This paper argues the importance, for the study of accounting history, of collecting evidence of accounting’s past and of questioning its conventional wisdoms. It is known that Cronhelm (1818) explained in algebraic terms the mathematical relationship between assets, liabilities and capital reported in a balance sheet. It is also known that the balance sheet equation Assets (A) – Liabilities (L) = Capital (C) became a foundation for teaching bookkeeping as the twentieth century progressed. Current knowledge suggests that, during the first half of the twentieth century, this mathematical approach to teaching accounting gained a foothold in the United States based on the writings of Sprague and Hatfield, and also in Continental Europe. This paper reveals that, in the 1730s in England, John Clark cogently demonstrated an algebraically rooted understanding of the interrelationship between double entry bookkeeping and the structure of the balance sheet as exemplified by the above equation. The paper proves that journal-oriented learning was not the exclusive training method employed by bookkeeping instructors during the early eighteenth century and raises the possibility that other teachers of bookkeeping were providing a more thoughtful education for aspiring clerks, bookkeepers, managers and businessmen than has hitherto been thought the case. This study also shows that accounting technologies do not continuously evolve towards their current state of elaboration, and that it is important for researchers to remain aware of plurality in patterns of accounting change and to be willing to embrace the full range of methodological approaches available for studying accounting phenomena.

Key words: Accounting history; Balance sheet equation; Double entry bookkeeping; John Clark.

Heeffer (2011, p. 112) observes parallel developments in double entry bookkeeping and symbolic algebra which, he argues, were ‘instrumental in the objectivation of value’ in the sphere of business. Heeffer draws attention to the fact that the earliest example of double entry bookkeeping can be found in the Farolfi ledger of 1299–
1300 (Lee, 1977) while the ‘earliest extant vernacular text dealing with algebra’ was written in 1307. Both algebra and double-entry bookkeeping were practised throughout the mercantile centres of Northern Italy from around that time onwards, with their initial appearance in ‘the very same’ treatise occurring in Pacioli’s Summa (1494). Heeffer (2011, p. 124) poses the question, ‘Why was bookkeeping treated in the same book with arithmetic and algebra?’ He answers: ‘Because they both were important instruments in the [sic] establishing objective and exact value, the basic principle of reciprocal relations of exchange [often involving barter] in a mercantile society’. The algebraic foundation for double entry bookkeeping procedures was not made explicit in the accounting literature for centuries.

The purpose of this paper is to reveal an early English-language contribution to the accounting literature which demonstrates an algebraically rooted understanding of the interrelationship between double entry bookkeeping (DEB) and the structure of the balance sheet. It shows that John Clark (1683–1736) elucidated the balance sheet equation, now expressed as \( C + L = A \) in 1738, which was 80 years before the currently acknowledged architect of that mathematical association, Frederick William Cronhelm (Littleton, 1933, p. 170; Jackson, 1956, pp. 310–11; Yamey, 1978; Scorgie and Joiner, 1995).

Miller and Napier (1993) have taken accounting historians to task for their search for the origins of present-day practices. Their paper instead calls for genealogies of calculation, where the term ‘genealogy conveys a focus on the outcomes of the past’ (p. 631). We agree that it is important to examine historical evidence without pre-conceptions concerning its significance for the present day, thereby ‘delimiting’ the study of accounting history (p. 636). We also understand why they emphasize ‘the importance of attending to ensembles of practices and rationales that are assembled at various collective levels, rather than with isolated instances of this or that way of accounting’ (pp. 633–4). At the same time, it is important to retain a degree of flexibility concerning recognition of legitimate and meaningful ways of tackling the study of accounting’s past. For example, the study of early business records for evidence of cost accounting initially revealed isolated examples of its use for performance assessment and decision making (e.g., Roll, 1930; McKendrick, 1970; Stone, 1973) that were not seen as a serious challenge to Pollard’s (1965) sweeping conclusions concerning accounting’s irrelevance for managerial purposes during the British Industrial Revolution. But as more and more case studies came to light (summarized in Boyns and Edwards, 2007, pp. 970–9), a new and radically different conventional wisdom has emerged.

The discovery that John Clark presented the balance sheet equation in print in 1738 is not important because it reveals that writers have been wrong to hail Cronhelm’s work as the original English-language contribution.\(^1\) Indeed, it is pos-

\(^1\) Second edition cited in this paper. It has not proved possible to trace a copy of the first edition published in 1732.

\(^2\) Whether the balance sheet equation features in writings other than English in the eighteenth century, or earlier, is unknown to the present author.
sible that Clark got some or all of his ideas from someone else. Nor is the finding important because it moves back in time 80 years the earliest known example of the balance sheet equation. It is of relevance to the study of accounting’s history because, given Clark’s position as a teacher, it reveals that journal-based learning was not the exclusive training method employed by bookkeeping instructors during the eighteenth century (Chatfield, 1977, pp. 217–18). It is also significant because it raises the possibility that other teachers of bookkeeping were providing a more thoughtful education for aspiring clerks, bookkeepers, managers and businessmen than has hitherto been thought the case. And it is of interest because it adds to our knowledge of the history of a professional discipline.

BOOKKEEPING AND PEDAGOGY

The history of pedagogic writings on DEB is judged to have gone through a series of broad stages. Following the publication of Pacioli’s Summa (1494), the early focus was on journal-oriented rote learning, with the ledger the ultimate resting place for transactions recorded in accordance with the author-teacher’s instructions (Jackson, 1956). Despite DEB’s practical origins, there were inevitably patterns of thought implicit in the mechanistic procedures described in early treatises on the subject (Littleton and Zimmerman, 1962, p. 47), and these have been gradually uncovered. Through to the eighteenth century, rules were increasingly structured in terms of the personification of accounts. It is thought that the nineteenth century witnessed the emergence of new theories of bookkeeping in the English-language literature, starting with proprietorship (or ownership) theory and, as the distinctive characteristics of the soulless joint stock company became recognized, the entity theory in the twentieth century (Chatfield, 1977, chapter 16). It is writers in the United States and Continental Europe that have been recognized as important in the formulation of these and other theories of bookkeeping (Yamey, 1975, p. xxiv).

Although researchers believe that the proprietorship theory of accounts did not develop until the nineteenth century, they do recognize that the transition from a journal-centred to a ledger-focused approach to learning caused early writers to consider more deeply the fundamental nature of DEB. A weariness of the traditional pattern of education is signalled by North (1714, p. 10): ‘I shall not in this my Undertaking, labour very hard, or penetrate deep, by exaggerating Multitudes of Rules and perplexed Examples, as most Writers of this Subject have done’. According to Chatfield (1977, p. 221), the essence of the proprietary theory can be traced to Alexander Malcolm (1718), who ‘distinguished between the totality of a merchant’s capital and its constituent parts’. Jackson (1956, p. 307) sees Hustcraft Stephens (1735) as ‘extricating himself from the quagmire of personification’ by focusing on the effect of transactions on the balance/ballance account (today’s balance sheet) in the ledger. Three categories of transaction were identified for this purpose: those which affected only assets; those which affected only liabilities; and those which affected both assets and liabilities. Central to this idea was recognition of capital as an abstract concept:
That Portion of Things which a Man possesses, or has otherways belonging to him, as a Security, taken all together, I call the Estate, and the Worth of a Man's Estate, consider'd abstractly from the Things which are valued, I call the computed Value or Extent of a Man’s Estate. (Stephens, 1735, p. 2, quoted in Jackson, 1956, p. 307)

In 1800 a bookkeeper with the Board of Revenue in Bengal, India, is thought to have had published ‘a more readable attempt to explain the internal equilibrium of double entry bookkeeping’ (Chatfield, 1977, p. 221; see also Jackson, 1956, pp. 309–10). James Fulton drew particular attention to the fact that the balance on the capital account was not only the difference between assets and liabilities, it could also be arrived at by adjusting opening capital for net changes in asset and liability accounts (Fulton, 1800). This balance sheet approach to teaching DEB was not to become widespread practice until well into the twentieth century.

The balance sheet approach can of course be reduced to a well-known algebraic equation, and Jackson (1956, p. 310; see also Chatfield, 1977, pp. 221–2) credits Frederick William Cronhelm (1818) with the first English-language rendition of this mathematical approach (see below) 18 years after the publication of Fulton’s treatise. Cronhelm’s methodology was later employed by the early U.S. accounting thinker Charles E. Sprague, then secretary (later president) of the Union Dime Savings Bank, in a series of articles entitled ‘The Algebra of Accounts’ written in 1880 (Sprague, 1880). Sprague may have been unaware of Cronhelm’s earlier work; certainly he makes no mention of it. According to McMillan (1998, p. 9), ‘for the first time in the U.S., the conceptual abstractions of the science of accounts found symbolic representation’. Sprague’s ideas were taken up by the ‘humanist, scholar and accounting educator’ (Zeff, 1999), Henry Rand Hatfield, in Modern Accounting published in 1916 (see chapter 1).

The rate of adoption of the balance sheet approach was the subject of comment in Jackson’s pioneering review of ‘the history of methods of exposition of double-entry book-keeping in England’. Writing in 1956, Jackson (1956, p. 312) draws attention to the fact that

The astonishing feature of this depersonalised, mathematical approach to book-keeping is that, although it is the principal current method of exposition in the United States of America and several European countries, it was not until 1949 that it was adopted in a twentieth-century British book-keeping textbook.

This neglect occurred despite a much earlier exposition of the mathematical approach in England by Cronhelm and, before him, by John Clark. These contributions are now considered.

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3 He was an early joint editor of The Bookkeeper (Loeb and Miranti, 2004, p. 7), launched in 1880.

4 Scorgie and Joiner (1995, p. 232) suggest that a more accurate date might be 1952 which saw the publication of Andrew Baston’s Elements of Accounts: Balance-Sheet Approach for Elementary and Intermediate Stage Students (Baston, 1952).
The mathematical-based exposition of DEB contained in Cronhelm’s *Double Entry by Single* (1818) has been the subject of critical study by Scorgie and Joiner (1995). In their view, his ‘was the seminal English contribution that identified and amplified the algebraical basis of double entry and made clear that a double entry system could be operated without resort to debits and credits’ (Scorgie and Joiner, 1995, p. 229). They summarize Cronhelm’s contribution as follows:

In general, the [previous double entry] treatises sought to explicate the double entry method by defining and explaining a set of rules for debits and credits. The explanations did not amplify the algebraic basis of double entry, nor did they suggest the operation of a double entry system without concomitant debits and credits (cf. de Roover, 1956, p. 11 [sic]). In contrast, FWC’s [Frederick William Cronhelm] treatise clearly identified and amplified the algebraic basis of double entry. Furthermore, his explanations in Part I of the treatise indicated that a double entry system could be operated without using debits and credits. (p. 230)

Cronhelm’s ideas are presented in chapter III entitled ‘Principle of Equilibrium’. Following a narrative explanation of the relationship between assets, liabilities and capital, Cronhelm (1818, p. 5) suggests that the ‘same reasoning may be more concisely expressed in an algebraic form’:

Let \( a, b, c, \&c. \) represent the positive parts, or Debtors; \( l, m, n, \&c. \) the negative parts, or Creditors; and \( s \) the Stock, or proprietor’s real worth. Then, as the whole is equal to the sum of its parts,

\[
a + b + c, \&c. - l - m - n, \&c. = \pm s.
\]

By transposition, we obtain

\[
a + b + c, \&c. - l - m - n, \&c. \pm s = 0
\]

Scorgie and Joiner (1995, p. 232) point to the fact that Cronhelm’s text was ‘the harbinger’ of a planned “‘School-book” containing sets of transactions in chronological order which students would analyse using algebraic methods and the accounting equation’. This, he believed, would prove a more effective teaching medium by employing ‘the true elementary plan that has so long been successfully used in Arithmetic’ (Cronhelm, 1818, p. ix).5 Apparently the ‘School-book’ failed to materialize (Scorgie and Joiner, 1995, p. 232).

Scorgie and Joiner recognize that Cronhelm’s ideas might have relied, at least to some extent, on the work of others. First, they link Cronhelm’s knowledge of the German language with a relevant literature emanating from Germany (1995, p. 233–4). Second, they claim that

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5 Yamey’s (1978, Introduction) interpretation of Cronhelm’s future publication plans leads him to foresee a publication ‘which in its approach would have had recourse to a teaching method used much earlier (and no doubt still used also in Cronhelm’s time)’.
circumstantial evidence enables a good case to be made that FWC drew on a translation of
the works of Indian mathematicians for the pivotal concepts of ‘positive property’ and
‘negative property’ which he expounded in his ‘Theory of Book-keeping’ (Cronhelm, 1818,
Part I). (p. 231; see also Scorgie, 1990)

The earlier work of John Clark, published in the same city (London) eighty years
earlier, would have been a more accessible source of inspiration for Cronhelm.

JOHN CLARK

John Clark⁶⁷ is best known as a penman, or writing master (Peltz, 2004).⁶ He was born
in Rotherhithe adjacent to the Thames, London, in 1683. John Clark’s father (also
called John) ‘had the command of a Guinea man,⁸ which at that time of day was a
very honourable and beneficial employ’ (Massey, 1763, p. 47). John Clark senior
traded with the West African Guinea coast, and was lost when his ship foundered on
the treacherous Goodwin Sands. As he was half owner of the ship and its cargo, the
shipwreck left ‘the family’s fortunes in ruins’ (Peltz, 2004). The son attended the
Merchant Taylors’ school in the City of London and was then sent to ‘Major Ralph
Snow’s [school], on the paved stones, little Moorfields, to be finished in writing and
accounts’ (Richard Clark,⁹ quoted in Massey, 1763, p. 48). He then served an appren-
ticeship with Snow.

Clark first made his name as a penman ‘who took great pains to improve that
useful branch of learning, true and natural writing’ (Massey, 1763, p. 45). His impor-
tant contribution was in ‘simplifying writing, and relieving it of much of its flourishes’
(Noble, 1806, p. 355). His first book, The Penman’s Diversion, in the Usual Hands of
Great-Britain, in a Free and Natural Manner, was published in 1708 from his house
at The Hand and Pen in Wood Street near Cheapside. He moved to Warwick Lane
two years later, advertising himself as a teacher of ‘Writing, Arithmetick, Merchants
Accounts,¹⁰ Shorthand and Several Parts of the Mathematicks’ (Heal, 1931).

‘Encouraged by the success of this treatise—which provided examples of simple and
clear penmanship, designed for the use of merchants—Clark issued his next copy-

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⁶ For prior references to Clark in accounting historiography, see Edwards (2009), Edwards and
Anderson (2011), Edwards et al. (2009), and Jackson (1956).

⁷ For some of the history of these experts in calligraphy, see Heal (1931) and Douglas (2001). For a study
of the occupational group of writing masters and accountants, see Edwards and Anderson (2011).

⁸ Guinea man was the name given to a ship involved in the triangular slave trade connecting with
Guinea, Africa.

⁹ Richard was John Clark’s son and, at the time of supplying this information to Massey, also claimed
that John Clark’s grandfather (his great-grandfather) was ‘Captain of a man of war in (K.) Charles the
11th’s reign, wherein he distinguished himself so much in an engagement with the Dutch Fleet,
commanded by Van Trump, as to he honoured with knighthood’ (Massey, 1763, p. 47).

¹⁰ Together these three subjects comprised the core of a unified commercial education in eighteenth-
century Britain (Edwards, 2009).
book, *Writing Improved, or, Penmanship Made Easy*, in 1712’ (Peltz, 2004). According to his son, Richard, these books together sold at least 10,000 copies (Massey, 1763, p. 48).

Around this time Clark entered into a bitter argument with another ‘bright star in a contemporary galaxy of writing-masters’, Charles Snell (Nairne, 2004). Like Clark, Snell was also an accountant, and one who features in accounting historiography. An undignified controversy arose concerning the degree of elaboration appropriate in early eighteenth-century penmanship. Clark together with another prominent writing master and accountant, George Shelley, advocated a way of writing suitable for the efficient conduct of business that was far less ornamental than calligraphic practices previously in vogue. But their functional writing style remained more elaborate than the ‘dull’, standardized copperplate favoured by Snell which, nevertheless, proved perfectly designed to meet the needs of merchants and their multitude of counting house clerks (Nairne, 2004; Edwards, 2009, p. 247). Consequently:

Snell in the preface to his *Art of Writing* made scoffing allusion to ‘some of our late Authors who have made Owls, Apes, Monsters and Sprig’d Letters so great a part of their copy books’. Clark retaliated in the preface to his *Writing Improv’d* with an attack on ‘a late Author who has made a violent noise about sprigging of Letters and Pencilling of Flourishes and the scurrilous Treatment of all other Penmen on that Score’. From blast and counterblast in the prefaces to various editions of their copy-books the matter was carried further into the advertisement columns of the newspapers right on till 1717. (Heal, 1931)

Clark’s combative nature came again to the fore in the mid-1720s when he ‘engaged in a vociferous debate, this time with Thomas Clayton and James Weston regarding the merits of two different forms of shorthand’ (Peltz, 2004).

Clark was an active self-publicist, with advertisements for his services appearing regularly in the classified columns of newspapers. The *Daily Courant* of 4 October 1714 (Issue 4039) announced that *Writing Improved, or, Penmanship Made Easy* would be ‘very useful for all Learners, and others who wish to write well, either to Teach or Practice the Art in any other Way of Business’. In the following year, advertisements proclaimed his ‘Copy Book’, which was the term used to describe texts that set out various ways of writing for pupils to imitate, as ‘the best Piece of Penmanship extant’ (*Post Man and Historical Account*, 4 January 1715, Issue 11050). At his school in Warwick Lane, Clark’s teaching curriculum was designed ‘to qualify Youth for any manner of Business’ (*Post Man and Historical Account*, 2 January 1718, Issue 16542), with employment prospects later made explicit:

11 Charles Snell produced, for parliament in about 1721, ‘an accountant’s report’ on the affairs of a firm, Sawbridge & Co., belonging to one of the directors of the South Sea Company (Worthington, 1895, chapter 2).

12 The advertisements which follow are taken from newspapers contained in the 17th and 18th Century Burney Collection Newspapers.

13 This is likely to have been *The Penman’s Diversion a New Copy-book*, published c. 1710.
John Clark, Writing-Master and Accomptant, in Warwick-Lane, London, Boards young Gentlemen, and with the utmost Expedition compleatly qualifies them for any of the public Offices, Merchants Compting-Houses, Attorneys Clerks, or any other Manner of Business. (*Daily Courant*, 1 October 1725, Issue 7476)

Tactics designed to promote his didactic texts and teaching skills also involved denigrating the competition (*Daily Courant*, 1 October 1725, Issue 7476):

Himself and his two Assistants are constantly employed in teaching Writing, Arithmetick and Merchants Accompts: so that Gentlemen, who come under his Care with a Desire of Excelling in those useful Sciences, may in a few Months retrieve the Loss of many Years formerly spent with ignorant Academies and General Undertakers, it being well known to the Judicious, that not one of them, nor any of their boasted numerous Understrappers, is capable of forming a good Penman, and an accurate Accomptant.


John Clark married twice; his second wife was Hester Dance of Uxbridge. Clark moved from Warwick Lane to Peterborough Court in Fleet Street in 1727 where he died in 1736. He was buried in the Dance family vault in Hillingdon churchyard. John Clark had two sons from his first marriage—the Reverend John Clark who was sur-master at St Paul’s School, and Richard Clark, writing master to the Royal Academy in Portsmouth—and a daughter Hester from his second marriage (Massey, 1763, p. 49; Peltz, 2004).

**LECTURES ON ACCOMPTS**

The Preface to the ‘corrected and amended’ second edition of *Lectures on Accompts* (Clark, 1738) claims originality for a method of exposition which is ‘not only Different from what has hitherto appear’d on this Subject, but also a rational and ready Way, of coming to a clear Understanding of this Art’. Lecture I (Clark, 1738, pp. 1–2) opens with the following observation: ‘The Design of every Person in carrying on Trade is without Doubt to improve his Fortune’. Clark then moves on to explain the central role of accounting in the pursuit of that endeavour:

It is therefore necessary for all Merchants, and others, in order to know whether they Encrease or Lessen their Estates, to keep an exact Account of their Transactions in Trade, as they daily occur, together with all the different Alterations, and the Profits and Losses arising from those Alterations of their Estates; which ought to be done in such a Manner, as they, or any skilful Person in Accompts may at any Time make a true Estimate of their Estates.¹⁴

In the Preface to *Lectures*, Clark makes clear his view that: ‘The Scheme of keeping Books after the Italian Method by double Entry of Debtor and Creditor,

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¹⁴ For a full discussion of the promotion, by early writers, of the use of accounting information for performance assessment and also decision making, see Edwards *et al.* (2009).
being in it self compleat, I have not in the following Sheets attempted to make any Alterations therein'. Instead, his purpose is to focus on the ‘Method of them’ and, to do this, launches (Lecture I) into a balance sheet-oriented explanation of the operation of a system of DEB.

Then let it be supposed, when I begin to Trade, that my Estate consists of the following Particulars, etc.

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have in Ready Money by me</td>
<td>l. 199</td>
</tr>
<tr>
<td>In South Sea Stock, at 102l. per Cent</td>
<td>4080</td>
</tr>
</tbody>
</table>

The Total of these would be the real Value of my Estate, if no Person had any Demand upon it. But suppose I am indebted to Thomas Smith l.500, then that Debt, which ought to be paid, lessens the Value of my Estate, and I am, in reality, worth no more than 1.3779.

Clark concludes Lecture I with an ‘hypothesis’ which Jackson (1956, p. 299) describes as ‘the complete personification theory’:

Then let it be supposed, that this Accompt of Stock [i.e., Capital] is a real Person impoy’d by me to take Care of my Estate; and render an Accompt to me of the Improvement he has made of it, whenever I think fit to call upon him for that Purpose. And as this Accompt of Stock is to be considered as a Person impoy’d by me to take Care of my Estate: so likewise the Accompt of Cash, South Sea Stock, and all other Accompts, which I may have Occasion to keep in my Books, may be considered as Persons impoy’d by Stock to take Care of that Part of my Estate they are entrusted with, and to render an Accompt thereof to Stock, when called upon for that Purpose. (Clark, 1738, p. 4)\textsuperscript{15}

Lecture II is important for two reasons. First, Clark develops his ‘Different’ approach, which we can infer was designed to replace journal-oriented learning by a better way of understanding the essence of double entry bookkeeping. Clark does this by explaining how journal entries can be derived from an examination of the nature of the transactions reported in the balance account (i.e., balance sheet) in the ledger. That is, the sequence of learning about how to do accounting is from the balance account in the ledger to the journal entries rather than the reverse as was the established pedagogical approach.

Second, Clark lucidly demonstrates the fundamental relationship between the profit and loss account and the balance account by showing that the closing ‘Value of my Estate’ (closing capital) can be arrived at by drawing on the content of either of these two financial statements. In his words (Clark, 1738, p. 10):

Thus by these two Accompts, I find the Value of my Estate two different Ways: one is by (Accompt of Stock) the [opening] Value of my Estate first Setting out, and the Profits added to it, which gives its improved [closing] Value. The other is by collecting my Effects and

\textsuperscript{15} This wording is rather different from that contained in Jackson (1956, p. 299), whose quotation of Clark (1732) is taken from Foster (1852). In the absence of the first edition of Clark’s book, it is not possible to confirm whether the discrepancy results from differences between the first and second editions or from Foster paraphrasing the content of Clark (1732).
Debts due to me into one Total, as in the *Accompt of Ballance*, and taking from thence the Total of all the Debts I owe, which gives me likewise the improved and present Value of my Estate, on supposition, that my Effects and Debts prove good.

Clark explains how to open up the new books based squarely on notions of personification, but does not then go ‘thro’ all the various Cases in Accompts’ as these have ‘been largely treated on’ in other texts. Instead Lectures III and IV ‘proceed to explain a few necessary Accompts, not sufficiently understood, or explain’d by other Writers on this Subject’ (Clark, 1738, p. 11). Lecture III deals with two situations: the operation of ‘accompts currant’ both where two parties undertake transactions in the same currency and in different currencies; and the complications that arise where merchants are in partnership. Lecture IV addresses some of the accounting issues associated with the ‘very common Practice among Merchants to form a [joint stock] Company by Subscription’ (p. 23).

Clark’s series of four short lectures—the entire book consists of just 32 quite small pages—is followed by an appendix that presents his ideas in algebraic form. For its originality, and because of its clearness and brevity of exposition, it is reproduced in full as an appendix to this paper.

**Comments on Clark’s Appendix**

Chapters I–IV, though employing a balance sheet focus, may be considered to explicate the proprietorship theory of accounts, though much of the narrative is pure personification. In the Appendix, the approach which later became known as proprietorship theory is clearly expounded.

Clark’s Appendix explains that the ideas presented in his book are first couched in narrative form for the benefit of those ‘unacquainted with Mathematical Studies’, and then demonstrated algebraically so that those ‘Persons who have some Knowledge in Algebra, may see the Scheme in a narrow Compass’. The perceived advantage of the latter approach being, for the mathematically minded, to further ease understanding and acquire transferable knowledge that could be applied to any business situation. The features of the Appendix can be summarized as follows.

1. ‘Value of his Estate’ (Capital) at the beginning of the accounting period may be computed by deducting ‘Debts owing’ (Liabilities) from ‘Effects’ (Assets).
2. All Assets represent additions to the estate and can be distinguished by the plus (+) sign; all Liabilities are negative effects represented by the minus (−) sign.
3. Using symbols, the relationship Assets − Liabilities = Capital is stated algebraically and applied to financial details to give: £3,900 − £300 = £3,600.
4. It is shown that the books may be opened by using the owner’s capital account to record the contra entries for assets and liabilities. Debit (+) entries are made in the

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16 The original wording appears in the Appendix. In the remainder of this sub-section the modern equivalents, as indicated here, are used.
capital account for capital and liabilities and credit (−) entries for individual assets. This presentation recognizes the relationship: Capital + Liabilities = Assets.\(^{17}\)

5 The effect on the ledger accounts of the following three transactions is explained in terms of their + (positive) effect and their − (negative) effect.

a  Part payment of debts owing by him £100
   Reduces debts owing (positive effect) from −300 to −200
   Reduces cash (negative effect) from +500 to +400

b  Sale of merchandise costing £3,000 for £4,000
   Increases debts due for merchandise sold (positive effect) from zero to +4,000
   Reduces merchandise (negative effect) from +3,000 to zero
   Gives rise to a profit (negative effect) of −1,000

c  Collects £200 from sundry persons
   Increases cash (positive effect) from +400 to +600
   Reduces debts due from sundry persons (negative effect) from +400 to +200.

6 It is shown that closing Capital can be computed in two ways.

a  By adding profit of £1,000 to opening Capital to give the ‘improved Value of the Estate’: £3,600 + £1,000 = £4,600.

b  By collecting together the new values for all the Assets and Liabilities: £4,800 − £200 = £4,600

It is worth noting that Clark’s three examples—5a, 5b and 5c above—appear to be selected so as to cover quite different situations. Transaction 5a involves a reduction in both sides of the balance sheet; both assets and liabilities are reduced by £100. Transaction 5c affects only the assets side of the balance sheet; there is a redistribution of resources with cash increasing and receivables decreasing by £200. Transaction 5b introduces the complication of different values with the plus effect exceeding the minus effect by £1,000, giving rise to a profit figure of that amount.

Even applying teleological analysis, the only criticism that might be directed at the pedagogic contribution of Clark’s Appendix is the failure to recognize the notion of a business as a separate entity, though the relationship Capital + Liabilities = Assets is implied when demonstrating the opening of the books using the owner’s capital account (item 4 above). In contrast, Cronhelm (1818, p. 7) explicitly acknowledges the notion of a separate entity when writing: ‘In these general relations of Debtors and Creditors, the estate or concern itself is abstracted from its proprietor, and becomes a whole, of which the Stock or proprietor’s Account is now also one of its component parts’.

DISCUSSION AND CONCLUDING REMARKS

The heavy focus on journal-oriented learning in bookkeeping treatises published up to the end of the eighteenth century, and indeed much later, does not mean that such

\(^{17}\) For a discussion of the use of the capital account to open the ledger, and speculation that such a presentation resulted in the British practice of placing sources of finance on the left-hand side of the balance sheet and assets on the right (which continued in use until the Companies Act 1981 took effect), see Yamey (1970, pp. 73–4).
texts were divorced from reality. Following Luca Pacioli (Sangster et al., 2007, p. 452), most authors\textsuperscript{18} devoted some space, and sometimes quite a lot, to contextualizing the bookkeeping process. Many authors explained the structure and interrelationship between the component parts of the scheme of record keeping they described. Some dealt with matters such as: business conditions and practices\textsuperscript{19}; identification of the types of businesses for which the recommended scheme of accounting was appropriate; the users of accounting information; and the various purposes that the bookkeeping system might be expected to serve. Such enlightenment might appear in a preface, an introductory chapter, or interspersed throughout the text. Usually, writers also imbued their examples with a ‘practical slant’ (Sangster et al., p. 453). For example, William Gordon who then taught at the Academy, Glasgow, based his exposition of double entry bookkeeping on the affairs of a Glasgow merchant, John Trader. John’s merchandise included linen, tobacco, rum, sherry and sugar, while his trading activities involved voyages from Glasgow to London, Madeira, Rotterdam, Maryland and Philadelphia. During the first six months of 1764 John also purchased a house in Trongate, Glasgow.

Teaching methods, however, were mainly based on rules rather than principles, though the rules were gradually embellished with explanations based on the personification of accounts. Invariably, the exposition of the bookkeeping process started with instructions concerning the debit and credit implications of a range of transactions which were then traced from the waste book through to the journal, then to the ledger, culminating in the collection of nominal balances in the profit and loss account and the remaining items in the balance sheet. The balance sheet based expositions of Clark and, later, Cronhelm therefore represented a radically different conceptual approach to the teaching of accounting. Yamey (1978) describes Cronhelm’s exposition of the concept of equilibrium as ‘well ahead of his time in the quality of its conceptualization and analytical elaboration’. So also was Clark’s.

There is no concern here to compare the relative merits of Cronhelm’s and Clark’s contributions or even to examine whether Cronhelm might have been familiar with Clark’s prior publication. Both authors adopted the balance sheet approach to aid understanding of the effect of transactions on the ‘Estate’ (Clark, 1738, p. 2; Cronhelm, 1818, p. 8) of its owner, and both express the financial effects in mathematical form. Clark also anticipates and elaborates Fulton’s contribution (Fulton, 1800) when using both accounting statements and algebraic notation to demonstrate the fact that closing capital can be computed either through the profit and loss account or simply by focusing on the content of the balance sheet at the end of the accounting period. Cronhelm and Clark appear to have discovered the utility of the balance sheet approach in different ways. Cronhelm (1818, Preface) describes his book as ‘the result of many years’ experience in Accounts, and [it] has been gradually perfected by a series of improvements in the books of an extensive and diversified

\textsuperscript{18} But by no means all. Examples of extreme brevity include publications by Alleine (1731) and Handson (1669), each of which consists of a single sheet detailing accounts to be debited and credited.

\textsuperscript{19} See, for example, ‘Dissertation on the business of the counting-house’ (Gordon, 1765, pp. 1–12).
establishment’. In contrast, Clark had, previous to publication, discovered his ‘Manner of treating Accompts to be the most intelligible, and best suited to the Capacities of young People’ (Clark, 1738, Preface). In other words, Clark, the pedagogue, believed that his scheme had passed the classroom test.

Writing in the 1990s, Parker (1994, p. 76) points to the fact that the ‘balance-sheet (or accounting) equation is familiar to all late twentieth century English-speaking accountants’ and can be expressed as ‘Assets ($A$) – Liabilities ($L$) = Capital ($C$’). Parker (1994, p. 71) further advises that a problem in writing about accounting, early on, was the absence of generic words to describe groups of debits and credits listed in the balance sheet. This is because, quoting Crystal (1987, p. 15), people ‘find it easier to make a conceptual distinction if it neatly corresponds to words available in their language’. For early writers of treatises on bookkeeping, such neatness appears not to have existed. For example, Mepham observes that the term assets was not used in eighteenth-century books on accounting. Writers therefore resorted to wordy descriptions such as Gordon’s (1766, p. 422) ‘inventory of the money, effects, and debts belonging to him’ (quoted in Mepham 1988, p. 387). For this kind of reason, in Parker’s estimation, ‘Those who before the nineteenth century tried to conceive of a balance-sheet or accounting equation had some difficulty in finding the words to do it with’ (Parker, 1994, p. 76).

It is certainly a plausible proposition that the lack of concise terms to describe the key components of the balance sheet served as a constraint on both conceptualizing the interrelationship between capital, assets and liabilities and in writing about them. However, their absence did not prove an insurmountable obstacle to Clark, and this may be because he employed terms that were sufficiently specific to enable him to conceptualize the relationship encapsulated in the balance sheet equation. The key words in Clark’s Appendix are:

the Total of all the Debts owing by him, being taken from the Total of all his Effects, the Remainder will be the Value of his Estate.

‘Value of his Estate’ (elsewhere referred to by Clark simply as ‘Stock’), ‘Total of all his Effects’ and ‘Debts owing by him’ do not trip off the tongue quite as easily as Capital, Assets and Liabilities. But they do enable notions to be presented in a rather more succinct fashion than does a fuller listing of assets or liabilities. Moreover, the terms used by Clark do possess the advantage of accepted everyday meanings, and thereby require no knowledge of technical accounting terminology to comprehend their significance.

Hopper and Armstrong (1991, p. 405) expressed concern with what they saw as a fixation among traditional accounting historians with ‘a search for origins,[and] on the

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20 The failure of writers on accounting to settle on the word assets to describe business resources does not reflect total unfamiliarity with the term. Charles Hutton, in the arithmetic section of his treatise, refers to a ‘deficiency of assets, &c.’ (Hutton, 1771, p. 86), while Thomas Dilworth (1791, p. 86), in a book on arithmetic, refers to a ‘deficiency of Assets or Effects’.

21 According to Parker (1994, p. 76) the earliest attempts to coin succinct terms was made by Stephens (1735) who used the word ‘Condition’ for the left-hand side of the equation and the word ‘Extent’ for the right hand.
questions of who did what first, and when’. Miller and Napier (1993, p. 632) emphasize
the need to ‘focus on the outcomes of the past, rather than looking for the origins of
the present’. Their legitimate priority is not to ‘delimit’ the study of accounting history.
Much of accounting’s past would undoubtedly be left uncovered, and our knowledge
severely curtailed, if studies were confined to events which are part of an unbroken
chain of events through to the present day. But it is important to uncover past ‘events’
in order to add to the stock of available evidence (Napier 2009, pp. 40–1), although
some would argue that such happenings are of interest only if they make a difference.
As past study of the development of cost accounting in Britain has revealed, however,
it is difficult to know, during the early stages of the study of a particular phenomenon,
whether a particular episode or finding is important. And in this context we should be
mindful of the fact that we remain at an early stage in the study of much of
accounting’s past. Acceptance of conventional wisdoms can have a delimiting effect
on research agendas whereas quests for new knowledge of accounting’s theory,
institutions and practices can help to raise new possibilities and, in due course, new
understandings of important episodes in accounting history.

The finding that Clark presented the balance sheet equation in algebraic form 80
years before Cronhelm is, even for the present, of more than antiquarian interest. It
is evidence that one early accounting thinker understood the potential of the
balance sheet equation for better explaining the operation of the system of DEB and
that he employed it for teaching purposes. This study has focused on events which do
not appear to have been part of a continuous history through to the present day, but it does show that eighteenth-century pedagogic methods were not confined to
journal-oriented, and rote, learning. And more may have been going on than we now
believe to have been the case. Certainly, we can also draw attention to the fact that
Benjamin Donn (sometimes Donne) experimented with innovative teaching
methods in Bristol where he opened a teaching academy in the 1760s and published
a number of books including The Accountant and Geometrician: [containing] An
Essay on Book-keeping by Double Entry (Donn, 1765). His entry in the Oxford
Dictionary of National Biography reports:

Donn was one of a number of educational reformers in Bristol at the time who wanted to
stop the rote learning of words and substitute the study of things with the aid of toys or
experiments, introducing children to the principles behind each subject so that they could
accept rationally what they were taught, not merely believe it slavishly. (Baigent 2004)

Whether Donn or other teachers employed the same method to teach book-
keeping as Clark remains unknown at this stage. Even if they did, there are signs
that such teaching methods did not survive in England. Perhaps the approach was
rediscovered, certainly it was re-published, by Cronhelm in the second decade of
the nineteenth century, but it was in the United States and Continental Europe
that the method first obtained a foothold for teaching purposes, not appearing
anew in print in England till the middle of the twentieth century. This study is

22 In Yamey’s (1978, Introduction) estimation, Cronhelm’s book ‘seems to have had but little detectable
influence on its successors’ and the same may have been the case with Clark’s.
therefore also of interest as a counter to the Whiggish interpretation of history as a triumphant process of improvement to the present state. Journal-oriented learning survived long after the contributions of Clark and Cronhelm, and even Sprague and Hatfield. In order to better understand accounting’s past and its transition through time, it is important to be aware of plurality in patterns of accounting change and to embrace the full range of methodological approaches available for studying accounting phenomena.

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APPENDIX

I have adapted the foregoing Treatise to the Capacities of those, who are unacquainted with Mathematical Studies; but as the Foundation of it may be Algebraically demonstrated, I thought it not improper to add this Appendix, that Persons who have some Knowledge in Algebra, may see the Scheme in a narrow Compass, which, being understood, the Application of it in Business, will soon become familiar.

The State of a Merchant’s Affairs, when he first begins to Trade and keep Books, may be supposed to be as follows.

In Cash - - - - 500l. which Acc. is represent. by c

In Mer. and other Eff. 3,000 _____________ e

In Deb. from several Per. 400 _____________ d

Debts owing by him - 300 _____________ a

Then the Total of all the Debts owing by him, being taken from the Total of all his Effects, the Remainder will be the Value of his Estate, which being to be found, let x stand for it.

From hence may be observed, that all Debtors to him make an Addition to his Estate, and therefore may be called positive Quantities, and be distinguished by the Sign of (+).

And that all Creditors take from his Estate, and therefore may be called Negative Quantities, and may be distinguished by the Sign of Subtraction (–).

Let x stand for the unknown Value of his Estate, which will be found by the following Theorem:

\[ x = c + e + d - a = 3600l. \]

Which when carried into the Account of Stock, the Debtor-Side whereof, to be known by (+) and the Creditor side by (–) it will be \[ x + a = c - e - d. \]

And when the Particulars are carried to every Account, it will be \[ c + e + d - a \] and will stand thus:
Then suppose Cash pays to a £100 i.e. $100

Which carried to the particular Acts will be

\[
\begin{array}{cc}
\text{c} & \text{a} \\
+500 & -300 \\
-100 & +100
\end{array}
\]

Merchandize sells the whole on Credit to g for £4000

On which there is a Profit of 1000l. i.e.

\[
\begin{array}{cccccc}
\text{c} & \text{a} & \text{e} & \text{g} & \text{p Pfit} \\
+500 & -300 & +3000 & +4000 & -1000 \\
-100 & +100 & -4000 & & -1000
\end{array}
\]

Cash Receivers of Debtors £200 i.e.

\[
\begin{array}{cccccc}
\text{c} & \text{d} & \text{a} & \text{e} & \text{g} & \text{p} \\
+500 & +400 & -300 & +3000 & +4000 & -1000 \\
-100 & -200 & +100 & -4000 & & \\
+200 & & & & +1000
\end{array}
\]

Then let p. or 1000l. Profit be carried to the Account of Stock, as at first $x+a+p=-c-e-d-g$, then $p+1000$ being carried to the Ntt Value of the Estate, will give the improved Value of the Estate.

That is $x = c + e + d + g - a = 4600$.

And when the above Totals are collected, the Ntt Value of your Estate will be also found, that is, $+600 (c) +200 (d) +0(e) +4000 (g) -200 (a) = x = 4600l.$

$\therefore x=4600l$. The Value of the Estate

<table>
<thead>
<tr>
<th>Cash or c</th>
<th>Merch. or e</th>
<th>Debts or d</th>
<th>Creditors or a</th>
</tr>
</thead>
<tbody>
<tr>
<td>+500</td>
<td>+3000</td>
<td>+400</td>
<td>-300</td>
</tr>
</tbody>
</table>