

The Newton Project

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In early 2022, the next phase of the Newton Project (newtonproject.ox.ac.uk) will have gone live, with a presentation of materials from the National Archives relating to Isaac Newton's stewardship as Warden and, later, Master of the Mint in the period from 1696 to his death in 1727. At its heart lies the transcription of the contents of Mint 19. This was originally the largest single lot (number 327) in the sale at Sotheby's in July 1936 of the residue of Isaac Newton's papers, which had been consigned by Viscount Lymington, who had inherited them in direct line from Newton's niece, Catherine Barton, and her husband, John Conduitt, also Newton's successor at the Mint. Lot 327 made £ 1400 and was sold to the Hungarian-American book dealer, Gabriel Wells, who played perhaps the critical role in the dispersal of items from the sale. The philanthropist, Charles Wakefield (1st Viscount Wakefield), subsequently bought Newton's Mint papers at cost from Wells on condition that he give them to the nation. Now published with accompanying material, in particular from the papers of the Treasury, Mint 19 makes available Newton's work in fulfilling the recoinage of England's silver currency, the administration of the London Mint and its various English outposts, the reorganisation of the Edinburgh Mint, the prosecution of clippers and coiners, the design of medals, the consideration of the value of coin and the provision of money for the colonies or for the payment of the army in the Low Countries. It shows him at work in what became his primary responsibility, both at a theoretical level (for example, in calculating the role of gold currency in the money supply) and at a practical one (for example, assessing the capacity of the relatively new machinery for pressing coins in use at the Mint).

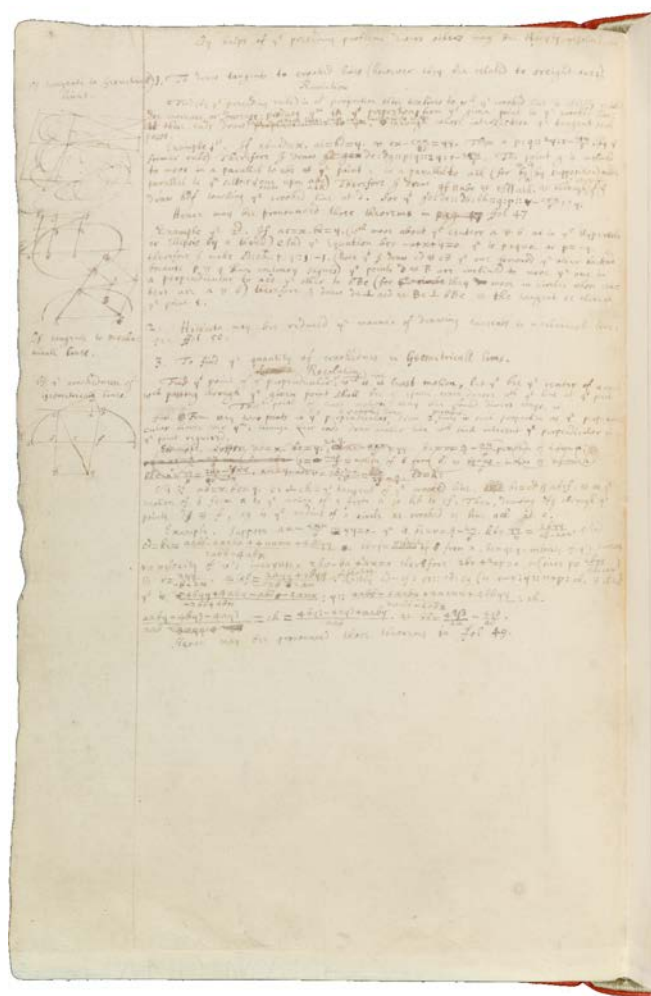
The Newton Project was founded in 1998 by Rob Iliffe and Scott Mandelbrote, at the prompting of Harvey Shoolman, with the intention of producing an edition of those parts of the manuscript remains of Isaac Newton (1642–1727) that had so far remained unedited. Between 1959 and 1984, sixteen volumes of Newton's correspondence, mathematical papers, and unpublished optical lectures had been printed by Cambridge University Press, under the editorship (respectively) of H. W. Turnbull, J. F. Scott, A. Rupert Hall and Laura Tilling, D. T. Whiteside, and Alan E. Shapiro. Last year, one further magisterial volume, edited by Shapiro, and considering the preliminary work for the published *Opticks* appeared. With the

partial exception of the *Correspondence*, which necessarily cast its net much more widely, most of the material edited in these books derived from the holdings of Cambridge University Library, where items deposited by Newton himself had been vastly augmented by the gift in 1872 from his heirs of the Portsmouth Collection, consisting of almost all his surviving mathematical and scientific papers and manuscripts. Whiteside, in particular, had been able to supplement material in the Portsmouth Collection with information drawn from manuscripts that had left Newton's possession in his lifetime and which had passed through the hands of William Jones (1675–1749) into the possession of his pupil, the Earl of Macclesfield, at Shirburn Castle. By great good fortune (notably the intervention of the Heritage Lottery Fund and the Andrew W. Mellon Foundation), Cambridge University Library was able to acquire those papers, including a long run of Newton's correspondence, in 2000. This accession largely brought to an end the peregrination of Newton's papers, which started as early as the 1670s, but which really took off after 1936, with the scattering, initially to booksellers and private collectors, and later (largely through donation) to libraries across the world of imperfectly described fragments from Newton's manuscript writings. A few items from the 1936 sale remain publicly unaccounted for. Most of these were among the Newton papers that resurfaced at Sotheby's in New York in December 2004 from the purchases of Emmanuel Fabius. In general, the surviving folios of Newton's writing that remain in private hands or in the trade derive from that sale. Several have been recycled through the auction rooms multiple times, including, most recently, from the discredited Aristophil collection built up by Gérard Lhéritier.

One aim of the Newton Project, which has largely been accomplished, was to provide an up-to-date record of the dispersal of Newton's papers consequent on the 1936 sale. This was achieved through the cataloguing work of Rob Iliffe and of John Young, who also led the first phases of the transcription work undertaken by the project. They built on the efforts of Peter Murray Jones, who had superintended the microfilm edition of most of Newton's manuscripts issued by Chadwyck-Healey in 1991. Several important changes of ownership, in addition to those noted above, have occurred since 1991: above all, perhaps, the transfer of the Babson

collections, formed largely after 1936, to the library of Bern Dibner, and its subsequent peregrination via Cambridge, Massachusetts, to the care of the Huntington Library in San Marino, California. For the last twenty years, the bulk of the work of ordering and transcribing Newton's unpublished materials has been done online by the team of transcribers working for the Newton Project. The decision to present materials in an electronic format was taken from the start and has necessarily altered the type of editorial work involved.

The Newton Project, initially funded in 1999 by the Arts and Humanities Research Board, and since supported by a wide variety of public and private donors (including the Arts and Humanities Research Council, the Joint Information Systems Committee, the Royal Society, and the Winton Foundation), is an evolution of one of the earliest born-digital research endeavours. The fragmentation of the sources on which it worked (initially in the field of Newton's theological writings), together with their sheer bulk, quickly indicated that a print edition of the kind undertaken by Whiteside or Shapiro would be impossible. For all his tremendous skill as an editor, Whiteside had, moreover, taken decisions about the date of composition of materials and their relationship to one another that, faced with multiple and disordered drafts, the directors of the Newton Project felt it unwise as well as impossible to emulate. The Newton Project has now existed for slightly longer than the period that Whiteside required for editing *The Mathematical Papers*. In all other respects, the two works are incomparable. Whiteside recreated Newton's progress and achievement as a mathematician, working over time to particular themes that the editor identified. The Newton Project has not reconstructed Newton's processes of thinking or discovery but has instead presented the range of surviving evidence for his activities across many fields in a form that assists scholars or ordinary readers to make their own judgements. Presenting both a diplomatic and a normalised transcription of documents, the Newton Project allows readers to search Newton's previously unpublished writings by words and phrases, as well as to order his writings by their current location or (less accurately) by date. It allows one quickly to trace Newton's activity across a vast corpus of materials scattered throughout the world and is thus the starting point for future scholarly endeavour rather than an end point in itself. At its heart is the coding (based on TEI guidelines, version P5) provided by the transcribers and taggers (notably John Young, Cesare Pastorino, Yvonne Martin-Portugues Santacreu, Linda Cross, Raquel Delgado-Moreira, Will Scott and Kees-Jan Schilt) who have worked on the project and ultimately superintended by Michael Hawkins, who has organised its technical side. This is and always has been work that has involved large-scale human input to produce materials of adequate accuracy and consistency to enable effective searches. It has been accomplished by editorial effort as well as by technological innovation and requires constant intervention to keep it up-to-date and fully functional. Remarkably, it has been possible to maintain the Newton Project as a freely accessible site to any user throughout its life.



Page 57v of Newton's Waste Book (MS Add. 4004), from Cambridge Digital Library cudl.lib.cam.ac.uk/view/MS-ADD-04004/118. Reproduced by kind permission of the Syndics of Cambridge University Library.

As the possibilities of digital editions have grown, so has the Newton Project. From the start, the intention was to provide readers with translations (many by Michael Silverthorne) as well as transcriptions, and this has proved more straightforward than the original intention also to annotate documents. The growth of digital photography and especially the development of IIF imaging that allows the viewer to explore at high resolution all aspects of the original document has transformed the possibilities for accompanying transcription with images. In its collaborations with both the Cambridge Digital Library (cudl.lib.cam.ac.uk/collections/newton/1) and the National Library of Israel (nli.org.il/en/discover/humanities/newton-manuscripts), the Newton Project has thus been able to provide searchable transcriptions to run side-by-side with document images that enable the online researcher to see more (in many cases) and read faster than the reader in the search room could do.

This breakthrough has occurred at precisely the moment when the rising value of scientific manuscripts and increasing concern for the fragility of Newtonian materials have meant that access to the originals has become more restricted. Online media have also allowed the growth of the Newton Project, alongside the Cambridge Digital Library, to include interpretative essays on materials and presentations in the format of sound and video recordings of scholarly assessments of Newton's writings. These supplement the library of reference materials about Newton that have been incorporated into the Newton Project's own website to create a wide-ranging and diverse presentation of Newton's writings accessible to many different kinds of user. In the Newton Project's current work on the Mint Papers, this will include the possibility of following Newton's movements, documented in the National Archives, on a contemporary map of London, as well as a series of interpretative essays (many of them provided by the current postdoctoral researcher on the Newton Project, Alice Marples). The result has been the development of something closer to a digital research environment for Newton, rather than the straightforward fulfilment of the original, more limited, idea of a digital edition.

The range of materials covered by the Newton Project has expanded from its original focus on theological writings to include most of Newton's correspondence, much of his scientific writing (including drafts for the *Principia* and the *Opticks*), and now his administrative papers. In preparing transcriptions, work has been assisted by the contribution of Stephen Snobelen and the Newton Project Canada (including Liz Smith and Niki Black). New collaborations are being taken forward actively, for example with the team at the Bodmerlab in Geneva who are digitising and studying the large collection of Newton's drafts erroneously known by the title "Of the Church" and owned by the Fondation Martin Bodmer. The most significant long-standing collaboration, however, has been with the Chymistry of Isaac Newton Project (webapp1.dlib.indiana.edu/newton/), led by William R. Newman and funded by the National Science Foundation and the National Endowment for the Humanities at the University of Indiana since 2005. Newman and his team (including Wallace Hooper, John Walsh, and Will Cowan) have similarly pioneered multi-media presentation of images, transcriptions, recreations of experiments, and scholarly commentary as part of their development of a digital edition of Newton's chymical and alchemical manuscripts, also accessible through the Newton Project. As is the case with some of the materials presented through the Cambridge Digital Library, the Chymistry of Isaac Newton Project has sought to appeal to teachers and school projects as well as to professional academics in its interpretation of Newton's manuscripts.

The possibilities available to the Newton Project have been heavily limited by the availability of funding for what remains a complex and resource-intensive form of scholarship, intended to make materials fully accessible to many different kinds of online user. Commitments to funders have affected when material has been

made available and which materials have been prioritised. Funding constraints have also contributed to the choice of source materials: originally microfilm copies checked (where possible) against the originals; more recently greyscale or even high-quality colour images provided by the libraries and archives with which the Newton Project has collaborated. Some of these factors explain a small level of duplication in the materials offered across the Newton Project and the sites of its collaborators. They also contribute to the ongoing problems of inaccuracy, particularly at the level of transcription, which can now be very easy for a user (with access to IIF images) to spot, but which remain time-consuming to correct and re-encode. The difficulty of proof-reading in a digital edition that is now closing in on ten million words and that has involved the labour of more than fifty collaborators is considerable. The management of the Newton Project has largely been the achievement of Rob Iliffe, who has led it across successive migrations of infrastructure and personnel from Imperial College, London, to the University of Sussex, and now to the University of Oxford.

Future development of the Newton Project, which may include closer collaborations with partner libraries, will also depend on the availability of further elements of funding. They may include steps to annotate materials with reference to Newton's library and will certainly involve the improvement of the material descriptions of manuscripts and their relationship to one another. This is one outcome to be expected from another ongoing collaboration associated with the Newton Project and funded at present by the Arts and Humanities Research Council and the National Endowment for the Humanities. In collaboration with the National Archives, Cambridge Digital Humanities, the Huntington Library, and the Science History Institute, the Newton Project and the Chymistry of Isaac Newton Project are seeking to develop new guidelines for the photography of early modern manuscripts and digital techniques for the analysis of watermarks in early modern paper. This work builds on tools developed by the École des Chartes (Marc Smith) and the École des Ponts ParisTech (Mathieu Aubry) for the computer-assisted visual analysis of watermarks (filigranes.hypotheses.org). At a technical level, the intention is to use the results of transmitted and reflected light photography and multi-spectral imaging to generate clean images of watermarks previously hidden by handwriting on the sheets of manuscripts. It is then hoped to develop a computer-vision tool to match watermarks automatically in the resulting images. Applied to the corpus of Newton's manuscripts, this will allow more accurate analysis of the paper stock used by Newton and its matching to dated examples provided by his correspondence. It will form the basis for enhancing both the images associated with transcriptions through the Newton Project and for improving the material descriptions of the manuscripts themselves.

The work of the Newton Project represents therefore the development of a digital research environment that facilitates both traditional scholarship in the history of science and the traditional

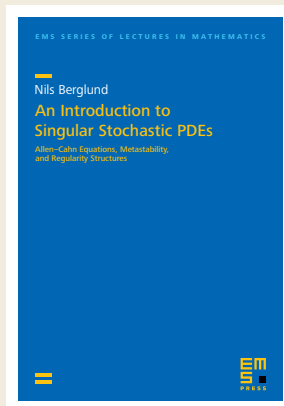
disciplines of curatorship that form part of manuscript librarianship. It allows for widespread access to fragile and valuable materials and for the continuing enhancement of their online description and presentation. The Newton Project provides a model for large-scale, collaborative projects in the humanities, in particular by demonstrating what is possible in a site which remains free to users. It has a record of producing skills and knowledge, as well as presenting material for analysis by current and future researchers. At the same time, the experience of the Newton Project underlines the complexity and fragility of large-scale endeavours in the digital humanities. The long-term maintenance and development of the Newton Project remain uncertain, even as its latest major intervention comes on-line.

Select bibliography of works about the Newton Project or compiled using it

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