

ISAAC NEWTON LEARNS HEBREW: SAMUEL JOHNSON'S *NOVA CUBI HEBRÆI TABELLA*

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This note concerns the earliest evidence for Isaac Newton's use of Hebrew: a manuscript copy by Newton of part of a work intended to provide a reader of the Hebrew alphabet with the ability to identify or memorise more than a thousand words and to begin to master the conjugations of the Hebrew verb. In describing the content of this unpublished manuscript and establishing its source and original author for the first time, we will suggest how and when Newton may have initially become acquainted with the language. Finally, basing ourselves in part on an examination of the reading marks that Newton left in the surviving copies of Hebrew grammars and lexicons that he owned, we will argue that his interest in Hebrew was not intended to achieve linguistic proficiency, but remained limited to particular theological queries of singular concern.

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The interest of Isaac Newton (1642-1727) in biblical studies is well known. Writing about the 1670s, Richard S. Westfall commented 'if [Newton] had not done so earlier, he learned Hebrew in order to read Ezekiel in the original'.ⁱ The manuscript discussed by Westfall was, however, written much later than this, and contains in any case little evidence of real familiarity with Hebrew or proof that Newton read rather than consulted texts in Hebrew.ⁱⁱ As Matt Goldish, in the fullest analysis yet of Newton's knowledge of Judaism, puts it: Newton 'had enough Hebrew to find his way through the Old Testament in the original, but he learned about Jewish history and practice mainly through Latin and English translations by more advanced Hebraists.'ⁱⁱⁱ Neither Westfall nor Goldish, however, notice the earliest surviving evidence for Newton's acquiring some familiarity with the Hebrew language. As a consequence, they also place Newton's acquisition of Hebrew in the context of the growing interest in the interpretation of prophecy, the history of the Church, and theology, which he began to show from the late 1670s and which became a major focus of his writing only in the 1680s and, particularly, the 1690s.^{iv} This note concerns that evidence: a manuscript copy by Newton of part of a work intended to provide a reader of the Hebrew alphabet with the ability to identify or memorise more than a thousand words and to begin to master the conjugations of the Hebrew verb. In describing the content of this unpublished manuscript and establishing its source and original author for the first time, we will suggest how and when Newton may have initially become acquainted with the language. Finally, basing ourselves in part on an examination of the reading marks that Newton left in the surviving copies of Hebrew grammars and lexicons that he owned, we will argue that his interest in and use of Hebrew was not intended to achieve linguistic proficiency, but remained limited to satisfying particular theological queries that were prompted by concerns whose origins lay elsewhere in Newton's thought and reading. Limited knowledge of Hebrew was part of the education that Newton had acquired before he completed his undergraduate education. The considerable interest that he eventually displayed in parts of the Old Testament and in aspects of the history and religion of the Jews, by contrast, manifested itself perhaps twenty years later. It was pursued largely through the Latin world of late humanist scholarship. To master such literature, however, and to write in its style, Newton himself required the ability, which he had already acquired, to follow citations in Hebrew and to evaluate arguments that depended on claims about the meaning and derivation of Hebrew words (especially those for the names of people and places). In this regard, Newton's Hebrew, while more limited than his command of Greek or his fluency in Latin, appears to have surpassed his ability in other languages, for example Arabic, that his contemporaries increasingly deployed in such scholarship. Unlike in the case of Hebrew, no evidence survives that Newton attempted to learn and succeeded in manipulating even the most basic forms of these languages, even if he occasionally copied phrases in their alphabets.^v

The first known record of Newton's study of Hebrew comes from a bound notebook (12.1 x 7.1 cm) of 118 leaves, now kept at the Fitzwilliam Museum, Cambridge, which Newton himself bought as a blank pocket-book for 8d. in about 1662.^{vi} Judged 'Not fit to be printed' by Thomas Pellett on behalf of Newton's executors on 25 September 1727, extracts from this notebook have intrigued Newton's biographers since a list of accounts taken from it and compiled between 23 May 1665 and April 1669 was published in part by Sir David Brewster in 1855.^{vii} The most striking use of it was that of Westfall, who deciphered, from Thomas Shelton's system of shorthand, a numbered list of Newton's sins, entered into this pocket-book 'Before Whitsunday 1662'.^{viii} In addition to keeping accounts of one kind or another, Newton employed the Fitzwilliam notebook to work through aspects of his reading. His notes largely concern mathematical problems, for example methods of describing curves and analysing their properties, which draw on the English mathematician, William Oughtred's *Clavis mathematicæ* (3rd edition, 1652) and the commentaries and exercises of the Leiden professor, Frans van Schooten (1615-60). Van Schooten was one of the most successful popularisers of the *Geometria* of René Descartes. Newton first encountered this through a Latin translation published by van Schooten in 1649, which he bought secondhand after he arrived in Cambridge in 1661. By Christmas 1664, he owned the enlarged edition that van Schooten brought out between 1659 and 1661, which also contained the *Elementa curvarum* of Jan de Witt, a pupil of Descartes' friend and collaborator, Isaac Beeckman. Much of the geometry to be found in the Fitzwilliam notebook depends in part on constructions derived from de Witt.^{ix}

The Fitzwilliam notebook, therefore, contains material written by Newton throughout the 1660s, when he was an undergraduate at Trinity College (from 5 June 1661), a Bachelor (January 1665) and then Master of Arts (7 July 1668) and a minor (2 October 1667) and later major Fellow of his College (7 July 1668). It was one of a number of bound notebooks that Newton kept to record expenses, to make observations and notes on reading, and to develop his own thoughts at the time.^x There is some similarity in content between these notebooks. For example, both the Pierpont Morgan notebook and the Fitzwilliam notebook contain brief passages in shorthand. Both the Trinity College notebook and the Fitzwilliam notebook record detailed accounts of expenditure for a time. The Pierpont Morgan notebook has in common with one of Newton's notebooks in the Cambridge University Library (Ms. Add. 3996) that parts of it are set out as a recipe book or a book of secrets, although the latter manuscript also represents the best evidence for Newton's induction in the formal undergraduate curriculum and his preparation for the disputations that represented its rites of passage.^{xi} The Trinity College notebook, by contrast, contains scholarly exercises redolent of the grammar-school Latin of Newton's education at Grantham, as well as recording purchases of books more suitable for a beginning Cambridge undergraduate. Both the notebooks in the Cambridge University Library show the rapid development of Newton's mathematical skill and natural philosophical curiosity in a fashion that later passages in the Fitzwilliam notebook only hint at, or merely document through items of expenditure. Several notebooks therefore pertain to scholastic exercises undertaken by the young Newton. They also testify to an interest in the way that languages work (not least the passages on phonetics in the Pierpont Morgan notebook) and to Newton's practising of his skill in Latin (and to a lesser extent Greek). It should not be surprising, therefore, that, at what is now the back of the Fitzwilliam notebook (which appears to be where Newton began writing), there should be a page in the Hebrew alphabet with Latin annotations, headed 'Nova Cubi Hæbræi Tabella'.^{xii}

NOVA CUBI HEBRÆI TABELLA

In writing which preserved a number of letter forms from secretary hand, and which was characteristic of his script before 1664 (when he adopted a more consistent version of italic), Newton copied out over seven and a half lines running across the page from right to left 71 Hebrew words together with their Latin renderings, under the title 'Nova Cubi Hæbræi Tabella'. The words are written so as to emphasise the consonantal roots that define them, with the first two root letters highlighted in heavier ink and not then repeated (later words being defined either by adding the third consonant of the root alone or by the remainder of the word being written out in full, together with the appropriate vowel points or, in the case of some verbs, an indication of the conjugation). The words are arranged in ten columns; they all start with the letteraleph – the first in the Hebrew alphabet – specified at the top-right corner of the table. Words are classified alphabetically along each line from right to left, and the lines of words themselves have been framed by straight lines drawn with a ruler across the page and down the right-hand margin. The text breaks off in the middle of the eighth line, that is after having worked through words whose second root letter was taken from one of the next ten letters of the Hebrew alphabet (beth to kaph). It thus represents barely half of a table that might be constructed on these principles for the first of the twenty-two letters of the Hebrew alphabet.

This aborted table of Hebrew words was not Newton's own composition. Instead it was drawn from what is now a relatively rare book: *Nova cubi Hebræi tabella: quæ radices omnes, unâ cum punctis, & significationes suas diversas exhibet*, compiled by 'Samuel Jonson' (or Johnson) and published by Bonaventura and Abraham Elzevier at Leiden in

1627.^{xiii} This work was manifestly intended for new learners. Johnson, in a brief address to the reader printed on the verso of the titleleaf, exhorted the reader: ‘look at the roots in this table, which contains the whole thesaurus of the Hebrew language, at a single glance’, and subsequently praised the table as a means ‘more readily to discover all roots and commit them to memory in a more fruitful way.’^{xiv} The young Newton evidently had recourse to this abridged lexicon of Hebrew radices when drafting his table as the latter includes, without any omission or addition, the first 71 roots, together with their Latin renderings, listed on the recto of the second leaf of Johnson’s work. Newton’s version, however, differs minutely from the original in that he added vowel points immediately to the right of 31 of the final consonants of the roots in order to facilitate their pronunciation and memorisation. In this respect, he followed the author’s advice in the preface: ‘Points or vowels are sporadically placed before the last letters of roots for the sake of beginners... except for these words that may either easily be completed by means of readily learned grammatical rules and four-consonant roots with polysyllables, where, as in many other places, if the reader so pleases, he may himself supply vowels more correctly than the printer could.’^{xv} The table takes the appearance of an unfinished piece of work as roughly half of the words starting with aleph listed by Johnson are copied, and the final entries break off without either completing a line in Newton’s own text or finishing the words given by Johnson for which kaph is the second letter of the root. Newton thus seems to have interrupted his work of copying and expansion from Johnson’s table at an early stage.

Our knowledge of Newton’s library is largely dependent on the listing of his books after his death, but relatively few works that he owned then and that he could have owned in the early 1660s would have given him assistance in filling in the vowel points omitted by Johnson. The three likeliest starting places among books that Newton is known to have owned would have been the fairly straightforward grammar of Victor Bythner; a handbook that promised to teach Hebrew in a space of twenty-four hours, compiled by Wilhelm Schickard; and the more demanding grammar of the elder Johann Buxtorf. Any one of these might teach a student the basic rules of pointing, accenting, and conjugating Hebrew, and Schickard’s work even included a small Hebrew-Latin lexicon which duplicated a number of the words given by Johnson, and printed them in pointed form.^{xvi} Newton does not, however, appear to have owned a copy of Johnson’s work, and it is therefore impossible to claim that other sources about the Hebrew language that he may have used in the early 1660s would be limited to books that he did later own. Indeed, several of the works that Newton consulted in the composition of his philosophical notebook (Ms. Add. 3996) were ones that Newton does not appear to have owned or, at least, retained in his library, whereas he did keep a number of textbooks acquired in the period 1659-61 and most of the books that are recorded as purchases during the mid-late 1660s in the accounts to be found in either the Trinity College or the Fitzwilliam notebooks.^{xvii}

Nevertheless, Newton’s use of Johnson was not unique in contemporary English universities. At least two of the surviving copies of Johnson’s work point to such a readership or context. One of the three copies in Cambridge has the ownership signature of Thomas Danson (1629-94), who had learned Hebrew in London from Christian Ravius, and was chaplain of Corpus Christi College, Oxford, when he acquired the book with which he bound his copy of Johnson’s table, on 12 May 1649.^{xviii} Danson later incorporated his Oxford MA at Cambridge, in 1654. More significantly, the copy at the Universiteitsbibliotheek in Leiden bears a dedication from Johnson to Laurence Chaderton (1536?-1640), the first Master of Emmanuel College (who held office until 1622).^{xix} This perhaps provides a clue as to the identification of Johnson (or ‘Jonson’) himself, which has otherwise proved elusive.^{xx} The matriculation register of the University of Leiden records the entrance of an English student of arts named ‘Samuel Janson’, who was twenty-two years old in 1627.^{xxi} Three people with the name ‘Samuel Johnson’ (or variants thereof) matriculated at Emmanuel College, Cambridge, before 1627, only one of whom would have been twenty-two in 1627. This was Samuel Johnson (1605-58), the eldest son of Abraham Johnson, High Sheriff of Rutland, and his second wife, Elizabeth, who was the daughter and only child of Laurence Chaderton. According to Patrick Collinson, ‘Johnson and his family became part of the furniture of Emmanuel’: Abraham’s father, Robert, endowed scholarships at the College; Abraham and his sons (Isaac, Samuel, Ezekiel, and Francis) were all educated there, and ties of kinship, economic self-interest, and puritan religion bound them to Chaderton’s Cambridge. Abraham Johnson was disinherited in favour of his son Isaac, who invested heavily in the Massachusetts Bay Company and eventually sailed for New England in 1630. Isaac Johnson died at Salem in that year, and remembered his grandfather Chaderton’s contribution to his education fondly in his will. Isaac’s half-brother, Samuel, who lacked his fortune and connections, eventually followed him into the ranks of the clergy. His stay in Leiden may have been brief, since he incorporated his Cambridge MA at Oxford in 1628. By July 1640, he was carrying out the function of preacher in the parish of Ashdon, Essex, where he died eighteen years later.^{xxii}

The library at Emmanuel in the 1620s was relatively rich in sixteenth- and early seventeenth-century Christian scholarship about Hebrew, whose study Chaderton appears to have encouraged. More interestingly, its furniture appears to have included a ‘Hebrew Table with a wainscot frame’. This was one of several framed visual aids for the teaching of basic facts about the Bible, which otherwise consisted of a table of scriptural genealogies, a table derived from one of the works of the Hebraist and biblical scholar, Hugh Broughton (1549-1612), and a map of the globe.^{xxiii}

The library also seems to have contained a copy of the principal forerunner to Johnson's own table: a similar (if much larger) device compiled by the Leipzig Hebraist, Elias Hutter (1553-1605). This was originally published in Hebrew and German, but later printed in Hebrew and Latin.^{xxiv} It was certainly known and used in late sixteenth-century Cambridge by students of Hebrew.^{xxv} Hutter's work and that of Johnson overlapped only to a small degree in terms of the words that they illustrated, but Johnson emulated the concept that Hutter provided much more closely.

Charles Hoole (1610-67), a schoolmaster who was active in London when Newton was at school in Grantham, estimated that 'many defer the Hebrew to be learned at the University', and that it is 'found a thing very rare, and is by some adjudged to be of little use, for School-boyes to make Exercises in Hebrew'. He nevertheless urged making the attempt in the sixth form, and recommended learning the method of 'finding a *Radix*' in order to use an appropriate lexicon.^{xxvi} The practice of contemporary tutors at Cambridge is, however, less clear. Richard Holdsworth (1590-1649), who was Master of Emmanuel from 1637, compiled a set of directions for study at the University, in which Hebrew was to be mastered only after completion of the first four years of the curriculum (unlike New Testament Greek, which was part of the programme from the first year). Holdsworth was one of those who advocated the use of small, octavo notebooks (such as Newton later employed as a student).^{xxvii} At Trinity College, James Duport (1606-79), set out rules for the pupils to whom he was tutor (between 1635 and 1664). These are also much more specific about the acquisition of Greek than they are about Hebrew, although Duport stressed that 'you cannot see clearly into Gods Word without the two eyes of Greeke and Hebrew.'^{xxviii} Between 1663 and 1667, Isaac Abendana (d. 1699), a Spanish-born Jewish scholar, received regular payments (possibly in return for teaching Hebrew, as well as for his work in translating the Mishnah) at Trinity. These were supplemented in 1664 and 1665 by others to Moses Scialliti (who had publicly converted to Christianity in 1663) and, in 1665, to the 'converted Jew Michael'. No evidence has been found, however, that Newton sought Hebrew instruction from Abendana or any other Jewish tutor – or that he was acquainted with any contemporary Jews for that matter.^{xxix} Indeed, the University milieu in practice did not seem to provide strong incentives to learn Hebrew. The then Master of Emmanuel College, William Sancroft (1617-93), wrote to his former tutor, Ezekiel Wright, in January 1663, lamenting: 'It would grieve you to hear of our public examinations; the Hebrew and Greek learning being out of fashion everywhere, and especially in the other colleges.'^{xxx} Given the nature of Newton's studying habits at Trinity, it thus seems very likely that his copying from Johnson's table of Hebrew reveals part of the youthful endeavour of an autodidact in the early 1660s.

NEWTON'S USE OF GRAMMARS AND LEXICONS: SOME EVIDENCE FROM THE BOOKS THEMSELVES

Newton owned a fairly sizeable collection of aids for learning or making sense of Hebrew, many of which are now kept at the Wren Library of Trinity College. Given the discussion above, it is significant that his copy of Johann Buxtorf the Elder's *Lexicon Hebraicum et Chaldaicum* (Basel, 1621) bears his name on the fly-leaf, since one of the periods in his life when Newton seems to have recorded ownership of a book in this way was when he was still an undergraduate. Thus, Newton may have acquired the *Lexicon* soon after entering Cambridge and at about the time he copied the table of Hebrew roots.^{xxxi} Most of the other Hebrew, Aramaic, and Syriac lexicons that Newton acquired during his lifetime show signs of use, although it is sometimes difficult to ascertain whether they were made by him or not.^{xxxii} Scholars have long remarked on Newton's peculiar habit of dog-earring his books, by turning page corners over to point to particular passages of interest to the reader. Given the concerns of Newton's theological writings of the last forty years or so of his life, it is telling that the entries for a Hebrew word sometimes translated as 'idol' are dog-eared both in Buxtorf's *Lexicon* and in William Robertson's *Thesaurus linguae sanctae*.^{xxxiii} The two lexicons similarly define its primary meaning as '*nihilum*' or '*res nihili*' ('nothing'). The homologous Hebrew word for 'vanity', often rendered 'idol' in the Authorized Version, is correspondingly dog-eared in the *Lexicon*, in which it is defined as '*Iniquitas, Vanitas, Molestia, Idolum*' ('iniquity, vanity, vexation, idol').^{xxxiv} In a manuscript on the history of the Church, Newton himself defined idolatry as 'the worshipping of a fals God, a God who is not what your worship supposes him to be, a fictitious God, a Vanity.'^{xxxv} Likewise, in his copy of Edward Leigh's *Critica sacra*, a folded page corner points to the entry defining the Hebrew for 'constellations' or 'zodiac signs', under which David Kimchi's rationale for the Gentile practice of star worship is reported.^{xxxvi} Also marked with a dog-ear is the entry for 'Teraphim', which Leigh defined as 'small Images made under a certain constellation, which [the Gentiles] used to consult both in things doubtfull and future, supposing they had a power to this effect, received from heavenly influence'.^{xxxvii} From no later than the 1680s, when he wrote about '*Theologiae Gentilis origines philosophicae*' ('The philosophical origins of Gentile theology'), Newton displayed considerable interest in the origins of idolatry and astral worship among the peoples of the ancient Near East.^{xxxviii} The fact that several of the relatively few dog-ears exhibited in Newton's lexicons pointedly relate to this characteristic concern of his writings suggests that these volumes were not primarily used to achieve proficiency in Hebrew, but instead to investigate and corroborate particular theological views.

Newton's use of Hebrew in his manuscripts consisted of the citation of a few isolated words or phrases.^{xxxix} There is no clear evidence that Newton was able to read an extensive text in Hebrew.^{xl} Even in works that he did consult extensively that contained continuous Hebrew text, such as the parallel Hebrew and Latin edition by Dionysius Vossius of Maimonides's *De idololatria liber* (Amsterdam, 1641), Newton marked the Latin translation rather than the original.^{xli} When he was in old age, Newton denied any specific skill in the Hebrew language. He responded to the Breslau Hebraist Caspar Neumann (whose own ideas about the language were, it must be admitted, decidedly strange) in the following terms:

A copy of your book entituled Clavis Domus Heber was presented to me in your name some months ago & I then desired the person who brought me the present to return my thanks, & told him that I did not understand Hebrew... The Hebrew tongue is said to be narrow, & the just signification of several words to be almost lost & few books are extant written in the ancient Hebrew, & the designe of recovering the ancient signification of the words must be very commendable: but for want of skill in that tongue I am unable to make further judgement of the success in this designe then I am perswaded that a person of your abilities has wanted the success desired.^{xlii}

The young Newton had found diversion in the work of Johnson and others who tried to make learning Hebrew easier, and he acquired some facility in the language as a result. Whether he committed Johnson's table to memory (as was its author's intention) is unknown, but he certainly failed to acquire the confidence in Hebrew to which that other Cambridge tyro had once hoped to bring his readers.

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Notes

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ⁱ Richard S. Westfall, *Never at Rest. A Biography of Isaac Newton*, p. 346 (Cambridge: Cambridge University Press, 1980).

ⁱⁱ Babson Ms. 434, then at Babson College, now in the collections of the Huntington Library, San Marino, California: see *A Descriptive Catalogue of the Grace K. Babson Collection of the Works of Sir Isaac Newton*, pp. 196-7 (New York: Herbert Reichner, 1950). For a facsimile and edition (with Spanish translation) of this manuscript, see Ciriaca Morano (ed.), *Isaac Newton. El Templo de Salomón*, with an introduction by José Manuel Sánchez Ron (Madrid: Consejo Superior de Investigaciones Científicas, 1998); for an English translation, see Tessa Morrison, *Isaac Newton's Temple of Solomon and his Reconstruction of Sacred Architecture*, pp. 105-56 (Basel: Birkhäuser, 2011). On the basis of content and similarity to other works written by Newton, this manuscript is in fact most unlikely to date from the 1670s; Sánchez Ron (pp. xciv-v), with reference to letters and manuscripts composed in the 1690s, correctly suggests that it cannot have been written before 1690 and may have been drafted much later than that.

ⁱⁱⁱ Matt Goldish, *Judaism in the Theology of Sir Isaac Newton*, p. 26 (Dordrecht: Kluwer, 1998). Brian P. Copenhaver, 'Jewish Theologies of Space in the Scientific Revolution: Henry More, Joseph Raphson, Isaac Newton, and their Predecessors', *Annals of Science*, 37, 489-548 (1980), at p. 544, notes Newton's knowledge of the Hebrew alphabet.

^{iv} On the chronological development of Newton's interest in these matters, see Rob Iliffe, "'Making a shew': Apocalyptic Hermeneutics and the Sociology of Christian Idolatry in the Work of Isaac Newton and Henry More', in James E. Force and Richard H. Popkin (eds.), *The Books of Nature and Scripture*, pp. 55-88 (Dordrecht: Kluwer, 1994).

^v Newton's consideration of Arabic names in one of his earliest works on the historical fulfilment of prophecy was thus copied directly from the printed text of Edward Pococke's *Specimen historiae Arabum*, pp. 133-4 (Oxford, 1650): see Jerusalem, Jewish National and University Library, Yahuda Ms. (hereafter Yahuda Ms.), 1.7, f. 36v.

^{vi} Cambridge, Fitzwilliam Museum, Ms. 1-1936. This manuscript was acquired in July 1936 on behalf of the Museum by the Friends of the Fitzwilliam from the London bookdealer, Maggs Brothers, for £180. It had been sold along with

the other residual papers of Newton held by his heirs at Sotheby's on 14 July 1936. See Sotheby & Co, [compiled by John Taylor], *Catalogue of the Newton Papers sold by order of the Viscount Lymington*, pp. 52-3 (London: Sotheby, 1936). On the sale, see also P.E. Spargo, 'Sotheby's, Keynes and Yahuda — the 1936 Sale of Newton's Manuscripts', in P.M. Harman and Alan E. Shapiro (eds.), *The Investigation of Difficult Things*, pp. 115-34 (Cambridge: Cambridge University Press, 1992); Sarah Dry, *The Newton Papers*, pp. 112-60 (New York: Oxford University Press, 2014).

^{vii} David Brewster, *Memoirs of the Life, Writings, and Discoveries of Sir Isaac Newton*, 2 vols: vol. 1, pp. 28-30 (Edinburgh: Edmonston and Douglas, 1860 [1st, 1855]).

^{viii} Richard S. Westfall, 'Short-Writing and the State of Newton's Conscience, 1662', *Notes and Records of the Royal Society of London*, 17, 10-16 (1962).

^{ix} See D.T. Whiteside (ed.), *The Mathematical Papers of Isaac Newton*, 8 vols: vol. 1, pp. 15-45 (Cambridge: Cambridge University Press, 1967-81); John Harrison, *The Library of Isaac Newton*, pp. 131-2, 207 (Cambridge: Cambridge University Press, 1978).

^x Others include the Pierpont Morgan notebook (New York, The Morgan Library and Museum, Ms. MA 318 (Newton, I.2)), begun in 1659; the Trinity College notebook (Cambridge, Trinity College, Ms. R.4.48c), also begun in 1659; and Cambridge University Library Mss. Add. 3996 (begun in 1661) and 4000 (begun in winter 1663-4).

^{xi} See J.E. McGuire and Martin Tamny (eds.), *Certain Philosophical Questions: Newton's Trinity Notebook* (Cambridge: Cambridge University Press, 1983).

^{xii} Ms. 1-1936, f. 117v; the existence of this table was noted, for example, by Brewster, *op. cit.* (note 7), vol. 1, p. 27 and by [Taylor], *op. cit.* (note 6), p. 53.

^{xiii} Surviving copies of this work are known in two forms: a broadside (which is identified as the work of 'Samuelis Ionsoni Angli' ['the Englishman, Samuel Jonson']), printed in red and black in four columns on vellum and with the main text reading right to left (Leiden, Universiteitsbibliotheek (shelfmark 1366 C 4)); and a quarto (with signatures $\pi^{2(-1)}$, A-B²) printed in red and black in lines across the page, with the main text reading right to left, where the author is identified only as 'S.I.' (nine copies known: 1. Cambridge University Library, shelfmark 2.24.39(1); 2. Library of the British and Foreign Bible Society [on deposit at Cambridge University Library], shelfmark BSS. 140. B.39.4(2); 3. Cambridge, private collection; 4. London, University College Library, shelfmark Strong Room Ogden 38; 5. Manchester, Chetham's Library, shelfmark 2.I.5.53(7); 6. Paris, Bibliothèque Mazarine, shelfmark 4° 10036-1; 7. Fulda, Hochschul- und Landesbibliothek, shelfmark 4° Spr Ab 62/30; 8. Stift Kremsmünster, shelfmark 8° Fc 93; 9. Philadelphia, University of Pennsylvania, Van Pelt-Dietrich Library, Kislak Center for Special Collections, E.B. Krumbhaar Elzevier collection). It is not listed in either the online English Short-title Catalogue or the online Short-Title Catalogue, Netherlands, and it is not recorded in L. Fuks and R.G. Fuks-Mansfeld, *Hebrew Typography in the Northern Netherlands 1585-1815. Historical Evaluation and Descriptive Bibliography*, pp. 38-45 (Leiden: Brill, 1984), which however omits all broadsides. The copy at Leiden was known to Alphonse Willems, *Les Elzevier*, p. 75, no. 281 (Brussels: Van Trigt, 1880). See also G. Hubert Matthews, 'An undescribed Elzevir quarto, Samuel Jonson's *Nova cubi hebraei tabella*', *The Library Chronicle of the Friends of the University of Pennsylvania Library* 21, 9-14 (1955), which compares the Leiden and Philadelphia copies.

^{xiv} 'Lector, in hâc Tabellâ Radices quas totus Ebraeæ linguæ Thesaurus continet, omnes uno intuitu vide... Iamque accipiat Lector benevolus Cubum Ebraum in hanc formulam redactum, typis elegantioribus impressum, quo Radices omnes faciliùs invenire & fœliciùs memoriæ mandare possit.'

^{xv} 'Ante ultimas Radicis litteras puncta seu vocales eius... Tyronum gratiâ passim apposui; exceptis Verbis, quòd vel leviter imbuto præceptis grammaticis facillè sit ea supplere: & verbis quadratis cum polysyllabis, ubi (ut & alibi sæpiùs) Lector (si placet) ipse accuratiùs adscribat quàm Typographus potuit appingere.'

^{xvi} See Harrison, *op. cit.* (note 9), pp. 113, 234; Victor Bythner, *Lingua eruditorum: sive methodica institutio linguæ sanctæ* (London, 1650); Johann Buxtorf, *Epitome grammaticæ Hebraeæ*, 5th edn (Basel, 1629); Wilhelm Schickard, *Horologium Hebraeum* (London, 1639). Of these, the current whereabouts of Newton's copy of Schickard alone is known: Cambridge, Trinity College, shelfmark NQ. 7.6. It reveals nothing about Newton's use of the book.

^{xvii} Harrison, *op. cit.* (note 9), pp. 2-3, 7-8; Westfall, *op. cit.* (note 1), pp. 83-103.

^{xviii} Cambridge, private collection: Danson bound his copy with [Roger Drake], *Sacred Chronologie* (London, 1648). On Danson, see William Lamont, 'Danson, Thomas (*bap.* 1629, *d.* 1694)', *Oxford Dictionary of National Biography* (Oxford University Press, 2004; online edn, Jan 2008), [<http://www.oxforddnb.com/view/article/7131>, accessed 20 Sept 2015]. The copy of Johnson in Cambridge University Library (shelfmark 2.24.39(1)) is accompanied by three seventeenth-century works in a later binding. One of these (*A Table Shewing the Dominical Letter* (London, 1665)) has annotations in a contemporary hand, but there is no reason to assume that the volume was in Cambridge in its current form in the 1660s.

^{xix} Leiden, Universiteitsbibliotheek, shelfmark 1366 C 4; see also Matthews, *op. cit.* (note 13), p. 12.

^{xx} Matthews, *op. cit.* (note 13), p. 14 comments: 'An attempt to identify the author in the obvious biographical sources was unsuccessful.'

^{xxi} W.N. du Rieu (ed.), *Album studiosorum Academiae Lugduno Batavae MDLXXV-MDCCCLXXV*, p. 203 (The Hague: Nijhoff, 1875); see in general Daniela Pröger, *English Students at Leiden University, 1575-1650* (Farnham: Ashgate, 2013).

^{xxii} J. and J.A. Venn, *Alumni Cantabrigienses, Part 1: From the Earliest Times to 1751*, 4 vols, vol. 2, p. 481 (Cambridge: Cambridge University Press, 1922-7); Sarah Bendall, Christopher Brooke, and Patrick Collinson, *A History of Emmanuel College, Cambridge*, pp. 227-9 (Woodbridge: Boydell, 1999); H.C. Porter, *Reformation and Reaction in Tudor Cambridge*, p. 235 (Cambridge: Cambridge University Press, 1958); see also 'Will, Letters, &c., of Isaac Johnson', printed in *Collections of the Massachusetts Historical Society* 4th series, 6, 20-32b (1863).

^{xxiii} See Sargent Bush, Jr., and Carl J. Rasmussen, *The Library of Emmanuel College, Cambridge, 1584-1637*, pp. 18-19, 39 (Cambridge: Cambridge University Press, 1986); Cambridge, Emmanuel College, Archives: CHA.1.4.B, f. 52v. The work by Broughton may perhaps have derived from the illustrations to his *Concent of Scripture* (c. 1590).

^{xxiv} Elias Hutter, *Cubus alphabeticus sanctae linguae Ebraeae* (Hamburg, 1586); Elias Hutter, *Cubus alphabeticus sanctae Ebraeae linguae*, ed. David Wolder (Hamburg, 1588). See also Bush and Rasmussen, *op. cit.* (note 23), p. 56.

^{xxv} See, for example, the copy at Cambridge, Peterhouse, Perne Library, shelfmark H.11.8, which belonged to Andrew Perne (1519?-89) and has been annotated in some places in manuscript to provide the correct vowel points for given roots.

^{xxvi} Charles Hoole, *A New Discovery of the Old Art of Teaching School*, pp. 192-194 (London, 1661). Among the books recommended by Hoole for beginners in Hebrew that Newton owned were those of Buxtorf and Schickard (cf. note 16 above). Schoolboys at Grantham may have had access to the collection of books kept in the chained library founded by Francis Trigge at St Wulfram's Church, which is adjacent to the King's School. The schoolmaster and the vicar of the church looked after the library, whose 1608 catalogue lists three volumes in Hebrew: a copy of the Antwerp polyglot Bible (1569-73), Sanctes Pagninus's *Thesaurus linguae sacrae* (also one of the works recommended by Hoole), and a Hebrew concordance. See Ruth Crook, *Arthur Storer's World: Family, Medicine and Astronomy in Seventeenth Century Lincolnshire and Maryland*, p. 45 (Grantham Civic Society, 2014); John Glenn and David Walsh (eds.), *Catalogue of the Francis Trigge Chained Library*, p. 77 (Woodbridge: D.S. Brewer, 1988).

^{xxvii} Cambridge, Emmanuel College, Ms. 48; see also John A. Trentman, 'The Authorship of *Directions for a Student in the Universitie*', *Transactions of the Cambridge Bibliographical Society*, 7, 170-83 (1977-80).

^{xxviii} C.D. Preston and P.H. Oswald, 'James Duport's Rules for His Tutorial Pupils: A Comparison of Two Surviving Manuscripts', *Transactions of the Cambridge Bibliographical Society*, 14, 317-62 (at p. 335) (2008-11).

^{xxix} David S. Katz, 'The Abendana Brothers and the Christian Hebraists of Seventeenth-Century England', *The Journal of Ecclesiastical History* 40, 28-52, p. 38 (1989). To the information provided by Katz, it can be added that both Abendana (1663-6) and Scialliti (1664-5) also received regular payments from Emmanuel College, see Cambridge, Emmanuel College, Archives: BUR.8.2. This suggests that support for them was more widespread among the Colleges, even before Abendana began to be paid by the University in 1669. José Faur ('Newton, Maimonides, and Esoteric Knowledge', *Cross Currents* 8, 526-538, p. 528 (1990); 'Newton, Maimonidean', in Alan J. Avery-Peck and Jacob Neusner (eds.), *Judaism and Christianity: new directions for dialogue and understanding*, pp. 127-162, p. 130 (Leiden: Brill, 2009)) proposed that Newton learned Hebrew from Abendana, but gave no reasons for this beyond the coincidence of the two men in the same town at the same time.

^{xxx} Printed in George d'Oyly, *The Life of William Sancroft, Archbishop of Canterbury*, vol. 1, p. 128 (London: John Murray, 1821).

^{xxxi} Harrison, *op. cit.* (note 9), pp. 2, 113; Newton's copy is now at Cambridge, King's College, shelfmark Keynes Ec. 7. 3. 26. Buxtorf was one of the works recommended by Hoole, *op. cit.* (note 26).

^{xxxii} Edward Leigh, *Critica Sacra, or Observations on all the Radices, or Primitive Hebrew Words of the Old Testament* (London, 1650); Sebastian Munster, *Dictionarium Chaldaicum, non tam ad Chaldaicos interpretes quam rabbinorum intelligenda commentaria necessarium* (Basel, 1527); Sanctes Pagninus, *Epitome thesauri linguae sanctae* (Antwerp, 1578); William Robertson, *Thesaurus linguae sanctae* (London, 1680); Karl Schaaf, *Lexicon Syriacum concordantiale, omnes Novi Testamenti Syriaci voces et multas alias complectens* (Lyon, 1709); Valentin Schindler, *Lexicon pentaglotton, Hebraicum, Chaldaicum, Syriacum, Talmudico-Rabbinicum, & Arabicum* (Hannover, 1612). See Harrison, *op. cit.* (note 9), pp. 177, 197, 209, 233-4.

^{xxxiii} Buxtorf, *Lexicon*, p. 16 (the volume exhibits eight instances of dog-earing); Robertson, *Thesaurus*, p. 28.

^{xxxiv} Buxtorf, *Lexicon*, p. 11.

^{xxxv} Yahuda Ms. 15.4, f. 68r.

^{xxxvi} Leigh, *op. cit.* (note 32), p. 144; Cambridge, Trinity College, shelfmark NQ. 10.58.

^{xxxvii} Leigh, *op. cit.* (note 32), p. 272.

^{xxxviii} Yahuda Ms. 16.2. See Richard S. Westfall, 'Isaac Newton's *Theologiae gentilis origines philosophiae*', in W. Warren Wagar (ed.), *The Secular Mind: Transformations of Faith in Modern Europe*, pp. 15-34 (New York: Holmes & Meier, 1982); Jed Z. Buchwald and Mordechai Feingold, *Newton and the Origin of Civilization*, pp. 143-63 (Princeton: Princeton University Press, 2013).

^{xxxix} For some typical instances of Newton's use of Hebrew, see Yahuda Ms. 13.2, ff. 5r, 13r, 13b, 18r, 19r, 20r; Yahuda Ms. 14, f. 32v.

^{xi} Newton owned very few such texts (as distinct from works that printed Hebrew alongside Latin translations). One that was in his library was the 1517 rabbinic Bible (Cambridge, Trinity College, shelfmark NQ. 8.22). Although clearly used by earlier readers, it shows no sign of having been read by Newton.

^{xii} See Cambridge, Trinity College, shelfmark NQ. 8. 46¹.

^{xiii} H.W. Turnbull et. al. (eds.), *The Correspondence of Isaac Newton*, 7 vols, vol. 7, p. 481 (Cambridge: Cambridge University Press, 1959-77). The book was Neumann's *Clavis domus Heber* (Wrocław, 1712), now: Cambridge, Trinity College, shelfmark NQ. 9.172¹. Newton's comments echo those of Neumann in distinguishing between modern (rabbinic) Hebrew and an ancient Hebrew tongue, now supposedly obscure.

Figure captions

Figure 1. Newton's table of Hebrew roots. © The Fitzwilliam Museum, Cambridge.

Figure 2. S[amuel] I[ohnson], *Nova cubi Hebraei tabella* (Leiden: Elzevier, 1627), sig. A1r © Cambridge University Library.

Short title for page headings

Newton learns Hebrew