "To the Royal Society," from *Micrographia: or Some Physiological Descriptions of Minute Bodies Made by Magnifying Glasses with Observations and Inquiries Thereupon* (London: Jo. Martyn, 1665), sig.A2v.

[21]Robert Boyle, *The Sceptical Chymist* (London: J. Cadwell, 1661), 4–5.

[22]Robert Plot, *The Natural History of Oxford-Shire, Being an Essay toward the Natural History of England* (Oxford: The [Sheldonian] Theater in Oxford, 1677), 71.

[23]Isaac Newton, "A Letter of Mr. Isaac Newton . . . . containing his New Theory about Light and Colors," *Philosophical Transactions of the Royal Society* 80 (1672): 3,075–87. The content of this letter, along with the *Optical Lectures* delivered at Cambridge University in 1670–72, would constitute the bulk of *Opticks*. The process has been described in detail by A. Rupert Hall and Dennis Sepper. See Hall, *All Was Light: An Introduction to Newton's Opticks* (London: Clarendon, 1993), and Sepper, *Newton's Optical Writings: A Guided Study* (New Brunswick: Rutgers Univ., 1994).

[24]Quoted by Thomas Birch, in *The History of the Royal Society*, 3 vols. (London: A. Millar, 1756–57), 3:12.

[25]Quoted by Stephen Gaukroger, in "Empiricism as a Development of Experimental Natural Philosophy," *Newton and Empiricism*, ed. Zvi Biener and Eric Schliesser (New York: Oxford Univ., 2014), 26.

[26]Mordechai Feingold, "Mathematicians and Naturalists: Sir Isaac Newton and the Royal Society," in *Isaac Newton's Natural Philosophy*, ed. Jed Z. Buchwald and I. Bernard Cohen (Cambridge: MIT, 2001), 83.

[27]Isaac Newton, *Opticks, or, a Treatise of the Reflections, Refractions, Inflections and Colours of Light* (1704), ed. I. Bernard Cohen (New York: Dover Publications, 1979), 1. This is the text used for all allusions to *Opticks*.

[28]I. Bernard Cohen, "The First English Version of Newton's Hypotheses Non Fingo," *Isis* 53 (1962): 381.

[29]Alan E. Shapiro, *Fits, Passions, and Paroxysms: Physics, Method, and Chemistry, and Newton's Theories of Colored Bodies, and Fits of Easy Reflection* (Minnesota: Univ. of Minnesota, 2009), 17. For a technical discussion of the role of hypotheses in Newton's philosophical system, see William L. Harper, *Isaac Newton's Scientific Method: Turning Data into Evidence about Gravity and Cosmology* (Oxford: Oxford Univ., 2011), 343–71.

[30]Roger Cotes, "Editor's Preface to the Second Edition," in Newton, *Principia*, 393, 397.

[31]Niccolò Guicciardini, *Isaac Newton on Mathematical Certainty and Method* (Cambridge: MIT, 2009), 180.

[32]Matthew Wickman, *Literature after Euclid: The Geometric Imagination in the Long Scottish Enlightenment* (Philadelphia: Univ. of Pennsylvania, 2016), 48–50.

[33]*The Correspondence of Isaac Newton*, ed. H. W. Turnbull, 7 vols. (Cambridge: Cambridge Univ., 1960), 2:443.

[34]Quoted by D. T. Whiteside, "The Mathematical Principles Underlying Newton's *Principia Mathematica*," *Journal for the History of Astronomy* 1 (1970): 116.

[35]Samuel Clarke, *Sermons*, 10 vols. (London: W. Botham, 1730), 1:iii.

[36]See Zev Bechler, "Newton's 1672 Optical Controversies: A Study in the Grammar of Scientific Dissent," in *The Interaction Between Science and Philosophy*, ed. Yehuna Elkana (Atlantic Highlands: The Humanities Press, 1974), 116–17.

[37]Donna J. Haraway, *Modest-Witness@Second-Millennium.Femaleman-Meets-Onco Mouse: Feminism and Technoscience* (New York: Routledge, 2018), 24. I have intentionally used the masculine pronoun since Haraway's goal was to retool Shapin and Schaffer's modest-witness concept to mount a broader argument on the transparent male subject being the default scientific standpoint to the exclusion of women, who, by contrast, were reckoned as marked, and thus unreliable observers.

[38]Al Coppola, *The Theater of Experiment: Staging Natural Philosophy in Eighteenth-Century Britain* (New York: Oxford Univ., 2016), 35.

[39]Tita Chico, *The Experimental Imagination: Literary Knowledge and Science in the British Enlightenment* (Stanford: Stanford Univ., 2018), 37.

[40]Ruth Bernard Yeazell, *Fictions of Modesty: Women and Courtship in the English Novel* (Chicago: Chicago Univ., 1991), 9.

[41]*The Tatler* 52 (6 August 1709).

[42]See, for example, *The Spectator* 2 (2 March 1711).

[43]*The Spectator* 20 (23 March 1711).

[44]Robert Warren, *The Devout Christian's Companion. The Second and Last Part* (London: C. Smith, 1710), 189.

[45]William Cave, *Primitive Christianity* (London: R. Chiswel, 1702), 226–27.

[46]George Cheyne, *Philosophical Principles of Natural Religion* (London: George Strahan, 1705), 2, and Daniel Defoe, *The Consolidator: or Memoirs of Sundry Transactions from the World in the Moon* (London: B. Bragge, 1705), 94. One might wonder whether Defoe directed his satire to Newton or Boyle—the lunar philosopher is, after all, referred to as "*virtuoso.*" When taken in context, however, it seems clear that Defoe's hidden referent was Newton. References to "the *how*, the *modus* of all the secret Operations of Nature" unveiled through mathematics and glasses would have reminded everyone of Newton, especially since Boyle was almost unanimously perceived as a pious experimenter unfailingly guided by religious modesty (17).

[47]Richard Marsh, *The Vanity and Danger of Modern Theories* (Cambridge: The University Press, 1701), 2–3.

[48]Courtney Weiss Smith, *Empiricist Devotions: Science, Religion, and Poetry in Early Eighteenth-Century England* (Charlottesville: Univ. of Virginia, 2016), 152.

[49]*Hermit* 1 (4 August 1711) and 28 (9 February 1712).

[50]Robert Markley, *Fallen Languages: Crises of Representation in Newtonian England, 1660–1740* (Ithaca: Cornell Univ., 1993), 136. On Newton's religious outlook, see also Rob Iliffe, *Priest of Nature: The Religious Worlds of Isaac Newton* (Oxford: Oxford Univ., 2019).

[51]*Hermit* 1 (4 August 1711) and 28 (9 February 1712).

[52]Quoted by Larry Stewart, in *The Rise of Public Science: Rhetoric, Technology, and Natural Philosophy in Newtonian Britain, 1660–1750* (Cambridge: Cambridge Univ., 1992), 75.

[53]James E. Force, "Newton's God of Dominion: The Unity of Newton's Theological, Scientific, and Political Thought," in *Essays on the Context, Nature, and Influence of Isaac Newton's Theology*, ed. Force and Richard H. Popkin (Dordrecht: Kluwer, 1990), 53.

[54]On Newton's *Chronology*, See Cornelis J. Schilt, "Manuscripts and Men: The Editorial History of Newton's *Chronology* and *Observations*," *Notes and Records: The Royal Society Journal of the History of Science* (2019), 1–4, online at < royalsocietypublishing.org/doi/full/10.1098/rsnr.2018.0069 >, and Alessio Mattana, "*Antiquitas Non Fingo*: Newton, the Moderns, and the Science of Ancient History," *Journal for Eighteenth-Century Studies* 43 (2020): 447–61.

[55]*Grub Street Journal* 296 (28 August 1735).

[56]*The Spectator* 635 (20 December 1714).

[57]*The Spectator* 197 (16 October 1711).

[58]Craig Calhoun, "Introduction," *Habermas and the Public Sphere*, ed. Calhoun (Cambridge: MIT, 1992), 1–50; the quotation is from 28. These discursive loci obeyed principles of social cohabitation quite similar to the ones that were in place within the Royal Society at the time of the "New Theory" controversy. The difference is that the scientific production of early Royal Society practitioners had very little relevance for culture at large—Boyle's weighing air and Hooke's microscope observations, as Coppola contends, were often the subject of scathing satirical plays—whereas Newton's ideas were immediately made a matter of national pride. See Coppola, *Theater of Experiment*, chapter 1.

[59]Lawrence E. Klein, *Shaftesbury and the Culture of Politeness: Moral Discourse and Cultural Politics in Early Eighteenth-Century England* (Cambridge: Cambridge Univ., 1994), 4–6, 8.

[60]*The Spectator* 197 (16 October 1711).

[61]*The Spectator* 373 (8 May 1712).

[62]Quoted by Chico, in *Experimental Imagination*, 42. On Folkes, see Anna Marie Roos, *Martin Folkes (1690–1754): Newtonian, Antiquary, Connoisseur* (Oxford: Oxford Univ., 2021).

[63]Feingold, *Newtonian Moment*, 30–31, and Stewart, *Rise of Public Science*, xxix. Massimo Mazzotti, in "Newton for Ladies: Gentility, Gender, and Radical Culture," *The British Journal for the History of Science* 37 (2004): 119–46, rightly cautions against separating the production of scientific knowledge from its social dissemination, and this is all the truer in Newton's case (121).

[64]Massimo Mazzotti, "The Two Newtons and Beyond," *British Journal for the History of Science* 40 (2007): 105–11.

[65]Margaret C. Jacob, *Newtonians and the English Revolution, 1689–1720* (Ithaca: Cornell Univ., 1976), and John Bennett Shank, *The Newton Wars and the Beginning of the French Enlightenment* (Chicago: Univ. of Chicago, 2008).

[66]Stephen D. Snobelen, "On Reading Isaac Newton's *Principia* in the 18th Century," *Endeavour* 22:4 (1998): 159–63; the quotation is from 160, online at <https://www.sciencedirect.com/science/article/pii/S016093279801148X >.

[67]Rob Iliffe, "Isaac Newton, Lucatello Professor of Mathematics," in *Science Incarnate: Historical Embodiments of Natural Knowledge*, ed. Christopher Lawrence and Steven Shapin (Chicago: Univ. of Chicago, 1998), 123.

[68]Iliffe, "Is He Like Other Men?," 159–60; the quotation is from 175. On solitude as Newton's cultivated pose of the man of genius, see Steven Shapin, "'The Mind Is Its Own Place': Science and Solitude in Seventeenth-Century England," *Science in Context* 4 (2004): 191–218, especially 194, 205–206, and Simon Schaffer, "Newton on the Beach: The Information Order of Principia Mathematica," *History of Science* 47 (2009): 243–76, especially 243–47.

[69]Mazzotti, "Two Newtons, 108. By 1800, Newton boasted an estimated 122 portraits and 109 sculptures. See Milo Keynes, *The Iconography of Sir Isaac Newton to 1800* (Suffolk: Boydell, 2005).

[70] Dr. [Henry] Pemberton, "To the Noble and Right Honourable Sir Robert Walpole," *A View of Sir Isaac Newton's Philosophy* (Dublin: John Hyde, 1728), sig.A2v.

[71]Quoted by David Brewster, in *The Life, Writings, and Discoveries of Sir Isaac Newton*, 2 vols. (Edinburgh: Thomas Constable and Co., 1860), 2:405.

[72]Robert E. Schofield, "An Evolutionary Taxonomy of Eighteenth-Century Newtonianisms," *Studies in Eighteenth-Century Culture* 7 (1978): 175–92; the quotation is from 177.

[73]Scott Mandelbrote, "Eighteenth-Century Reactions to Newton's Anti-Trinitarianism," in *Newton and Newtonianism: New Studies*, ed. James E. Force and Sarah Hutton (Dordrecht: Kluwer Academic, 2004), 93–111; the quotation is from 111.

[74]William Whiston, *Sir Isaac Newton's Mathematick Philosophy More easily Demonstrated* (London: J. Senex, 1716), 1. See James E. Force, *William Whiston, Honest Newtonian* (Cambridge: Cambridge Univ., 2002).

[75]John Theophilus Desaguliers, "Preface" to *A Course of Experimental Philosophy* (London: John Senex, 1734), sig.a4v.

[76]Pemberton, *View* (London, 1724), 19–20.

[77]John Harris, *Astronomical Dialogues Between a Gentleman and a Lady* (London: T. Wood, 1719), 147.

[78]Carolyn Merchant, *The Death of Nature: Women, Ecology, and the Scientific Revolution* (San Francisco: Harper and Row, 1980), 273.

[79]See Shelley Costa, "The Ladies' Diary: Gender, Mathematics, and Civil Society in Early-Eighteenth-Century England," *Science and Civil Society* 17 (2002): 49–73.

[80]John Mullan, "Gendered Knowledge, Gendered Minds: Women and Newtonianism, 1690–1760," in *A Question of Identity: Women, Science, and Literature*, ed. Marina Benjamin (New Brunswick: Rutgers Univ., 1993), 41–56, especially 45–49.

[81]On the reprints of Algarotti's text in Britain, see Laura Miller, "Publishers and Gendered Readership in English-Language Editions of *Il Newtonianismo per le Dame*," *Eighteenth-Century Culture* 42 (2013): 191–214.

[82]Francesco Algarotti, *Sir Isaac Newton's Philosophy Explain'd For the Use of the Ladies. In Six Dialogues on Light and Colours*, 2 vols. (London: E. Cave, 1739), 1:vi–vii.

[83]See A. Rupert Hall, *Isaac Newton: Eighteenth-Century Perspectives* (Oxford: Oxford Univ., 1999), 53–54.

[84]François-Marie Arouet de Voltaire, *The Elements of Sir Isaac Newton's Philosophy* (London: Stephen Austen, 1738), 3.

[85]*Lloyd's Evening Post and British Chronicle* 196 (18–20 October 1758).

[86]*London Chronicle* 1,765 (6–8 August 1765).

[87]*London Chronicle or Universal Evening Post* 2,798 (12–15 November 1774).

[88]*Public Advertiser* 1,330 (30 May 1777).

[89]*London Chronicle* 1,347 (6–8 August 1765).

[90]For a study on the nineteenth-century images of Newton, see Rebekah Higgitt, *Recreating Newton: Newtonian Biography and the Making of Nineteenth-Century History of Science* (London: Pickering and Chatto, 2007).