# ELIZABETH TOLLET: A NEW NEWTONIAN WOMAN

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Women do not figure prominently in biographies of Newton. Only three have been accorded any serious role in his life: his mother, his niece Catherine Barton, and his own "impertinently litigious Lady" of philosophy. As an adult, Newton moved in a largely male world. This real exclusion is made starker by the failure of Newton's contemporaries to provide information about women who were present; thus few details survive of his daily interactions with Barton, even though they shared a house for many years.

Newton was acquainted with one woman whom previous biographers have apparently not uncovered: the poet Elizabeth Tollet (1694–1754). The Appendix of this paper reproduces her elegy to Newton, which appears in print for the first time since 1780. Tollet was a new Newtonian woman in two senses. Most immediately, she has not previously been mentioned by Newton specialists, and there seem to be no commentaries devoted to her work. More interestingly, as a woman who wrote about Newton and incorporated scientific imagery in her poetry, she provides an unusually early example of the eighteenth-century women who were starting not only to learn about natural philosophy, but also to affect its inclusion in polite culture.[1]

The hierarchical structure of English society during Newton's life meant that many people — including women — were simply omitted from the record, a problem compounded by subsequent historians working with a narrow definition of who and what should count as important. During the past twenty years, historians of science have become increasingly interested in retrieving actors who had previously been rendered invisible, such as back-stage technical assistants, paid experimenters and — more recently — women. Women were denied entry to the Universities and to institutions such as the Royal Society; held to be intrinsically unsuited to natural philosophy and those who did show any aptitude were made the butts of savage satires. Nevertheless, several studies have demonstrated that, despite their limited educational opportunities and a hostile intellectual environment, a few outstanding women did practise and even lecture on natural philosophy during the seventeenth and eighteenth centuries.[2] Attention has also been paid to analysing ways in which larger numbers of women helped natural philosophy to reach wider audiences. Some of them wrote or translated simplified versions of Newtonian philosophy, and hence played an important role in communicating his ideas and consolidating his status. In addition, women were collectively targeted as an important consumer group for the new philosophical products that were being marketed, such as books, demonstration lectures and educational toys.[3]

Despite her neglect by historians of science, Tollet has received some attention

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in literary studies, where scholars have been challenging traditional accounts of eighteenth-century writing. By analysing earning and spending capacities, they have given women new and more powerful roles as both producers and consumers of literature in a commercializing society. By studying the books written by women that were successful at the time, but that have been excluded from the canon of English literature, they have substantially revised the century's literary characteristics.[4]

Tollet is interesting not only because of her connection with Newton, but also because her life and poetry provide fresh evidence about women and changing attitudes towards natural philosophy in eighteenth-century England. Poetry was an important didactic medium for spreading Newtonian ideas. The seminal work on this theme, Marjorie Hope Nicolson's *Newton demands the muse*, focuses on the influence of Newton's *Opticks*, and is now almost sixty years old. Analysing Tollet's poetry, which is not mentioned by Nicolson, illustrates how imagery drawn from the *Principia* and other sources also contributed to the diverse understandings of Newtonianism that developed during the eighteenth century.[5]

Historians concerned to reverse earlier gender bias have stressed female influence, but there is a risk of distorting the past in a different way by creating role models for modern feminists. A few exceptional individuals — such as Laura Bassi, Margaret Cavendish and Émilie du Châtelet — have been the subject of excellent studies, but more information is needed about less prominent women. Resurrecting Tollet and other forgotten women is essential in order for historians to achieve a more realistic appraisal of their significance, and also a richer understanding of how natural philosophy became an important component of polite culture.[6]

## 1. LIFE AND WORKS

Little biographical information about Tollet has survived. The frustratingly brief accounts describe a woman who lived quietly, never married, and published anonymously. The family was probably originally from Westmorland, but she was brought up in London. Some time after 1720, she moved to her father's country home of Betley Hall in Staffordshire, which was a substantial house set in a large estate, and later to Stratford and then West Ham, where she died. She bequeathed to her youngest nephew the substantial fortune she had inherited from her father, and so presumably enjoyed a comfortable life.[7] Typically, no contemporary records mention Tollet's mother or any sisters, but she did have at least two younger brothers. George went to Westminster School and Christ Church, Oxford, but left without a degree and then antagonized their father by moving to the Isle of Man and marrying a local woman. Cooke, notorious for his "fiery disposition" and "gay and courtly" habits, was probably expelled from Westminster, but then went to St John's College, Cambridge; he subsequently married, and died in 1739.[8]

Tollet presumably met Newton at the Tower of London, where he was working at the Mint, and she was living with her father, George Tollet. He held a succession of state administrative posts, initially in Ireland, where he was associated with the Dublin Philosophical Society, and later in London. From 1702 to 1714, he was Extra

Commissioner of the Navy, one of several temporary officials paid an annual salary of £500 to serve on the Navy Board and perform general duties during busy periods. Although the exact affiliation remains unclear, he evidently managed to obtain Tower housing, a convenient location near to the major Navy offices situated in and around the Tower itself. This may have been because he twice appointed Charles Tollet (his brother, perhaps?) to be his Clerk, a much lower position paying around £30 a year, but which may have entitled him to live in the Clerk's House in the Tower. George Tollet's silverware showed the Tower as well as his memorial arms, and Charles Tollet was buried in the Tower in 1717.[9]

Elizabeth Tollet's poems provide another source for reconstructing her life. For instance, from one of her very few dated poems, in which she laments that "sorrow has untun'd my voice to sing", we learn that she lost an intimate friend called D.D.D in 1732. More generally, her poems demonstrate her erudition: the breadth of her knowledge is confirmed by internal learned references as well as her footnote amplifications. As Mary Hays, a campaigning essayist and novelist, commented in 1803, "several of her poems are on philosophical subjects, and display profound thinking".[10] Most famous in the eighteenth century for her poetic epistle about Anne Boleyn, Tollet wrote in varied styles on a range of topics. Interspersed between the long, serious poems on religion, natural philosophy and women's education there are epitaphs for lost friends (such as Newton), elegies to the pleasures of music, translations of psalms and classical poetry, brief epigrammatic verses, and light-hearted poems, some of which were set to music.

Literary texts do not yield unequivocal information about an author's personal history, especially a woman's. Narrating women's lives raises problems of devising an appropriate voice, language and plot, since biographies are generally governed by masculine conventions and milestones, and are structured chronologically by public achievements rather than focusing on interests and emotional relationships. Tollet's own work does provide evidence of her experiences and character, yet female writers used literary genres to express experiences, aspirations and grievances that were common to many women who were denied other outlets for their thoughts. For example, although Tollet wrote many poems about melancholy, death and bereavement (including her own epitaph) this does not necessarily mean that she was an unusually depressive woman. Melancholy, a gender-laden attribute, was conventionally associated with scholarship and devotion, and in the first half of the eighteenth century was used to describe women more often than men.[11]

Nevertheless, it does seem safe to infer from Tollet's writings that she was a religious woman, passionately interested in music, and an independent thinker who greatly preferred intellectual and artistic pursuits to more fashionable activities such as dancing, shopping and discussing clothes. In one mocking social commentary, she articulated an ideal type of life to which she surely aspired:

> On what wou'd I my Wishes fix?
> 'Tis not upon a Coach and Six:
> 'Tis not your rich Brocades to wear;

'Tis not on Brilliants in my Ear...
Friends that in any Dress would come;
To whom I'd always be at home....
My Table still shou'd cover'd be,
On this side Books, on that Bohea [tea].[12]

George Tollet was an affluent man who recognized his daughter's intelligence and ensured that she received an excellent education. She presumably grew up in a musical household, since he wrote a letter to William Holder suggesting small corrections to his *Treatise of the natural grounds, and principles of harmony* (1694), and her poetry demonstrates her own keen interest in music.[13] The lack of any reference to George Tollet's wife reinforces the intuition that she died relatively young, leaving Elizabeth Tollet to care for her younger brothers and any sisters, a normal obligation in this period for an oldest daughter. This suggestion would explain several points: why she never married, the references in her poetry to the emotional support provided by other women, her description as Mrs Tollet, and the friendship of Isaac Newton, her father's colleague.[14]

It seems very probable that, like other enlightened parents of this period, George Tollet allowed his daughter to share her brothers' lessons before they went to Westminster. This supposition is strengthened by Elizabeth Tollet's own angry question about the restrictions on women's education:

Is this a crime? for female Minds to share
The early Influence of instructive Care....[15]

Perhaps George Tollet himself taught his children mathematics and scientific subjects. In 1686, he had astounded the Dublin Philosophical Society by showing off the skills of a ten-year old girl he had been teaching. "Mr Tollet's Schollar" impressed the Fellows with her knowledge of mathematics, astronomy and geography, even surviving an interrogation on "y$^{e}$ most difficult propositions of Euclid, w$^{ch}$, she demonstrated with wonderful readiness".[16] Nearly twenty years later, perhaps Tollet made his own daughter perform similar mathematical feats for the entertainment of visitors. If so, then his friend Isaac Newton would be an obvious guest to invite.

Newton paid Elizabeth Tollet more attention than would be normal for a colleague's daughter: "Sir Isaac Newton honoured both him and his daughter with his friendship, and was much pleased with some of her first essays [poems]."[17] From her side, evidence of her admiration for this unusual patron is provided by her poetry. She wrote a long elegy on his death, and used Newtonian imagery in several of her other poems. Perhaps she was also thinking of Newton when she picked only one brief section to translate from Ovid's *Fasti* — "The praise of Astronomy".

In addition to excelling at the conventional female skills of music and drawing, "she spoke fluently and correctly the *Latin, Italian*, and *French* Languages; and well understood History, Poetry, and the Mathematicks".[18] Although many intelligent women spoke French and Italian, Latin was regarded as more appropriate for men. While some women did learn Latin, few reached her level of expertise. Tollet not

only translated Latin texts into English, but also wrote original Latin verse, as well as English poems based on classical authors. She was also gifted at versifying psalms into both Latin and English, a talent for which she received high praise. Sir Tanfield Leman (a physician) judged "she may be reckoned uncommonly successful", and John Hanway (a Cambridge graduate and Horace enthusiast) composed a Latin ode in tribute to her translation skills.[19]

Judging from her poems, Tollet had a good grasp of the basic principles of Newton's cosmology. Writing in 1727, before simplified primers had started to appear, she wrote of the planets:

> What Force their destin'd Line obliquely bends,
> And what in vacuous Space their Weight suspends.[20]

This is a more informed description than other poets' vague references to "circling spheres" and "whirling orbs". Other women were also well-informed about Newtonian ideas. As the young wife of the Astronomer Royal, Margaret Flamsteed studied mathematics, including Newtonian fluxions; another of John Flamsteed's assistants was Mary Astell, a controversial writer on women's education. Inspecting individual women reveals the insufficiency of simplistic one-way top-down models, which claim that knowledge of Newtonian physics and mathematics was disseminated by experts in the second third of the century as natural philosophy became part of polite culture. While Tollet and Flamsteed were unusual, they were certainly far from unique. Tollet closely matches the gentrified female readership of the *Ladies' diary*. Between 1704 and 1725, this widely-read journal regularly printed mathematical rhyming enigmas, many of them contributed anonymously by women. These puzzles included arithmetical calculations with commercial applications, as well as problems involving Newtonian fluxions. Significantly, this choice of subject was not imposed by the editor, but was expanded in response to the female readers' demands.[21]

According to all the surviving accounts, Tollet's first publication was in 1724, when her *Poems on several occasions* appeared (this was a common title).[22] Despite her learnedness, Tollet remained obscure: the 1724 volume appeared anonymously, it is now rare, and she was only identified as its author towards the end of the twentieth century. But she continued to write, and a more substantial collection of poems — including many from the 1724 book — was published under her own name in 1755, the year after she died, when it was favourably discussed in the *Monthly review*. This volume aroused sufficient interest for a revised edition to be produced in about 1760, in which the numerous typographical errors were corrected. In 1756, about thirty of her poetic psalms were reproduced in the *Select collection of the Psalms of David* rendered by "the most Eminent English Poets" and published by Henry Dell, a London bookseller (and unsuccessful actor). In 1780, the far better known publisher John Nichols included several of her poems (including her elegy to Newton) in his poetry anthology. It is impossible to scour anthologies comprehensively, but reproduction of her work seems then to have declined, although one nineteenth-century collection of women's poetry did print a couple of her poems (but with no accompanying

information). Nowadays, because of the rapidly growing interest in women's writing of the eighteenth century, her work is more readily available. Samples have been reproduced on university web-sites, and also in Roger Lonsdale's anthology, which includes the most informative — albeit brief — biographical note to date.[23]

There are few contemporary references to Tollet. Continuing the Renaissance tradition of addressing flattering verses to learned women, Hanway wrote a Sapphic ode (the appropriate form for a woman) to compliment Tollet's Latin translations, in which he also commented on her unmarried state.[24] A more prominent poet and speculator, Aaron Hill, may also have been an admirer, since he composed a poem *To Mrs. T__T*.[25]

Benefiting from her father's wealth, Tollet had no need to support herself through her writing. She may well typify an undiscovered (perhaps inherently undiscoverable) group of women who did not, contrary to recent interpretations, enter the literary marketplace: only two women published their poems in the first twelve years of the eighteenth century. On entering this male-dominated milieu, women authors often published anonymously to avoid public censure. Tollet led a secluded life, praised for her "religion, justice, and benevolence". Isolated from commercial literary networks, she deliberately shunned publicity and "would not suffer her poems to appear till she herself was beyond the reach of envy or applause".[26]

There was little incentive for women to advertise their interest in natural philosophy. James Miller's play *Humours of Oxford* (1726) spelled out the differentiated sexual roles that were deemed desirable. Lady Science confesses "I am justly made a Fool of, for aiming to be a Philosopher — I ought to suffer like *Phæton*, for affecting to move into a *Sphere* that did not belong to me". Miller's dastardly Gainlove confirms the appeal of this separate spheres model: "The Dressing-Room, not the Study, is the Lady's Province — and a Woman makes as ridiculous a Figure, poring over Globes, or thro' a Telescope, as a Man would with a Pair of *Preservers* mending Lace".[27]

Female writers developed different strategies for coping with this antagonism. In 1705, the successful playwright Susannah Centlivre (1667–1723) wrote *The basset-table*, a moral comedy about gambling, love and marriage. Centlivre was a highly intelligent woman who spoke five languages, but unlike Tollet, she was an orphan who had taught herself and was forced to earn her own living. She created Valeria, described in the cast list as a "Philosophical Girl", who read Descartes, dissected worms and enjoyed microscopy. Published anonymously, *The basset-table* appears to be colluding with the male verdict that female natural philosophers are inherently figures of fun. However, Centlivre makes Valeria conform to conventions by falling in love and getting married, thus reassuringly removing the threat of abnormality posed by female scholars. By concealing her own identity, Centlivre could use Valeria as a mouthpiece to plead for the establishment of schools for girls.[28] Tollet may have known about Centlivre's farce, which was republished in 1736, despite only having run originally for four nights. Tollet herself wrote a musical drama, but with no need to survive by her pen, did not adopt Centlivre's tactics of entrepreneurial concealment.

Instead, her approach towards her writing closely resembled that of the Countess

of Winchelsea, Anne Finch (1661–1720), whose poetry she deeply admired, although it is unclear whether the two women ever met. Judging from Tollet's celebratory memorial ode, Finch — a prominent woman poet, over thirty years older and moving in higher social circles — provided a role model for Tollet to emulate. Finch had, like Centlivre, been orphaned, but as a member of the privileged classes was not obliged to earn money from her poetry. Because she and her husband maintained their Stuart affiliations, she was effectively exiled to the countryside, where she lived a secluded married life. Doubly marginalized as a woman and a political outsider, she established an identity for herself through her poetry. Tollet published anonymously throughout her lifetime, but Finch's poetry eventually appeared under her own name; perhaps she felt more self-confident in her married state, surrounded by supportive friends. Even so, although encouraged by authoritative male writers such as Alexander Pope and Jonathan Swift, Finch suffered misogynist attacks, and cautiously held back some of her more controversial pieces, which only appeared posthumously.[29]

Like Finch, Tollet used a variety of literary techniques, thus enabling her to express subversive sentiments by manipulating literary conventions and deploying different literary devices. She wrote poems that ranged from deceptively frivolous rhyming couplets to weighty philosophical arguments, and from brief snippets to lengthy odes. Her work included translations, neat epigrams and sombre elegies, as well as songs and dramas that were set to music. In common with Finch and other women poets of the early eighteenth century, Tollet set great store by female friendship, and wrote poetic tributes to several women. Some of them seem to have vanished without further trace: she was close to Elizabeth Blackler (on her account, a gifted and beautiful young musician who died in 1717 and was buried in the Tower), and Elizabeth Bridges, a motherly older spinster to whom she turned for comfort. In addition to this supportive network, she effectively belonged to a wider virtual community of women who powerfully influenced her life and her development as a writer.[30]

Tollet was born a generation before Elizabeth Carter, the most prominent member of the blue-stocking group of women, who collectively helped to make female learning respectable. One of Carter's earliest commissions was translating Francesco Algarotti's *Newtonianism for the ladies*, and so she is often cited to illustrate women's interest in natural philosophy. However, Carter appears to have regarded this work merely as a money-earning opportunity, and there is no evidence to suggest that — unlike Tollet — she took any serious interest in Newton's ideas.[31] Moreover, she reinforced rather than undermined the notion that women who engaged in natural philosophy were inherently ridiculous, since Algarotti implicitly mocks his flighty Marquise by making her mouth flirtatious and trivial interpretations of Newton's ideas.

Carter became famous partly because, from mid-century on, female intellectual pursuits were praised rather than derided, and learned women became converted into icons of national progress.[32] Tollet was born too early to enjoy this public appreciation, but when her poetry collection was published posthumously, people were actively seeking out women's achievements. The *Monthly review*, Britain's leading literary journal, was helping to promote "the literary productions of the fair sex"

by selecting their books to review and reproducing substantial extracts. Journals were powerful mediators of intellectual fashion because they instructed readers how to regard unfamiliar work. *Monthly review* readers were told that although Tollet could not be ranked "in the first class ... her performances justly entitle her to some distinction in a literary journal. Her numbers are generally harmonious, and her versification easy".[33]

A copy of Tollet's *Poems* was included in one of the surviving catalogues from a lending library, and so was presumably also available from other similar libraries.[34] Although she is now virtually unknown, during the second half of the eighteenth century many readers must have encountered her work in her own publications and in anthologies. While Tollet herself may have slipped from our sight, her poems remain as evidence of the varied ways in which Newtonian thought was circulated. Several themes are prominent in Tollet's poetry, but two are particularly relevant for considering her relationship with Newton: her sense of confinement in the Tower, and her references to natural philosophy.

## 2. THE TOWER

In Newton and Tollet's time, life inside the Tower was very different from now, although it was already a tourist site. The visitor attractions included not only the Crown Jewels and the Armoury, but also the popular menagerie with its lions, tigers and other animals. The English and Irish Mints lined the northern walls, and the Chapel of St John served as a records repository. In addition, there was a strong military presence. The Tower still functioned as a state prison, large new storehouses sheltered guns and ammunition, and there were offices and living quarters for the soldiers and naval personnel who worked there. The Tower's walls enclosed its own community, to which Samuel Pepys paid frequent social visits — and a compulsory one as a prisoner.[35]

The Tower features in several of Tollet's poems. She portrayed herself strolling "round the Walls and antique Turrets" to admire a scene that Newton must also have contemplated as he went to work at the Mint:

> See! here Augusta's massive Temples rise,
> There Meads extend, and Hills support the Skies;
> See! there the Ships, an anchor'd Forest ride,
> And either India's Wealth enrich the Tide.[36]

Newton and Tollet both found this walled environment oppressive. Tollet wrote enviously to her brother Cooke at Cambridge that "No noisy Guards disturb your blest Retreat", and Newton evidently experienced similar problems. He only tolerated life in the official warden's lodgings at the Tower for a few months, rapidly moving away to Jermyn Street in order to escape from the soldiers and the Mint's dirty, clanking machinery.[37]

But as a single young woman, Tollet did not enjoy Newton's freedom. Trapped in her father's house inside the Tower's walls, she fretted at her long days spent

in solitary study, with only her books for companions. She empathised with other women who had been held in the Tower, translating the Latin aphorisms that Jane Grey had scratched into the wall of her cell, and composing a poetic version of a letter by Anne Boleyn that resonates with a cry of experience:

> Think how I pass the melancholy Hours,
> Alone, immur'd in these relentless Tow'rs,
> My languid Head upon my Hand declin'd,
> Supported only by the conscious Mind.[38]

As well as being physically confined within the Tower, Tollet perceived herself as a psychological captive, imprisoned by social norms:

> What cruel laws depress the female Kind,
> To humble Cares and servile tasks confin'd?[39]

Aware that knowledge means power, Tollet accused men of subordinating women through denying them access to education:

> That haughty Man, unrival'd and alone,
> May boast the World of Science all his own:
> As barb'rous Tyrants, to secure their Sway,
> Conclude that Ignorance will best obey.[40]

It is tempting to depict women like Tollet as early feminist campaigners, but there are important differences.[41] Although she did protest about female subordination, she complained privately, recording her angry frustration for posterity rather than her contemporaries. Despite having transgressed the social boundaries for her sex by learning Latin, astronomy and mathematics, Tollet refused to publish under her own name, and resigned herself to the existence she had been allocated. Physically, she became progressively freer during her life, moving from the confining Tower first to her father's country estate, and later to her own home. But psychologically, she never ventured out from the confines of her psychological Tower into the public realm.

Furthermore, she apparently shared the prevalent belief that women were constitutionally less suited than men to intellectual work:

> Nature in vain can Womankind inspire
> With brighter Particles of active Fire,
> Which to their Frame a due Proportion hold,
> Refin'd by dwelling in a purer Mold.[42]

Even at the end of the eighteenth century, Mary Wollstonecraft — often dubbed England's first feminist because of her radical outspokenness for women's rights — seemed to believe that women were inherently inferior beings who had been allocated an unequal portion of what she termed "the heavenly fire". Just as Newton "was probably a being of superior order accidentally caged in a human body", so too — she wrote in language inspired by astronomical imagery — "the few extraordinary women who have rushed in eccentrical directions out of the orbit prescribed to their

sex, were *male* spirits, confined by mistake in female frames".[43] This seems an apt description for Tollet, who repeatedly used images of frustrated confinement not only within the Tower's brick walls, but also within a metaphorical Tower constructed by her own beliefs and the constraints imposed by the rules of Augustan society.

## 3. NEWTON AND NATURAL PHILOSOPHY

The night of Newton's funeral, 28 March 1727, Tollet composed an elegy for her former friend, one of the earliest of several poems she composed about death and monuments (see Appendix). Tollet may well have circulated manuscript versions of this elegy, since it was a common practice to exchange poetic work in extended correspondence circles. Almost thirty years later, this poem appeared in the two mid-century editions of her writing, and so helped to consolidate Newton's fame publicly and communicate his ideas. Moreover, because this was one of the poems Nichols chose to reproduce in his anthology, it eventually reached still wider audiences.

Newton was buried in Westminster Abbey with great ceremony, and many writers were inspired to commemorate his death. By far the best known verse was Alexander Pope's epitaph ("Nature and Nature's Laws lay hid in Night / God said, *Let Newton be!* and All was *Light*"). Some longer poems were widely published, and contributed to establishing Newton's reputation as an English hero. Those composed by poets who later became famous, notably James Thomson, have formed the focus of several academic studies. Historians of science are also familiar with John Desaguliers's poem, which opportunistically entwines Newtonian attraction with the Hanoverian monarchy, and Richard Glover's long verse introduction to Henry Pemberton's Newtonian primer (the source of the phrase "Newton demands the muse"). Further poems, including several in Latin, have, like Tollet's, been discovered in more obscure publications.[44]

These early celebratory poems hymn Newton's achievements, usually proclaim his immortality as a roving celestial genius, and often hail him as evidence of Britain's greatness. The literary ability and scientific knowledge of these poets varied widely. Some of their lines verged on doggerel: "We thank the Author of our frame, / Who lent him to the earth so long"; others now seem unbearably florid: "To Newton's genius, and immortal fame / Th'advent'rous muse with trembling pinion soars"; several provided no descriptions of his intellectual achievements.[45]

Tollet's rhyming couplets are less vivid than Thomson's eloquent Georgics, but her poem stands out from its contemporaries because, although constrained by the demands of versification, she has a sound grasp of Newtonian natural philosophy that she articulates poetically. Unusually, she specifically cites Bacon and Boyle as Newton's forerunners, placing him in a British lineage that will — she boasts — supplant the nation's classical ancestors (lines 33–44). Furthermore, Tollet provides more precise information than normal about Newton's works, giving priority to his cosmology (9–24), but also describing concisely his optical theories in a way that suggests familiarity with the differences between Descartes and Newton (25–32).

Tollet also used images drawn from natural philosophy for other poems, including "Hypatia", her homage to the learned Egyptian philosopher and mathematician who was already becoming a role model for intellectual women. "Hypatia" appeared in her 1724 collection, and so predates other poetry (notably James Thomson's *Seasons*) that is credited with spreading Newtonian ideas. Informing her readers that Hypatia lectured at her father's school before being killed by "illiterate Christian monks", Tollet sets her up as a female martyr who voices Tollet's own desire to participate in scholarly activities. Interestingly, it is primarily mathematics and knowledge of the natural world that she wishes women to acquire. Urging that they be taught "Abstracted Truths in Numbers to explain", Tollet poetically surveys the domains of natural philosophy — chemistry, geology, the changing seasons, and the nature of life itself. As she points out, she made her description of comets "follow the late Improvements of Astronomy":

> ... Comets trail their fiery Hair
> ... real Stars, which unextinguish'd burn,
> Thro' larger Periods of a just Return.

Tollet also developed her own religious objections to materialism and determinism, presenting her readers with anti-Epicurean arguments in a simplified verse form. In her "Against Chance and Fate", which first appeared in 1724, she denied that life could be the consequence of random atomic events:

> 'Tis not wild *Chance*, or arbitrary *Fate*,
> Fond Man! That guides thy fluctuating State...
> Cou'd wand'ring Atoms, in their casual Fall,
> Compose the Fabric of this wond'rous Ball[?][46]

She continued this theme in a later work, "On the Origin of the World". In this, as she built up her insistence on divine creation, she familiarized her readers with a more precise version of Newtonian astronomy than did many poets:

> As in proportion'd Intervals they go,
> Swift in Approaches, and at Distance slow:
> Or in a less, or in a wider Space,
> As his directive Force directs their Race.
> 'Tis he compels them in their Orbs to keep;
> Tho' such an Influence turns their ample sweep.[47]

In "Microcosm", Tollet praises God's omnipotence but also celebrates the power of human reason. She explicitly intended this poetic argument, which is around 270 lines long, to rebut the opinions expressed by Henry Baker in his *Universe*, a poem that first appeared in 1727. Baker later became an active Fellow of the Royal Society, renowned for his work on polyps and microscopy. But in this earlier part of his career, he published poems and essays, and collaborated on a journal with his famous father-in-law, Daniel Defoe. Baker's *Universe* is a good example of the

physico-theological poetry of this period that provided evidence for divine design. By reconciling biblical accounts with new discoveries and theories, it facilitated the spread of natural philosophy.

Although Tollet probably never met Baker, and certainly could not have argued with him in a public forum, she did engage in debate through the medium of print. In their poems, both of them hymned the power of reason, surveyed the fields of human knowledge, and celebrated God's wisdom and omnipotence. But Baker aimed "to restrain the Pride of Man" by emphasizing the vastness of the universe; to imagine that God had created the entire cosmos for human benefit was, he declared, "downright Madness".[48] In contrast, Tollet set out to refute Baker by stressing human supremacy. Elaborating Psalm 8, which praises God for giving the human race dominion over the world and its living creatures, she insisted that the divine architect had created "another Universe in Man", endowing human beings with superior intelligence so that they could discover more about His creation:

> Labour to Man was as his Portion giv'n;
> How just and how benevolent is Heav'n!
> The Soul from stupid Indolence to raise;
> To trace the great Creator's mystic Ways.

Tollet's poem is an extended defence of progress through rationality, a favourite theme of eighteenth-century writers. She explains that microscopes have revealed nature's hidden secrets, compasses have removed unwarranted fears of monsters in unknown lands, and Newtonian astronomy has successfully vanquished superstitious beliefs about comets:

> Let *Halley* this, or *Newton* this explain;
> And fix his Period to return again:
> While the pale Vulgar sees, with wild Amaze,
> The Sword of God, unsheath'd for Vengeance blaze.[49]

## 4. CONCLUSION

Despite the lack of biographical details about Tollet, exploring her poetry sheds light on women's lives as well as on attitudes towards natural philosophy in the eighteenth century. Carrying out close analyses of specific women is important because concrete evidence is needed both to substantiate and to revise models of how natural philosophy became a component of polite culture. Far less information survives about women than about men because less was recorded at the time. Moreover, until recently, historians often ignored or even suppressed the activities of women who did leave traces of their existence. To gain a more realistic impression of the past, it is essential to retrieve not only the occasional exceptional women, but also those who were less famous. Unfortunately, there must be many, many philosophically inclined women who have vanished for ever. Tollet is historically valuable because she is simultaneously special and ordinary: special because she

knew Newton and was a poet, ordinary because she typifies all those now unknowable clever daughters who were unable to realize their intellectual ambitions.

Tollet's relationship with Newton may have been casual, but it is, nevertheless, rewarding to uncover further information about him. In particular, her lines about the experience of living in the Tower illuminate a brief period of Newton's life that is not often discussed. Tollet's poems also make her unusual, although more because she published than because she wrote: poetry was an extremely popular literary genre in the eighteenth century, and many young women must have written reams of verse, including some on natural philosophy, which have long been destroyed. Poetry is an important source for illuminating the different versions of Newtonianism, but scholars have tended to focus on a few well-known examples. The canon needs to be broadened both by looking at poems that are not primarily about Newton or natural philosophy, and also by not restricting investigations to the privileged classes. For instance, in addition to genteel women, working men are also an under-researched group, as this popular performance song suggests:

> Newton talk'd of lights and shades,
> And different colours knew, Sir...
> After him we name our toast—
> "The centre of attraction."[50]

It would be historically insensitive to exaggerate Tollet's importance. Fascinating though it is, her poetry was not read as widely as Thomson's, and by the time that the posthumous editions of her book were published, Newton's fame was already firmly established. In addition, although she eloquently bemoaned her lot as a woman who was denied access to university education and public scholarly life, she bore scant resemblance to modern feminist activists. Yet it is precisely this lack of prominence that enables studies of Tollet and others to reveal new aspects of eighteenth-century life, and so revise interpretations based on eminent women who have bequeathed substantial archives.

Tollet's writing activities do not comply with recent attempts to give women a more substantial presence in the literary marketplace, since in her lifetime she only published one book — and even that was anonymous — and refused further publication until after her death. Just as she contradicts current models of literary productivity, so too, Tollet demonstrates the need for a more nuanced appreciation of how Newtonian ideas were interpreted and incorporated into eighteenth-century culture. Tollet illustrates that, contrary to conventional interpretations, women were conversant with Newton's fluxions and other aspects of his ideas very early in the eighteenth century. Her poetry corroborates suggestions that educated women were far more philosophically capable than is generally supposed. In gentrified households, Tollet's self-education within a male family environment was probably not that unusual, and women engaged far more closely in intellectual activities than is apparent from standard accounts. For instance, Damaris Masham, daughter of Ralph Cudworth and close philosophical associate of John

Locke, also met Newton (for a biblical discussion); Anne Conway studied alone at home, like Tollet, while her brother went to University, and her original work on philosophy was only published (anonymously) after her death.[51]

Tollet also confounds attempts to convert seventeenth- and eighteenth-century women into feminist campaigners. Certainly she did protest bitterly about the unequal educational opportunities for men and women, but — like many of her female contemporaries — she believed that women came lower down in the natural hierarchy. It now seems ironic that in "Microcosm", her accomplished work dedicated to the power of reason and the superiority of the human race, Tollet should implicitly deprecate her own abilities by acknowledging her inferiority as a woman:

> Dust is his Origin, and Earth his Place:
> But on the Mother's side tho' Man be base,
> Sprung from the sacred Sire, to Heav'n ally'd....[52]

Despite her intellectual achievements, she remained trapped within her own psychological and cultural Tower.

Although sparse, biographical details about Tollet do survive because of the status of the men with whom she was associated, especially Newton and her father. There must have been many other lonely daughters who borrowed their brothers' books, and wrote poetry or studied natural philosophy to while away the hours. In addition, since most men worked and studied at home, numerous women, whose existence is now concealed, must have been collaborating in experimental research. Solid yet fleeting pieces of evidence — passing references in letters, the occasional grateful tribute in a preface, the inclusion of a woman in the illustration of a new piece of apparatus — confirm that female participation was far greater than conventional accounts suggest. Experiments often require more than one participant, and the women in the household provided a free source of labour. For all the women who left behind some tangible trace of their activity, there must have been many more whose cooperation was essential, but who have disappeared from the archives.

In Centlivre's satirical play about learned women, an angry father can hardly tolerate that he has "a Daughter run mad after Philosophy, I'll ne'er suffer it in the Rage I am in; I'll throw all the Books and Mathematical Instruments out of the Window".[53] There was no shortage of frightened but dogmatic protests that women were inherently unfitted for natural philosophy. This propaganda campaign was so effective that it still affects how we view the past, although it is important not to introduce new distortions by retrospectively imposing modern ideals to give women more powerful roles than they actually enjoyed. Restoring women like Tollet to the historical record gives us a richer understanding of how women influenced the development of scientific ideas and their integration within society.

## *On the Death of Sir* ISAAC NEWTON[54]

by Elizabeth Tollet

'Tis now the Night thy pious Friends entrust
To sacred Earth thy venerable Dust:
By Nature doom'd maturely to expire;
If Life or Fame can satiate the Desire.
Immortal and secure thy Name remains,
Which scarce the habitable World contains.
Whether thou did'st the levell'd Tube apply,
To bring the Planets to thy searching Eye:
Or rather thro' the Heav'ns thy Spirit flew
To trace their Motions with a nearer View;
What Force their destin'd Line obliquely bends,
And what in vacuous Space their Weight suspends.
Or to describe how this terrestrial Ball,
Where Man, as in himself, has cent'red all,
And doom'd it ever to Repose profound,
Incessant finishes its ample Round
Of annual Course: Or to the Morning Ray
Obverts its Front; or wheels to fly the Day.
To calculate how distant we admire,
Or how enjoy remote the solar Fire,
Thy Soul th'Abyss of Numbers could explore:
Tho' they, like Hydra, multiply their Store.
Thy Mind, enlarg'd by Nature to compute
Her vastest Work, cou'd trace the most minute.
Alike exact to penetrate the Ways
Of subtile Light, and fine æthereal Rays:
What obstacle compels them, as they pass,
To march diverted thro' the pervious Glass;
What various Hues the lucid Pencils paint,
How deep or glaring soften into faint;
By what Degrees their kindred Shades unite,
And how their equal Mixture spreads a White.
*Sicilia* now, and *Samos* strive in vain
With *Britain* bounded by the ambient Main.
Of solid Rocks on shatter's Navies hurl'd,
And fancy'd Engines to remove the World,
Of pious Hecatombs on Altars lay'd,
When the discover'd Truth the Search repay'd.
Much have we heard, and something we believ'd;

But see the Wonders by thyself achiev'd.
*Bacon* and *Boyle* thy Triumphs but fore-run,
As Phosphor rises to precade the Sun:
Nor shall our Age or Isle resign the Praise
To *Greece*, for Sages born in ancient Days.
Soon shall the marble Monument arise,
And *Newton*'s honour'd Name attract our Eyes:
The finish'd Bust, in curious Sculpture wrought;
Shall seem to breath, alone absorpt in Thought.
When fading Letters vanish from the Wall,
And when the lofty Pile itself shall fall,
Shou'd wasting Age, and Barbarism conspire
To sink the Dome, or sacrilegious Fire,
Some future *Cicero*, in Times to come
Shall rescue from Neglect and *Archimedes'* Tomb.

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21. Iliffe and Willmoth, *op. cit.* (ref. 16), 244–57. S. Costa, "The *Ladies' diary*: Gender, mathematics, and civil society in early eighteenth-century England", *Osiris*, xvii (2002), 49–73. I am grateful to Shelley Costa for informing me that, up to 1725, Tollet did not contribute — at least, not under her own name.
22. However, since she included a short early poem addressed "To a Person who printed and mangled some Verses of mine" (p. 51 of the 1724 edition of Tollet, *Poems*), she must already have published one or more of her poems. She may have been the author of "The unfortunate maiden", a cheaply produced broadsheet of verses about Susannah's grief when her lover is drowned. The British Library catalogue tentatively attributes this poem to her (HS 54/1250 (6)), presumably because she later wrote a musical drama about Susannah; however, there does not seem to be much resemblance between them, and the broadsheet poem is not subtle (it ends: "When o'er the white waves stooping, / His floating corpse she espy'd, / Then like a lilly drooping, / She bow'd her head and dy'd.") She wrote an admiring poem about Handel, but his Oratorio "Susanna" appeared after she had already died.
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to suggest that they both lived there.

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