John Locke, Thomas Sydenham, and the Authorship of Two Medical Essays

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Amongst the Shaftesbury Papers in the National Archives are two short medical essays in the hand of the English philosopher John Locke. One is entitled ‘Anatomia’ and from its endorsement we know that it was composed in 1668. The other is endorsed ‘Ars Medica 1669’ and ‘De Arte med[ica] 1669’. Thus these two essays pre-date the early drafts of Locke’s most important philosophical work An Essay concerning Human Understanding (1690). The early drafts of the Essay, drafts A and B, were composed in 1671.

As it happens, the contents of the earlier medical essays are not only extremely interesting in their own right but may bear importantly on both our understanding of Locke’s own intellectual development and on the origins of the Essay itself. However, any analysis of the contents of these medical essays is complicated by the fact that since the mid–1960s some scholars have attributed their authorship to the London physician and friend of Locke, Thomas Sydenham. The resolution of the question of the authorship of ‘Anatomia’ and ‘De arte medica’ has recently been described as ‘one of the most difficult tasks of Locke scholarship’. It is the purpose of this study to lay the question of authorship to rest by providing a fresh analysis of the arguments for and against Sydenham’s authorship and Locke’s authorship, and by applying the latest techniques of computational stylistics to the texts themselves.

Part One: An assessment of the arguments for and against Lockeian authorship of ‘Anatomia’ and ‘De arte medica’,
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The first section of this first part of the paper outlines the history of the attribution of authorship of the dubia, that is ‘Anatomia’ and ‘De arte medica’. The second section provides an assessment of the claims that have been made for Sydenham’s authorship of the essays and for Locke’s authorship.

1.1 History of authorship attribution

The early discussions of the two dubia all assume Lockeian authorship. ‘De arte medica’ was first published in 1876 by H. R. Fox Bourne in his Life of John Locke. Fox Bourne attributed this essay to Locke without any explicit discussion of the question of authorship,

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1 National Archives (NA) PRO 30/24/47/2, ff. 31r–38v and ff. 49r–56r respectively.
and while he did not reproduce ‘Anatomia’, he attributed this to Locke as well. In the light of the fact that Sydenham had added a comment to the first page of ‘Anatomia’, Fox Bourne suggested that either Sydenham or Locke intended to add to the text, but the assumption throughout is that Locke is the author.\(^4\)

Sir William Osler, who was familiar with the medical manuscripts relating to Locke amongst the Shaftesbury Papers, discusses the contents of both essays in his important article entitled ‘An Address on John Locke as a Physician’ in The Lancet in 1900.\(^5\) He also attributes both essays to Locke without question and comments of ‘Anatomia’ that '[i]t is quite possible that the article was prepared at Sydenham’s suggestion, or for his use, as at the top of the page, in Sydenham’s handwriting, is the sentence …’\(^6\) Likewise, when ‘De arte medica’ was next reprinted, by A. G. Gibson in The Physician’s Art in 1933, both essays were attributed to Locke.\(^7\) Like Fox Bourne, Gibson provides no discussion of the question of authorship.

One may be tempted to take the combined weight of Fox Bourne, Osler and Gibson as setting an important precedent in the case for Lockean authorship of the dubia; however, in the cases of Fox Bourne and Osler there are reasons for questioning their presumption of Lockean authorship. For example, immediately after his discussion of ‘Anatomia’, Fox Bourne goes on to claim that the essay ‘Tussis’, an essay that is in Locke’s hand and is also to be found amongst the Shaftesbury Papers, is by Locke.\(^8\) ‘Tussis’, however, is attributed to Sydenham by Locke,\(^9\) and one wonders whether Fox Bourne’s attribution in this case is based solely upon the fact that the essay is in Locke’s hand. In a similar vein, Osler claims of the case notes on the famous operation and recovery of Anthony Ashley Cooper that there are four sets of notes and that they are all in Locke’s hand.\(^10\) In fact, there are three sets of notes and only two are written by Locke. This, of course, bears no necessary connection with Osler’s assumptions about Locke’s authorship of the two dubia, however, it does not inspire confidence that his attribution of Lockean authorship to the dubia was carefully considered.

In 1958 Kenneth Dewhurst published the first full transcription of ‘Anatomia’ and attributed both this and ‘De arte medica’ to Locke.\(^11\) However, Dewhurst’s views on the authorship of the dubia were to change and by the mid-1960s he had come to the opinion that both essays were the work of Thomas Sydenham.\(^12\) They were published in his Dr. Thomas Sydenham 1624–1689: His Life and Original Writings in 1966 as Sydenham’s original writings.\(^13\) Dewhurst’s arguments for attributing authorship to Sydenham should be quoted in full.

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\(^4\) Ibid., p. 228.


\(^6\) Osler, ‘Locke as a Physician’, p. 118.


\(^8\) Fox Bourne, The Life of John Locke, vol. i, pp. 229–30. ‘Tussis’ is found at NA PRO 30/24/47/2, ff. 75r–77r.


\(^10\) Osler, ‘Locke as a Physician’, p. 100.


\(^12\) For the details of Dewhurst’s change of mind see Patrick Romanell, John Locke and Medicine: A New Key to Locke (New York, 1984), pp. 163–4. Romanell argues for Lockean authorship of the dubia.

\(^13\) Dewhurst, Sydenham, pp. 79–93.
The Public Record Office has two uncompleted fragments, *De Arte Medica* (1669) and *Anatomie* [sic] (1668), intended to form chapters of a book wherein Sydenham proposed to show that experience was much more important in medical practice than the current stress on the basic sciences. ‘Dr. Sydenham is writing a book which will bring physicians about his ears,’ wrote John Ward, ‘to decry the usefulness of natural philosophie, and to maintaine the necessitie of knowldg in anatomie in subordination to physic.’ Ward clearly referred to Sydenham’s uncompleted book *De Arte Medica* of which *Anatomie* was meant to form part. Both essays are in the handwriting of John Locke, apart from one sentence in *Anatomie* written by Sydenham. Hence, Fox Bourne and Gibson assumed that they were, in fact, Locke’s work. When these essays were written, Locke was Sydenham’s occasional amanuensis, and several other fragments in Locke’s handwriting are now known to be copies of Sydenham’s writings, or his rough drafts hastily dictated to Locke. They clearly reflect Sydenham’s more mature clinical experience, and they were written when Locke (who then had a strong iatrochemical bias) was only just beginning his clinical apprenticeship. Furthermore, Sydenham expressed opinions similar to those in *De Arte Medica* and *Anatomie* in his *Observationes Medicae*.14

Dewhurst’s view was endorsed in 1975 by Donald Bates in his doctoral dissertation entitled ‘Thomas Sydenham: The Development of his Thought, 1666–1676’. Bates added additional arguments for Sydenham’s authorship of the two essays. In part VI of his appendix, entitled ‘The Authorship of the “Ars medica” and “Anatomia”’, Bates claimed that his dissertation affirmed Dewhurst’s case for Sydenham’s authorship and he adduced additional evidence. First he offered an argument from presumption: ‘after a close study of the relevant materials, the thing that is most striking is what a monumental presumptuousness would have been needed by Locke, eight years Sydenham’s junior and even more his junior in medicine, to have written so boldly, in the first person, and to have made such liberal use of Sydenham’s ideas, many of which were implicitly or explicitly already in print’.15 Second, Bates argued that Sydenham’s interpolated sentence, with catchwords, on the first page of ‘Anatomia’ ‘implies a link with something that went before and sets forth admirably, in the first person, the program executed by the rest of the text’. Third, Bates claimed that ‘the ensuing text [of ‘Anatomia’] also uses the first person on frequent occasions. And the whole style, tenor, and philosophical position are entirely consonant with Sydenham’s known work’. As for ‘De arte medica’, Bates claims similarly, that ‘[i]t would be possible to analyze the text line by line and show that each idea expressed is to be found in some known passage of Sydenham’s work’.16

We can summarize the evidence supporting Sydenham’s authorship as follows:

S1. John Ward’s ‘diary’ reference to a proposed work by Sydenham decrying the usefulness of natural philosophie and arguing for the subordination of anatomy to physic is a clear reference to ‘De arte medica’ of which ‘Anatomia’ was a part

S2. When these essays were written Locke acted as Sydenham’s occasional amanuensis

S3. The dubia clearly reflect Sydenham’s more mature clinical experience

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14 Ibid, p. 73.
16 Ibid., p. 361.
S4. The dubia ‘were written when Locke (who then had a strong iatrochemical bias) was only just beginning his clinical apprenticeship’

S5. It would have been presumptuous for Locke to have used the first person and to have ‘made such liberal use of Sydenham’s ideas’

S6. Sydenham’s interpolated remark (with catchwords) implies a link with a preceding text and is filled out by the content of ‘Anatomia’

S7. The style, tenor and philosophical position of both essays are ‘entirely consonant with Sydenham’s known work’.

The Dewhurst/Bates view of the authorship of ‘Anatomia’ and ‘De arte medica’ was subsequently challenged by Patrick Romanell in 1984 and again by G. G. Meynell in 1994 in his ‘Locke as Author of Anatomia and De Arte Medica’. Meynell begins his argument for Locke’s authorship by claiming against Dewhurst and Bates that, contrary to what they assert, ‘neither essay is primarily concerned with clinical medicine’. Rather ‘[w]hat can be determined is whether the style and vocabulary of the essays resemble Sydenham or Locke’. Meynell claims that ‘both essays seem far closer to Locke’s energetic prose than to Sydenham’s more ponderous style’ and that ‘the spelling and phraseology of both essays is unmistakably Locke’s’. He gives examples of ‘words and phrases like “jot” or “conveniency of” which occur in the two essays [and] can be found elsewhere in Locke’ but which are absent from Sydenham’s long manuscript entitled ‘Medical Observations’. Thirteen examples are then given of words which appear in the dubia and elsewhere in Locke’s writings, but which do not occur in Sydenham’s ‘Medical Observations’. (Romanell had made a similar claim in 1984 giving two examples.) Meynell concludes:

[j]f one adds to these quotations the broad scope of the questions discussed in the essays, the absence of these phrases in Sydenham, the characteristic features of Locke’s writing like the list of headings in De Arte Medica… and the numerous homely images … it seems beyond question that both essays are not merely in Locke’s writing but also derive from Locke’s thoughts.

Finally, Meynell claims that, while the content of the essays can be found in Sydenham’s writings, all of the ideas ‘can be traced to earlier authors’. Reinforcing Meynell’s case for Locke’s authorship of the essays, J. R. Milton claimed in ‘Locke, Medicine and the Mechanical Philosophy’ (2001) that

[t]he frequent alterations made in the manuscripts of both Anatomia and De Arte Medica show that Locke was not merely copying an earlier text, and seem to indicate that he was exercising some degree of authorial control over what he was writing.

18 Meynell, ‘Locke as Author’, p. 66.
19 Ibid., p. 69 and p. 70.
20 Royal College of Physicians MS. 572.
21 Romanell, Locke and Medicine, p. 165.
22 Meynell, ‘Locke as Author’, p. 72.
A similar claim has also been made by J. C. Walmsley who suggests that there are two strata to ‘De Arte Medica’ on the basis of (1) the fact that a lighter ink is used from the last three words of folio 55r to near the end of the seventeenth line of the final folio 56r (where a darker ink is used for the final sentence) and (2) the claim that corrections made in a darker ink (presumably the ink used to pen the last sentence) all pertain to ‘styling and phraseology’.24 To Walmsley these features of the manuscript ‘jointly suggest that Locke had full authorial control over the text’.25 The evidence adduced for Lockean authorship then is the following:

L1. *Pace* Dewhurst and Bates, the dubia do not reflect Sydenham’s more mature clinical experience

L2. The spelling, style and vocabulary of the dubia resemble that of Locke and not Sydenham

L3. The contents of the dubia are not necessarily derived from Sydenham because the ideas expressed are present in other earlier authors

L4. The alterations to the manuscripts and the variations in ink indicate that Locke was exercising authorial control.

1.2 Assessment of the arguments for authorship

I will deal with the evidence for Lockean authorship first, though this, at times, will inevitably lead us back to the arguments for attributing the essays to Sydenham. What remains then of the evidence for Sydenham’s authorship will be dealt with at the end of this section. I should also say at the outset that Meynell’s claim, L2, that the style and vocabulary of the dubia resemble that of Locke and not of Sydenham is the focus of the specialized study in computational stylistics which comprises Part 2 of this paper. Meynell’s more specific claim that the spelling is undoubtedly Locke’s is of no evidential value. Locke’s copies of Sydenham’s manuscripts are normally written using Locke’s spelling. The question of spelling would only play an evidential role in the question of authorship if it were clear that Locke had deliberately adopted Sydenham’s spelling in the essays. This, however, is not the case.

We turn next to Milton’s and Walmsley’s claim, L4, that the corrections to the dubia and the variations in ink indicate a degree of authorial control. These claims are difficult to substantiate. First there is the problem of specifying criteria, over and above handwriting, content and style, for features of Locke’s corrections that indicate authorial control. It cannot be ruled out that Sydenham might have directed Locke to insert the relevant changes. One can imagine Sydenham looking over Locke’s shoulder and instructing him to cross out a phrase here and to change a word there. This is clearly the case, for example, at some points in the early version of Sydenham’s ‘Pleurisie’ in Locke’s hand (Bodleian Library MS. Locke c. 29, ff. 23r–24r). This essay, which contains changes authored by Sydenham, was later incorporated with the relevant changes seamlessly worked into the text of Sydenham’s ‘Medical Observations’ (Royal College of Physicians (RCP) MS. 572, ff. 27r–28r).


25 Ibid., p. 83.
Second, on the question of the variation in the darkness of the ink used, it is just as likely that Locke changed his quill and/or his ink and composed ‘De arte medica’ in the one sitting, as is that there were two stages of composition. This is indeed suggested by the fact that the change to the lighter ink occurs mid-sentence. Moreover, the corrections in darker ink are consistent with a rereading of the essay immediately after the leaving off of the final sentence and none of these features rules out the possibility that all of this was done under the oversight of Sydenham.

Finally, the fact that Locke appears to have acted as Sydenham’s amanuensis from mid-1669 for the rough drafts of the Sydenham essays in Bodleian MS. Locke c. 29 removes the presumption of Lockean authorship, a presumption which naturally arises from the fact that the essays are in Locke’s hand. However, it does not in and of itself provide evidence for Sydenham’s authorship. Indeed, there are to my knowledge no examples of Sydenham essays in Locke’s hand prior to July 1669, a point to which we will return below.26 Dewhurst’s claim, S2, that the dubia were composed while Locke was acting as Sydenham’s amanuensis is unsubstantiated. Let us turn then to the more substantive evidence for Locke’s authorship.

The first claim by Meynell is, in fact, a counter-claim directed against evidence adduced for Sydenham’s authorship. By tackling this first, we can deal with both L1 and S3. Meynell claimed that the dubia do not reflect Sydenham’s more mature clinical experience, because they are not ‘primarily concerned’ with clinical experience at all. Now, while it is only a small logical point, it should be noted that just because the essays are not primarily concerned with clinical experience, this does not imply that they are not concerned with it at all. It may be that clinical medicine is tangential to the main themes of the essays and yet where it does intrude it does reflect, say, Sydenham’s greater experience. The relevant questions are, Are there references to or examples from clinical experience that could only have derived from Sydenham? and Does the presence of these references provide evidence for Sydenham’s authorship? After all, Locke could easily draw upon Sydenham’s experience in an essay of which he, Locke, is the sole author. As it happens there is no determinate reference or allusion to clinical medicine in either essay which could only derive from Sydenham. Nor did either Dewhurst or Bates provide any examples of such evidence.

**Locke’s clinical experience**

There is, however, important circumstantial evidence from Locke’s own personal situation for the claim that ‘Anatomia’ contains allusions to Locke’s own clinical experience. In June 1668 Locke was intimately involved in one of the most celebrated cases of abdominal surgery of the seventeenth century. It was the case of his patron, Lord Ashley (later to become the First Earl of Shaftesbury), in whose household Locke resided at that time. Ashley had for many years suffered from a large hydatid cyst located above his liver. By mid-1668 as a result of an acute medical crisis caused by the cyst, it was decided by the leading physicians whom Ashley consulted to cauterize the cyst and drain it. Locke was in attendance at the operation which took place on 12 June 1668, and Locke was in close attendance on Lord Ashley throughout his period of convalescence until 3 November of that year. He took detailed case notes of virtually every facet of the operation and then the regular draining of the cyst and dressing of the wound, and appears to have been involved in soliciting further advice on the wisdom of closing the wound or leaving a short silver tap in to drain it.

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26 The material relating to Sydenham in Locke’s hand from July 1669 is the dedicatory epistle and the preface to a projected work on smallpox dedicated to Lord Ashley. These are NA PRO 30/24/47/2, ff. 60r–62r and 64r–69v respectively.
This episode of life-threatening surgery on one of England’s leading political figures involved some of the most eminent physicians of the day, the leaders of the College of Physicians Francis Glisson (England’s expert on the liver, then President of the College of Physicians and Ashley’s physician-in-ordinary), Sir George Ent (College Council member), John Micklethwaite (Treasurer of the College) and Timothy Clarke (Physician-in-ordinary to the King’s household, FRS and FCP). Little wonder then that reports of it are found in the diaries of Samuel Pepys and John Ward. Later Ashley himself was to claim that he owed his very life to Locke, and this is reinforced by an examination of Locke’s assiduous note-taking about Ashley’s convalescence which occasionally lapses into the first person. It was an instance of ‘clinical experience’ that would have been indelibly marked on Locke’s mind.

Is it any wonder then that Locke should turn his mind to the uses of anatomy in physic in late 1668 and compose an essay on the subject, especially given the fact that the status of anatomy was a highly contested subject in the medical disputes of the 1660s (see below)? When the author of ‘Anatomia’ speaks of

he that has but anatomie enough to know a veine & skill enough to use a lancet or stands by a surgeon that does, has if he be a good physitian & an observing man, more information from the bloud, & light into the disease then ever he could gaine by riping up all the veins & arteries tracing their branches & meanders in never so many dead carcasses

it is hard to resist the conclusion that ‘stands by a surgeon’ skilled with a lancet is an allusion to Locke’s own recent clinical experience. Furthermore, the numerous references to bodily juices and the ten occurrences of the word ‘liver’ (one of which is deleted) may well owe their prevalence in his reflections to Locke’s recent clinical experience. If so, then this circumstantial evidence can be used as an aid to a more precise dating of the composition of ‘Anatomia’ to the period of Lord Ashley’s convalescence which ended in early November, or to the weeks immediately after his return to health.

In fact, it is possible to date the composition of ‘Anatomia’ to within the range of a few months (and possibly within a few weeks). On folio 37r there is a reference to ‘a little creature by the help of microscopes lately discovered in some kinde of sand, an animal so small that it is not to be discernd by the naked eye’. This is almost certainly an allusion to an extract from the Giornale de’ Letterati which was published in the Philosophical Transactions on 14 December 1668 and which tells how

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28 A full edition of Locke’s case notes on Ashley’s operation is forthcoming in John Locke: Writings on Natural Philosophy and Medicine, eds. Peter Anstey and Lawrence Principe (Oxford).

29 NA PRO 30/24/47/2, f. 35v (Dewhurst, Sydenham, p. 90). I have provided my own transcriptions of ‘Anatomia’ and ‘De arte medica’ and have placed the reference to Dewhurst’s published transcription in brackets.

30 Locke records in his case notes on Ashley’s operation that on 12 June 1668 ‘At six in the afternoon, the part having first been corroded with a caustic and numbed, the tumor was opened with a scalpel’, NA PRO 30/24/47/2, f. 20r.
with this Microscope [a]s they viewed the little grains of sand searced [sifted], they perceived an Animal with many feet, its back white and scaly, but less than any of those hitherto observed. For, although the Microscope shewed every grain of sand as big as an ordinary Nut, yet this Animal appeared no bigger than one of those grains of sand seen without a Microscope.\textsuperscript{31}

Thus, we can set a \textit{terminus a quo} for the composition of ‘Anatomia’ at 14 December 1668. It should also be pointed out that this allusion to Locke’s recent reading is typical of the natural, unaffected erudition of Locke’s prose. Note too in this regard that there is a reference to the experiments on the removal of animal spleens (f. 32r): possibly an allusion either to Boyle’s discussion of this in \textit{Usefulness of Natural Philosophy} (though, of course, these experiments were common knowledge).\textsuperscript{32} Such erudition is, by contrast, wholly untypical of the writing of Sydenham. Indeed, the dearth of scholarly references and allusions in Sydenham’s writings is one of the chief grounds upon which it has been argued that Locke had a hand in the new chapter on the plague added to the second edition of his \textit{Methodus curandi febres} of 1668 (see below). Moreover, while Locke frequently read the \textit{Philosophical Transactions}, the fact that he had been elected FRS on 23 November 1668 may have provided an additional stimulus for keeping up to date with the Society’s latest publication.

Even if we ignore Locke’s involvement in Ashley’s operation, it is not true that Locke lacked clinical experience in 1668. Anthony Wood is said to have commented that Locke treated some patients while he lived in Oxford\textsuperscript{33} (he departed for Ashley’s household in early April 1667) and Locke’s own medical case notes from patients to whom he ministered span from September 1667 and beyond the end of 1668.\textsuperscript{34} In fact, Locke attended to other patients during the period of close involvement with Ashley’s recovery, prescribing medicines and recording his patients’ progress. For example, in September he prescribed a medicine containing pellitory to young William Aberne and, interestingly, in ‘Anatomia’ we find a reference to our inability to know how the medicinal qualities of pellitory work.\textsuperscript{35} Indeed, Locke’s medical remains indicate that the latter half of 1668 was the most intense period of clinical experience in all of his many years of practising medicine.\textsuperscript{36} Far from ‘Anatomia’ and ‘De arte medica’ reflecting Sydenham’s more mature clinical experience as Dewhurst claimed, once we are cognizant of Locke’s activities as a physician in the latter half of 1668, there is an extremely strong case that these essays reflect, and are very possibly motivated by, Locke’s own clinical experience.

We turn now to Meynell’s third claim, L3, namely that the contents of the dubia are not necessarily derived from Sydenham because the ideas expressed are present in other earlier authors. Again, it is important to make the logical point that even if the ideas and arguments in the dubia are present in the writings of Sydenham, this fact (if it is a fact), on its own,

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\textsuperscript{31} \textit{Philosophical Transactions}, xlii (14 December 1668), p. 842.
\textsuperscript{33} As reported by John Brown in \textit{Locke and Sydenham} (Edinburgh, 1882), p. 43. I have not been able to find the reference in Wood.
\textsuperscript{34} See British Library Add. MS. 5714, ff. 3r–17v.
\textsuperscript{35} Ibid., f. 7v.
\textsuperscript{36} The notes for the Ashley case and Locke’s case notes from this period are not paralleled in quantity by other medical case notes. See NA PRO 30/24/47/2, ff. 14r–15v, 19r–30v and British Library Add. MS. 5714, ff. 4v–8v.
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does not imply anything about the authorship of the dubia. It may be that Locke borrowed Sydenham’s ideas; it may be that he arrived at them independently; it may be that they were both influenced by an independent source or sources. We need an auxiliary premise if we are to argue that the presence of Sydenham’s ideas implies Sydenham’s authorship. Bates’s S5 provides just that premise, namely, that it would have been presumptuous for Locke to have used the first person and to have ‘made such liberal use of Sydenham’s ideas’.

So what we need to establish first is whether these ideas are present in earlier works to which Locke had access. Second, we need to establish whether there were circumstances, perhaps their relative social status, age and experience, that would have rendered it presumptuous for Locke to use Sydenham’s ideas and to express them in the first person. Third, we need to establish whether the ideas expressed in the dubia are to be found in Sydenham’s writings. The third of these inquiries bears on yet other evidence for Sydenham’s authorship, namely, S7, that the style, tenor and philosophical position of both essays are ‘entirely consonant with Sydenham’s known work’. It is most charitable here to take ‘style’ in the broad sense of philosophical or dialectical style rather than literary style. Thus, by addressing L3 we are able simultaneously to deal with S5 and S7. But first, in order to answer these questions, it is essential that the broader context of the medical disputes in England in the 1660s be described.

The status of physic in mid-seventeenth-century England

By the late 1660s, when our dubia were composed, deep institutional tensions had emerged between the fellows of the Royal Society and those of the College of Physicians.37 One of the reasons for this tension was the implications for physic of recent developments in natural philosophy. It was clear that the new emphasis on observation and experiment by practitioners of the new Experimental Philosophy and their decrying of the speculation and hypotheses of the speculative philosophers had implications for the theoretical basis upon which the method of physic was practised. Physicians within the College applied a *methodus* tailored to individual patients, which was based upon a fusion of largely Galenic and Aristotelian natural philosophy. However, the theory of bodily humours and the concomitant theory of disease, which constituted the foundation of the *methodus*, came, in the late 1650s and early 1660s, to be accused of being founded upon the speculations of the ancients and not upon experiment and observation. In short, the new natural philosophy provided a challenge to the theoretical underpinnings of traditional physic, both as it was taught in the universities and as it was practised at the bedside.38 Exacerbating this situation was the widespread practice of Helmontian chymistry,39 which was under-girded by an overtly anti-Aristotelian natural philosophy and which was practised by non-physicians often with a view to developing medicines.


In spite of the high professional status of physicians within English society, the practice of medicine was unregulated and chemists, apothecaries and mountebanks could and did prescribe medicaments widely, often without any formal training. It is little wonder then that many physicians felt that their professional territory was being encroached upon. The situation first came to a head in 1664 when a bill to approve the College’s new charter was defeated in Parliament, in large part because of opposition from the Society of Apothecaries and supporters of the new philosophy. By the end of the same year an acrimonious pamphlet war erupted and a new, rival Society of Chymical Physicians was proposed, one which would be in direct competition with the Physicians’ College. The chymical physician Thomas O’Dowde published an ‘engagement’ in his *The Poor Man’s Physician* which gave notice of the intention to incorporate this new society, and Marchamont Nedham in his *Medela medicinae* launched a vitriolic attack upon the current state of physic which evoked a series of replies from Galenic physicians. Nedham’s tirade included criticisms of a number of the sub-disciplines which formed the physicians’ medical arsenal, namely medical botany, the efficacy of phlebotomy and, most important for our concerns here, anatomy. The self-styled reformers of physic pointed out the futility of the search for underlying causes of disease and stressed the need for first-hand observation and experiment. Some even questioned the need for a university education as a prerequisite for the practice of physic and revelled in being called illiterate if that meant that they did not follow ‘the Common Scholastick Road’. Needless to say, the rhetoric of the primacy of experiment and observation over speculation and the call for an instauration which characterized the new natural philosophy became rallying cries for the chymical physicians as well. After all, many of them were closely associated with leading members of the Royal Society.

Yet the situation was far from being polarized along the lines of defenders and opponents of traditional physic. Indeed, at least five different groups are discernible within the parties to the debate. First, there were the traditional physicians, often styled Galenists or Methodists, who defended the practice of traditional physic and attacked the new philosophy. Those who went into print included the controversialist Henry Stubbe, Robert Sprackling and John Twysden. Second, there were the chymical physicians such as Nedham, Edward Bolnest, Thomas Williams, Thomas O’Dowde, George Starkey and George Thomson, who were severe critics of the current state of physic and were the promoters of the proposed Society of Chymical Physicians. Starkey had attacked the Galenists in his writings of the late 1650s calling their method ‘erroneous and defective, dangerous and impotent, partly lame and ridiculous, partly lamentable and desperate’. He and Thomson were both signatories to Thomas O’Dowde’s ‘engagement’ for a Society of Chemical Physicians, as were each of the chymical physicians named above.

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43 See Nedham’s preface to Edward Bolnest’s *Medicina instaurata* (London, 1665), sig. A6v.
44 For the importance of the distinction between experimental and speculative natural philosophy in this period see Peter Anstey, ‘Experimental versus Speculative Natural Philosophy’, in Peter Anstey and John Schuster (eds.), *The Science of Nature in the Seventeenth Century: Patterns of Change in Early Modern Natural Philosophy* (Dordrecht, 2005), pp. 215–42.
Third, there were promoters of the Royal Society and its virtuosi, who were neither practising natural philosophers nor physicians, but who sniped from the sides of the dispute against the Galenists. Joseph Glanvill and Thomas Sprat were the most effective here, Glanvill opening his *Plus ultra* (1668), his defence of the ‘Royal Colledge of Philosophers’, by firing a sally against the usefulness of physic.\(^{46}\) Fourth, there were the virtuosi–physicians such as Christopher Merrett, Timothy Clarke, Daniel Coxe, Jonathan Goddard, Richard Lower and Gideon Harvey. Most of them were fellows of both the College of Physicians and the Royal Society who were well disposed to the new philosophy and to medical chymistry and who sought a *via media*. Fifth, and finally, there was a small group of natural philosophers and physicians who somehow managed to transcend the factionalization of the debates and whose works and personae were appealed to by both the protagonists and antagonists alike. Robert Boyle, Thomas Willis, Francis Glisson and Sir George Ent were lauded by Nedoam on behalf of the chymical physicians and Stubb for the Methodists, and by Timothy Clarke for the virtuosi–physicians.\(^{47}\)

The content of ‘Anatomia’

It is hardly surprising then, that we should have an essay in Locke’s hand on the status of anatomy, one of the central issues in the debates between the chymical physicians and the Galenists. Locke had connections with some of those closely associated with the proposed Society of Chymical Physicians such as John Read, Thomas Williams and William Currer and (apparently) Nedoam;\(^{48}\) he had been practising chymistry since receiving instruction from Peter Stahl in Oxford\(^{49}\) and his notebooks reveal that his most important influence in chymistry was Robert Boyle. As it happens, Boyle himself in the mid- to late 1660s was engaged in writing a critique of the Galenists’ medical practice (though there is no evidence that Locke ever saw this).\(^{50}\) Furthermore, Locke’s library contains numerous publications relating to the chymical physicians and there are reading notes on a number of these works.

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\(^{48}\) For John Read’s letter to Locke (which contains an enclosure for Nedoam) see *Correspondence of Robert Boyle*, eds. Michael Hunter, Antonio Clericuzio and Lawrence Principe, 6 vols (London, 2001), vol. iii, pp. 11–14. For Locke’s references to Williams see Bodleian MS. Locke f. 25, pp. 39, 60, 249, 316, 359, 361, Bodleian MS. Locke f. 19, p. 207, Bodleian MS. Locke c. 44, pp. 60–1; for Currer see Bodleian MS. Locke f. 25, pp. 23, 63, 277, 317b.


\(^{50}\) See Hunter, ‘Boyle versus the Galenists’. The critique was eventually suppressed by Boyle.
dating from the mid-1660s. It is clear then that Locke was well placed in terms of chymical and medical knowledge and his associations with chymists and chymical physicians to compose essays that were squarely within the polemical agenda of the chymical physicians.

These facts serve to undermine Dewhurst’s claim, S4, that the dubia ‘were written when Locke (who then had a strong iatrochemical bias) was only just beginning his clinical apprenticeship’. For, Dewhurst’s claim insinuates that Locke’s ‘iatrochemical bias’ would have precluded him from composing the dubia, whereas it is clear that ‘Anatomia’ and ‘De arte medica’ are the writings of either a chymical physician or someone very sympathetic to their cause. In fact, Dewhurst’s claim that Locke ‘then had a strong iatrochemical bias’ implies that he was to give this up as a result of his ‘clinical apprenticeship’ with Sydenham. However, Locke’s medical notebooks and correspondence do not indicate any change in orientation in his approach to physic, even though his other pursuits later encroached upon his practice of chymistry. Interestingly, in 1691 he was appointed by Boyle as one of three executors to Boyle’s chymical papers the contents of which were clearly of great interest to him. He had nearly two hundred pages of notes made from this material.  

‘Anatomia’ is concerned with the usefulness of anatomy to the treatment of diseases. It opens with a statement of the positive uses of anatomy and then a clear statement of the main thesis of the essay:

that anatomi is like to afford any great improvements to the practise of physic or assist a man in the findeing out & establishing a true method I have reason to doubt. All that anatomi can doe is only to shew us the grosse & sensible parts of the body, or the vapid & dead juices, all which after the most diligent search will be noe more able to direct a physitian how to cure a disease then how to make a man, for to remedy the defects of a part whose organical constitution & that texture whereby it operates he cannot possibly know is alike hard as to make a part which he knowes not how is made.
The reference here to ‘a true method’ connotes method of cure or methodus. The salient points of the essay are that we lack epistemic access to the underlying structure of bodily organs and fluids and that this ignorance cannot be dispelled through knowledge of gross anatomy. As a consequence, all that the physician can hope to do is to gather information about the behaviour and treatment of diseases by observation through medical practice. This fact gathering is regarded as a form of natural history. There is little use in the curative part of physic for the postulation of hypotheses about the underlying causes of disease, although, consistent with others disposed to chymical medicine, Locke does appear to presuppose a corpuscular account of the nature and function of bodily fluids and sees a central role for the blood and fermentation in the analysis of disease.

‘De arte medica’ by contrast sets out to provide the case for a new approach to physic. Its statement of aim is as follows:

My intention therefor is to propose some few things to the consideration of the Learned men of this soe useful a faculty & to excite their mutuall assistance to perfect the art & establish a setled certaine practise in the cure of sicknesses.\(^54\)

It is careful not to be dismissive of the medical wisdom of the past, while at the same time arguing strongly from the perspective of experimental natural philosophy against the use and abuse of speculation in physic – particularly with respect to the unknown causes of disease — and for the use of observation and histories of disease.

How accurate then is Meynell’s claim, L3, that the content of the dubia are not necessarily derived from Sydenham because the ideas expressed are present in other earlier authors? There are any parallels between the specific content of the dubia and medical writings with which Locke was familiar. For instance, Boyle’s *Usefulness of Natural Philosophy* contains a number of the points that Locke discusses in ‘Anatomia’. Boyle’s discussion of the usefulness of anatomy, as we have seen, refers to splenectomies, and Boyle also discusses the usefulness of dissections on living rather than dead animal bodies which is paralleled by Locke’s claim of sick or dead animals that

which soever of these two happen the humor he is examining will be of a far different nature & consideration from what it is when it has its due motion & activity in a liveing animal.\(^55\)

Again, earlier in the work Boyle had marvelled at the parts of a cheese mite in the following terms

the several Parts Internal and External, requisite to make up this little Animal; how many must goe to the texture of the Eyes, and other Organs of Sense; how many to the Snout (which he has, not unlike a Hog) and the several parts of it; how many to the Stomach and Guts, and the other Inward Parts addicted to the digestion of Aliment, and exclusion of Excrements; and to be short, how unimaginably subtle must be the Animal Spirits running too and fro in Nerves suitable in such little Legs.\(^56\)

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\(^{54}\) NA PRO 30/24/47/2, f. 49r (Dewhurst, p. 79).

\(^{55}\) NA PRO 30/24/47/2, f. 34v (Dewhurst, p. 89).

Locke is equally impressed with the mite or sand *animalculum* and describes it in similar terms:

> there must necessarily be supposed a mouth *stomach & guts*, heart veins & arteries & juices in them and the brains *nerves*, muscles & bones without all which it is hard to conceive life & motion & all these to omit. *eyes ears* liver spleen &c to be contained in a sensible particle of matter let the anatomist take this animalculum, or a mite.67

However, Meynell’s claim, L3, really pertains to the thematic content of the dubia. Here too, evidence is easy to adduce in support of Meynell. The critique of the current *methodus* of physic, and the concomitant aspiration to perfect it, are a central and prominent theme in the writings of the chymical physicians and the virtuoso physicians. Robert Boyle’s suppressed critique of Galenism was primarily a critical appraisal of the Galenists’ method, whereas Nedham’s *Medelam medicinae* presents a strident call for medical reform. Using Thomas Willis as his mouthpiece Nedham claims ‘the Art of Physick ought to be wholly renewed’.58 The need for reform was acknowledged by Timothy Clarke who in 1664, while defending the College physicians, had spoken of making ‘a good and thorough reformation in the whole *Materia medica*’.59

As mentioned above, one facet of the critique of Galenism was the elevated role that the Galenists assigned to anatomy. The contours of the attack on anatomy have been laid out by Andrew Wear who cites George Thomson’s call to

> Desist then ye vain-glorious *Galenists* from spending your dayes about impertinent and superfluous Searches in stinking Carcasses, which are never able to teach you how to destroy the Rampant Diseases …60

Note the parallels with Sydenham’s interpolated comment on the first page of ‘Anatomia’

> Others of them have more pompously & speciously prosecuted the promoting of this art [anatomy] by searching into the bowells of dead & living creatures as well sound as diseased to find out the seeds of discharging them but with how little success such endeavors have bin or are like to be attended I shall here in some measure make appeare.61

Note too, Thomson’s claim that ‘the lodging place of Diseases is seldom to be discovered by the Knife’, which closely parallels Locke’s claim in ‘Anatomia’.62

The controversy over the search for the underlying causes of disease is also found amongst the chymical and the virtuoso physicians. One of Boyle’s heads in his suppressed critique was concerned with the fact that

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57 Underlining indicates parallels with Boyle’s description.
59 Timothy Clarke, *Some Papers Writ in the Year 1664* (London, 1670), p. 34.
61 NA PRO 30/24/47/2, f. 31r (Dewhurst, p. 85).
oftentimes a Disease may proceed from several causes unknown to the
Physitian, or at least not duly consider’d by him, and so may make the method
improper or at least inferior to another.\(^{63}\)

Nedham has a long discussion of the various theories of the cause of disease critiquing
the traditional humoral theory and various contemporary theories of humours and elements
as underlying causes of disease. He accepts the view propounded by Boyle and others that

Diseases are caused, and may be cured as well as caught ... by invisible
radiations or Influences, or by intermediation of Corpuscles, Atoms, Effluviums,
or flying particles, after an indiscernible manner, is a matter now so far out of
question, that he who will deny it must first renounce his own knowledge of
visible effects ...\(^{64}\)

However, discussions of the causes of disease in the 1660s were part of a broader
methodological emphasis on the importance of experimental rather than speculative
philosophy. George Thomson attacks the Galenists’ account of the causes of disease and
their refusal to ‘come to the touchstone of true Experience’\(^{65}\). Promoters of the experimental
method, whether in natural philosophy or medicine, harshly criticized the development of
speculative natural philosophy and the use of hypotheses. The methodological literature of
the period, such as the writings of Glanvill and Thomas Sprat,\(^{66}\) is replete with anti-
speculative rhetoric and this methodological mantra was naturally applied in physic. On the
one hand, observation and experiment were emphasized over ancient authority, and on the
other speculative accounts of the nature and causes of disease were harshly criticized. Boyle,
as ever, took a more moderate, reconciling position on the relation between the experimental
and speculative, composing essays and articles of inquiry on ‘Of Usefulness of Speculative &
Experimental Philosophy to one another’\(^{67}\).

What is striking about ‘De arte medica’ is the very strong anti-speculative strain of the
work. The term ‘speculation’ and its cognates appear seven times as ‘useless speculations’,
‘remote speculative principles’, ‘speculative theorems’, ‘empty speculations’ and so on.
Likewise, ‘hypothesis’ occurs four times (all pejorative) and ‘phansey’s’ twice. Locke’s
preference for the experimental over the speculative continues for the rest of his life, but
nowhere does it appear so forcefully as in ‘Anatomia’. Interestingly, later in life, Locke
attributes a strong emphasis on the avoidance of hypotheses and fancies in physic to
Sydenham. Could he have been influenced by Sydenham as early as 1668/9 on this very
point? Or was it Sydenham who was influenced by Locke? In order to answer this and to
explore the question of Sydenham’s influence on Locke in general we need to examine
Sydenham’s role in the medical disputes of the 1660s and the contents of his writings.

\(^{63}\) Hunter, ‘Boyle against the Galenists’, p. 167. See Boyle’s elaboration of this head in the longer version of
the synopsis of this critique ibid., p. 188.

\(^{64}\) Nedham, Medelæ medicæae, p. 304.

\(^{65}\) Thomson, Galeno-pale, pp. 3 and 41. Chapter xi of Thomson’s book attacks the Galenic theories of the causes
of disease.

\(^{66}\) See for example Sprat’s History of the Royal Society, ‘Experimental Philosophy will prevent mens spending the
strength of their thoughts about Disputes, by turning them to Works ... And indeed of the usual titles by which
men of business are wont to be distinguish’d, the Crafts, the Formal, and the Prudent; ... The Formal man
may be compar’d to the meer Speculative Philosopher: For he vainly reduces every thing to grave and solemn
general Rules ... the Prudent man is like him who proceeds on a constant and solid cours of Experiments’,
p. 341, underlining added.

\(^{67}\) For further discussion and references see Peter Anstey and Michael Hunter, ‘Robert Boyle’s “Designe about
Natural History”’, Early Science and Medicine, xiii (2008), pp. 83–126.
Sydenham and the medical debates of the 1660s

Where does Thomas Sydenham fit into all of this? Born in 1624 Sydenham received his MB in 1648 from Oxford and was practising in London by the late 1650s.68 Sydenham was a fellow of neither the Royal Society nor of the College of Physicians. He gained a licentiate to practise physic from the College on 23 June 1663. He was known to Robert Boyle and Robert Hooke by mid-1663 and to Henry Oldenburg, the secretary of the Royal Society by mid-1665.69 The virtuoso John Beale mentions in passing in a letter to Boyle that Sydenham was a detractor of vegetables, meaning that he decried the knowledge of botany and its application in physic.70 This attitude was characteristic of some of the chymical physicians who also opposed learning in general. In 1664 Timothy Clarke had noted of the opponents of the College of Physicians that ‘learning or scholastick education they publickly declaim against, they rail at Anatomical exercises as useless, and think the knowledge of plants, fit only for an herbwife to make and sell Nosegays with’.71 Interestingly, the diarist Dr John Ward records in early 1669 that

Physick, says Sydenham, is not to be learned by going to universities, but hee is for taking apprentices; and says one had as good send a man to Oxford to learn shoemaking as practising physic.72

It seems that by early 1668 Sydenham had had a falling out with certain London physicians and that the gossip recorded by Ward was not too far from the mark. For, in the only extant piece of correspondence between Sydenham and Boyle, Sydenham complains that in spite of the success he enjoys with his patients, he

cannot brag of my correspondency with some other of my faculty, who, notwithstanding my profoundness in palmistry and chemistry, impeach me of great insufficiency … Though yet in taking fire at my attempts to reduce practice to a greater easiness and plainness, and in the mean time letting the mountebank at Charing-Cross pass unrail’d, they contradict themselves, and would make the world believe I may prove more considerable than they would have me. But to let these men alone to their books …73

The dismissive reference to ‘their books’ most likely expresses a similar attitude to learning as that reported by Ward. Furthermore, it is most likely that Sydenham’s reference to his ‘profundness in palmistry and chemistry’ is ironic. Sydenham is not known to have practised chymistry and physicians most certainly did not practise palmistry. Interestingly, however, by 1666 Sydenham was known to the physician and fellow of the Royal Society Daniel Coxe who mentions him occasionally in his letters to Boyle and clearly thought highly of Sydenham’s ability to cure his patients.74 Of particular note is his reference to Sydenham’s attitude to chymistry in a letter from 14 October 1666.

68 He was awarded a Cambridge MB and MD in May 1676, well after the period that is of interest to this paper.
69 Hooke to Boyle, 5 June 1665, Correspondence of Robert Boyle, vol. ii, p. 84.
70 Beale to Boyle, Correspondence of Robert Boyle, vol. ii, p. 534, ‘For the vegetables Dr Sydenham is a very heretique’.
71 Clarke, Some Papers, p. 12.
72 Quoted in G. G. Meynell, Materials for a Biography of Dr. Thomas Sydenham (Folkestone, 1988), p. 68.
73 Sydenham to Boyle, 2 April 1668, Correspondence of Robert Boyle, vol. iv, p. 56.
This & 2 or 3 other Considerable cures performed by chimicall medicines after the diseases had eluded all ordinary medicines & methods hath so startled Dr Sydenham that Hee begins to effect Chymistry speakes honourably of Chymicall medicines professes seriously hee would willingly give a good sum of money for a moderate insight into our misteries which if I can help him to hee is not like to bee long without.\

There is no evidence that a shift in Sydenham’s interest ensued. Coxe’s comment indicates that in late 1666 he was not a chymical physician, in spite of expressing attitudes that were commonly associated with those physicians who were set against the College of Physicians. One might expect, given Sydenham’s acquaintance with Boyle, Coxe and Oldenburg, that he was at least loosely affiliated with the Royal Society instead of the College, however, there is no mention of him in Birch’s History and from late 1667 such an association was unlikely in the extreme. For Sydenham had caused Oldenburg to complain bitterly to Boyle that while he (Oldenburg) was in the Tower Sydenham railed against him. Oldenburg charged that Sydenham ‘was such a coward, as afterwards to disown it, though undeniable. I confesse, that with so mean and un-moral a Spirit I can not well associate’. Interestingly, Sydenham all but drops out of Boyle’s correspondence not long after this, and he is never mentioned in any of Boyle’s published works.

The relative social and professional standing of Locke and Sydenham

The foregoing biographical details about Thomas Sydenham’s relations with the Royal Society and the College of Physicians provide some of the background from which we are able to assess Bates’s claim, S5, that it would have been presumptuous for Locke to have used the first person and to have ‘made such liberal use of Sydenham’s ideas’. Bates, it will be recalled, says that the assertion of Lockean authorship of the dubia is an instance of ‘monumental presumptuousness’ for Locke was ‘eight years Sydenham’s junior and even more his junior in medicine’.

Yet, in the 1660s Sydenham was not a leading physician and did not enjoy the reputation that he was to gain in the eighteenth century. His few surviving letters bear testimony to the fact that he had trouble securing wealthy patients; he was not yet a Doctor of Medicine; he was not a fellow of the Royal Society or the College of Physicians. In fact, the dominant impression from the evidence we have of his relations with the latter is one of conflict. This situation seems to have continued until late 1677, for when Dr John Mapleton solicited medical advice from Sydenham for Lady Northumberland in Paris who was suffering trigeminal neuralgia, he forwarded Sydenham’s advice to Locke with the caution that Sydenham’s name had better be suppressed.

I thought it not best to mention these our Friend’s [Sydenham’s] directions for reasons you may know … If you think the name will prejudice the advise you may take it upon yourself.\

Furthermore, there is no evidence that he was involved in Ashley’s household before 1669 apart from some advice for Ashley which could well have been solicited by Locke, quite independently of Lord Ashley. Locke by contrast lived in Ashley’s household, was close to

\[75\] Correspondence of Robert Boyle, vol. iii, p. 249.
\[76\] Oldenburg to Boyle, 24 December 1667, Correspondence of Robert Boyle, vol. iii, p. 386.
\[77\] John Mapleton to Locke, 3 December 1677, Correspondence of John Locke, vol. i, p. 537.
\[78\] See Dewhurst, Sydenham, pp. 164–6.
Boyle, was intimately involved in Ashley’s operation and ministering to his household as a physician and became FRS just prior to the composition of ‘Anatomia’. Locke might have been Sydenham’s junior by eight years, however, he was certainly far better educated than Sydenham, better connected than Sydenham and socially was in a far superior position.

When we assess the evidence of Sydenham’s relations with Ashley we find that the first evidence that Sydenham had worked as a physician in the Ashley household is in the draft dedicatory epistle to a projected work on smallpox from 1669. The manuscript is in Locke’s hand and says ‘I have practised noething in your family but what I durst owne publish & to the world’. It is clear then that Locke was not only privy to Sydenham’s attempt to ingratiate himself with Ashley but even assisted him in the task. He was certainly well placed to do so. (Sydenham had earlier dedicated both editions of his Methodus curandi febres to Boyle.) Hence, one needs to be extremely cautious before concurring with Bates’s claim, S5, that it would have been presumptuous for Locke to have made use of Sydenham’s ideas given their relative social and professional standing.

The content of Sydenham’s ‘Methodus curandi febres’

Are the ideas and arguments, the ‘style, tenor and philosophical position’ of the dubia, present in Sydenham’s writings? Happily, there is only one known writing by Sydenham that predates ‘Anatomia’. This is his Methodus curandi febres of 1666 (2nd edition 1668). The situation with ‘De arte medica’ of 1669 is slightly more complicated because there is manuscript material, some in Sydenham’s hand and some in Locke’s hand, which is datable to 1669 (though none in Locke’s hand before July 1669). Space does not permit a thorough comparison of the contents of all of these documents, so I will focus on the method of natural history.

When we turn to the first edition of Sydenham’s Methodus of 1666 we find it to be a work relatively untouched by the recent debates about the status and nature of physic. It contains no allusions to the spate of recent publications by chymical physicians on the need to reform physic, such as the works by Edward Bolnest, Christopher Merrett or Marchamont Nedham’s Medelaminae and the response to Nedham by Robert Sprackling. Nor, as mentioned above, is there any discussion of the recent plague which was the catalyst for a new wave of publications on the nature of this disease. Nor does it contain any reference to Bacon or the method of natural history. Sydenham’s Methodus is, in comparison with the profusion of medical writings at the time, a fairly traditional work in so far as it presents a methodus for the treatment of a variety of fevers. It lacks the erudition typical of much of the fevers literature from the period, and in this respect it can be usefully contrasted with Tobias Whitaker’s An Elenchus of Opinions concerning the Cure of the Small Pox (London, 1661) which is replete with references to ancient and more recent authorities on smallpox.

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79 NA PRO 30/24/47/2, f. 62r (Dewhurst, p. 102).
80 It should be noted that it is not possible to determine when the Preface to Sydenham’s ‘Medical Observations’, which is in Locke’s hand, was composed. While Sydenham began the work on 26 March 1669, it is unclear whether the sheet containing the Preface was in the original quire, a quire which has been significantly reordered. See G. G. Meynell, Thomas Sydenham’s ‘Observationes Medicæ’ and his ‘Medical Observations’ (Folkestone, 1991), p. 2.
81 Edward Bolnest, Medicina instaurata, or A Brief Account of the true Grounds and Principles of the Art of Physick (London, 1665).
83 Nedham, Medela medicinae.
84 Sprackling, Medela ignorantiae.
What it does contain in common with Whitaker is an emphasis on the manner in which the *methodus* presented is based on a combination of first hand observation and theory.\(^85\) A stress on the priority of first hand sensory observation over written authority had become prevalent amongst English writers of works in physic in part because of the powerful influence of the method of William Harvey on English medicine.\(^86\) It is also a prominent theme in the writings of the chymical physicians and promoters of the experimental philosophy in general such as Robert Boyle who apparently had an early connection with the work. Henry Stubbe was to claim that Sydenham had actually plagiarized Whitaker and there are some striking parallels in their recommended treatments for smallpox.\(^87\) However, the *Methodus* differs markedly from Whitaker’s *Elenchus* in so far as it contains a miasma theory of the cause of fevers (almost certainly derived from Boyle\(^88\) and/or Willis) and in so far as it contains a developed speculative ebullition or fermentation theory of fevers. This latter theory provides the rationale of the *methodus* that Sydenham prescribes. In this respect Sydenham’s approach to fevers is far closer to that of Thomas Willis than Whitaker. Willis was an eminent early exponent of the Harvean emphasis on observation over theory and it is likely that his account of the fermentation of the blood in intermittent fevers was the main source of these ideas in Sydenham’s *Methodus*.\(^89\)

Sydenham and the method of natural history of disease

Turning now to the question of the method of natural history, it was common practice in fevers literature in the mid-seventeenth century to present a number of case histories in order to illustrate the symptoms of fevers, the course of the various forms of fevers and the application of the physicians’ *methodus* to the patient. These case histories were either derived from actual patients or were more general accounts of seasonal fevers or epidemics. It is the presence of such histories which provides the most natural connection with the method of natural history as applied in natural philosophy. The most widely cited work on fevers in the 1660s, Thomas Willis’s *De febribus*, the second part of his *Diatribae duae* (1st edition 1659), provides a number of clear examples of the use these of ‘Histories and Observations’. For example, in his chapter on pestilential or malignant fevers, Willis tells us

\[
\text{That the figure, or Idea of this malignant Feaver, may be painted to the life, very many observations or histories of sick people, are easily to be had; of the many examples of this Disease, I shall only mention a few…}^{90}
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\(^86\) One of the most forceful statements of the priority of observation and experiment in Harvey’s writings is his preface to *De generatione* (1651) where, for example, he claims ‘in every Science, be it what it will, a diligent observation is requisite, and Sense it self must be frequently consulted. We must not (I say) rely upon other mens experience, but on our owne; without which, no man is a proper disciple of any part of natural knowledge’ (quoting George Ent’s translation, *Anatomical Exercitations, Concerning the Generation of Living Creatures* (London, 1653), sig ¶1v).


The next chapter on smallpox and measles uses the same format. After describing the
disease and the *methodus* Willis says:

> It were easie to illustrate the afore-recited Doctrine, concerning the Small Pox, 
> with Histories and Observations of the sick, because there is no Disease besides 
> can supply with a greater plenty of Examples, or variety of Accidents: but of 
> the great number of this kind, I shall only propose in this place a few Cases …  

Then follows a chapter on women in childbirth which, likewise, ‘may easily be illustrated 
with Histories and Observations’.  

Is there a parallel use of case histories in the writings of Thomas Sydenham? Surprisingly, 
the first edition of Sydenham’s *Methodus* does not contain any such histories. The closest 
Sydenham comes to using such histories is in the section on continued fevers, where he 
discusses the difficulty in accounting for the differences in fevers from year to year. Using 
examples from the seasons of the years 1661–63 he claims that there seems to be no 
correlation between the healthiness and unhealthiness of seasons. He then goes on to discuss 
the epidemics of 1661 and mentions ‘a female neighbour of my own was taken with her first 
quartern ague-fit on the 24th of June’.  

The situation with the second edition of the *Methodus*, however, is somewhat different. 
Not only is there a new section on the plague, thus bringing the work in line with the 
structure of fevers literature more generally and dealing with the most devastating epidemic 
of the age, but that section contains a paragraph on the use of phlebotomy in treating the 
plague which refers to a list of fifteen authorities on the nature of the plague. This is the 
only such reference to medical authorities in all of Sydenham’s writings. G. G. Meynell has 
argued convincingly that the key influence on Sydenham here was John Locke whom 
Sydenham had recently met. For all of the authors mentioned by Sydenham are listed in a 
work on the plague that Locke had recently been reading.  

Sydenham almost certainly copied his list, with some variations, from Locke’s copy of Diemerbroeck’s *Tractatus de peste* (1646).  

The second edition of the *Methodus* also contains a report derived from a Mr Francis 
Wyndham which relates to the Civil War period and Sydenham’s own brief case histories 
relate to patients he saw during the plague in 1665. Sydenham reports on the curing of two 
patients, though it is not clear from his accounts that they were indeed suffering from the 
plague. He then gives a justification of his leaving London with his family to avoid 
infection.

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91 Ibid., p. 145.  
92 Ibid., p. 158. Locke’s medical notebooks from the 1660s employ three marginal symbols for different aspects 
of the histories of diseases that he encountered in his reading: historia morbi; historia casus; historia therapiae 
particularis. See Bodleian MS. Locke d. 9, p. i and Bodleian MS. Locke f. 28, p. 7.  
93 Sydenham, *Methodus*, pp. 58/59–60/61. For similar examples of the use of such histories in writings from 
95 G. G. Meynell, ‘Sydenham, Locke and Sydenham’s *De peste sive febre pestilentiali*,’ *Medical History*, xxxvi 
and 177. See also Bodleian MS. Locke d. 11, ff. 7v and 289r for references to *De peste*. These entries appear 
to have been made in the early 1660s. He records Diemerbroeck’s name in Bodleian MS. Locke f. 27, p. 55a, 
an entry made between 18 and 20 September 1665 at the height of the plague in London.  
96 *The Library of John Locke*, II, 962.  
98 In fact, Sydenham expresses doubts that the young lady whom he treated was actually suffering from the 
Interestingly, in his letter to Boyle of 2 April 1668 mentioned above, while justifying his adherence to his radical view that smallpox should not be treated but left to run its course, Sydenham mentions to Boyle that

It would be too large for a letter, to give you an account of its history; only in general I find no cause, from my best observation, to repent of any thing said by me in my tract De Variolis.99

The tract to which Sydenham refers is the new section in the second edition of the Methodus. What is of interest here is the reference to ‘an account of its [smallpox’s] history’, which is the first such reference in Sydenham’s writings. From mid-1669, however, the situation was to change markedly, for the extant manuscript materials in the hands of both Sydenham and Locke contain new claims about the importance of histories of diseases. By the time of the publication of Sydenham’s Observationes medicæ in 1676, the natural history of disease had become, for Sydenham, a key component in his medical methodology.

For example, Sydenham took up the subject of smallpox again in July 1669 and extensive drafts for a new work on the disease survive.100 The preface (in Locke’s hand) begins as follows, ‘Reader, I heare present thee with the history and cure of a disease which however but too well knowne both by its terrible aspect and fatal effects to most familys in England’.101 Sydenham then reveals a further shift from the earlier Methodus by subordinating theory to observation and experience. He says,

If it were necessary to raise theories, and from thence draw probable arguments to prove that to be likely which is already verifyed in matter of fact and experience has justified to be true, the method I make use of in cureing this disease is a capable of a fair defence and may be made out from as rational grounds as the cure of any disease whatsoever.102

He then gives a taxonomy of the disease and a description of the progress of its symptoms. Importantly, in another manuscript, which is probably part of the same projected work, Sydenham describes this work as ‘the naturall history of the small pox as comprehending the true and genuine phaenomina belonging to them as they are in their owne nature’,103 and he acknowledges that his prescribed methodus is an advance on what he had previously published which was ‘less perfect for want of those opportunities of being thoroughly informed, which since that time I have plentifully had, especially in the years 1667 & 1668 in both which the Small pox raged more then scarce ever hath bin knowne’.104

But what is of most interest for our purposes is the first explicit reference to Francis Bacon in Sydenham’s writings. In the concluding paragraph of the extant text on smallpox, dated July 1669, Sydenham writes,

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100 NA PRO 30/24/47/2, ff. 60–9, transcribed in Dewhurst, Sydenham, pp. 101–22. For additional material on smallpox see also Royal College of Physicians MS. 572, transcribed in Meynell, Thomas Sydenham’s Observationes Medicæ and his Medical Observations, pp. 68–99.
101 Dewhurst, Sydenham, pp. 102–3 (corrected).
102 Ibid., p. 106.
103 Ibid., pp. 111–12.
104 Meynell, Thomas Sydenham’s Observationes Medicæ and his Medical Observations, p. 96.
I know to write the Hystory of a disease is comon, but soe to doe it as not to
deserve the just contempt expressed by that great Genius of rationall nature,
the Lord Bacon, agaynst some undertakers of the like kind, is somewhat more
difficult.  

This is followed by an extensive Latin quotation from Bacon’s De augmentis scientiarum on
the correct method of writing natural histories. A decisive shift towards a more Baconian
methodology is therefore evident in Sydenham’s thought from mid-1669. By July 1669 he
had explicitly adopted the Baconian method of natural history as the way to proceed in
physic. Sydenham’s Observationes published in 1676 contains a methodological preface which
spells out a developed theory of the natural history of diseases. The book as a whole has a
strong emphasis on disease classification and the recording of symptoms and it contains far
less speculative theory than the earlier Methodus. In particular the ebullition or fermentation
theory which is so prominent throughout the Methodus is significantly downplayed in the
Observationes. Each new chapter in the sections on epidemic constitutions begins with a list
of the dates in which the fevers manifested themselves. And the methods of treatment are
presented in a more empirical manner as techniques that have been tried and which have
yielded results, rather than being tied to an underlying theory. To be sure there is an
underlying ontology of fevers: Sydenham believes that they derive from noxious particles in
the air which, given the requisite atmospheric conditions as well as the correct
predisposition of the patient, become pathogens which disrupt the natural functioning of
the blood. However, the whole reads far more like a Baconian-style natural history applied
to the phenomena of fevers rather than a traditional methodus.

But all of this post-dates the dubia. Prior to ‘Anatomia’ there is no evidence that
Sydenham was committed to applying the neo-Baconian method of natural history in
physic. There were, however, other London physicians who were champions of the method
of natural history from the mid-1660s, physicians such as Daniel Coxe and Timothy Clarke.
The main physician within Sydenham’s ambit who had close exposure to the method of
natural history, as practised and promoted by the early Royal Society, was John Locke, whose
seminal influence in this matter was almost certainly Robert Boyle.

Other arguments for Sydenham’s authorship and influence

How then should one respond to Bates’s claim, S7, that the style, tenor and philosophical
position of both essays are ‘entirely consonant with Sydenham’s known work’? It is clear that
‘Anatomia’ sits comfortably within the polemical stance of the chymical physicians and bears
little or no relation to the contents of Sydenham’s Methodus. The critique of the therapeutic
value of anatomy, the emphasis on observation and the history of diseases, the muted
corpuscular account of bodily fluids and the erudition of the essay are all absent from the
Methodus. Likewise, the explicit aim of ‘De arte medica’ to seek a new methodus is squarely
in the agenda of the chymical physicians and sets it apart from genre and content of
Sydenham’s Methodus.

The situation with the strong anti-speculative stance of ‘De arte medica’ is, however,
more complicated. At first sight, this might appear to be at odds with the speculative theory
of fevers of the Methodus, his opening statement of the role of reason, and Sydenham’s more

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105 Ibid., p. 97.
106 Ibid.
107 Ibid., p. 98.
muted and occasional claims that he was avoiding speculation. However, there is a short ‘confessional’ paragraph in Sydenham’s ‘Medical Observations’ which was almost certainly written in late March 1669 and which clearly reveals that by that date he was opposed to a speculative approach in physic. It is worth quoting in full:

As for myself having spent my youth in idleness & my riper years to as little purpose viz in prepossessing myself with the images or platforms of diseases as they lay in bookes & were deduceable from speculative Hypotheses I have lost the opportunity of having made such thorrow observations as might enable me to contribut more considerably to this great worke, yett what I can doe, God willing, I will.\footnote{Sydenham, Methodus, pp. 100/101–102/103 (followed by an extremely speculative account of vernal fevers) and p. 166/167 (following the claim that the miasma theory should be considered as established!).}

It is clear then that by early 1669 both Locke and Sydenham were proponents of the experimental, as opposed to the speculative, methodology in physic. There seems to be no decisive textual evidence that Sydenham had by this time come to see the importance of the method of natural history, but given his reference to a history of smallpox in his letter to Boyle and his association with Locke, it seems highly likely. Bates's claim, therefore, is false for ‘Anatomia’, but true (in a strongly qualified form) for ‘De arte medica’.

These facts allow us, finally, to deal with the last evidence adduced for Sydenham’s authorship, S6 and S1. S6 is the claim that Sydenham’s interpolated sentence before ‘Anatomia’ implies a link with a preceding text and is filled out by the content of ‘Anatomia’. S1 is the claim that John Ward’s diary (it is strictly speaking a notebook) reference to a proposed work by Sydenham decrying the usefulness of natural philosophy and arguing for the need to subordinate anatomy to physic is a clear reference to ‘De arte medica’ of which ‘Anatomia’ was a part.

Let us deal with the interpolation first. ‘Anatomia’ begins ‘Anatomie noe question is absolutely necessary to a Chirurgion & to a physitian ...’. Sydenham’s interpolation which precedes these words says,

Others of them have more pompously & speciously prosecuted the promoting of this art by searching into the bowells of dead & living creatures as well sound as diseased to find out the seeds of discharging them but with how little success such endeavors have bin or are like to be attended I shall here in some measure make appeare. Anatomy noe question &c.\footnote{Meynell, Thomas Sydenham’s ‘Observationes Medicæ’ and his ‘Medical Observations’, p. 17. At the end of the long essay from which this extract is taken Sydenham says the time of writing is ‘the beginning of the year 1669’, ibid., p. 50. The title page of the manuscript is dated 26 March 1669 which is the beginning of the new year old style.}

The opening personal pronoun suggests a connection with something that precedes and the final clause ‘Anatomy noe question &c’ functions as catchwords to lead into the essay proper. What are we to make of this? We might speculate that the object of the opening clause ‘the promoting of this art’ refers to the main subject of ‘De arte medica’, the art of physic. Physic is called an art eight times in ‘De arte medica’. If ‘Anatomia’ was to be grafted in to the later methodological essay, then Sydenham may be providing a transition from some point in the text of ‘De arte medica’ to the text of ‘Anatomia’. But until more evidence is forthcoming this can only remain speculation. S6 on its own implies nothing about Sydenham’s authorship of the dubia.
We turn next to the diary entry by John Ward. The evidential value of private diaries and notebooks varies, but on the whole Ward’s diaries are considered to be reliable even though they are peppered with gossip. Moreover, Ward knew Sydenham and his diary contains many references to Sydenham which appear to derive from Sydenham himself. It is therefore likely, though by no means certain, that Sydenham is the source of the entry that refers to his purported anti-Galenic book. The entry says,

Dr. Sydenham is writing a book which will bring many physicians about his ears to decry the usefulness of natural philosophie, and to maintain the necessitie of knowldg in anatomie in subordination to physic.\footnote{Dewhurst, \textit{Sydenham}, p. 73 = Wellcome Library MS. 1673, p. 957. The implied conflict between Sydenham and the physicians adds to the note’s authenticity.}

The most natural way to take ‘to decry the usefulness of natural philosophie’ is in the sense of criticizing the speculative natural philosophy that underlay the Galenic \textit{methodus}, rather than as referring to natural philosophy as promoted and practised by members of the Royal Society. As it happens, ‘De arte medica’ is critical of this sort of natural philosophy. Likewise, the expression ‘necessitie of knowledge in anatomie in subordination to physic’ could loosely describe the main theme of ‘Anatomia’. If we add to this:

1. the fact that the diary entry is datable to between 27 December 1668 and early February 1668/9 (i.e. within two months of the composition of the earlier essay ‘Anatomia’)\footnote{Wellcome Library MS. 1673 contains an entry dated 27 December 1668 on p. 944 which precedes the Sydenham entry, and an entry datable to early February 1669 on p. 968 after the Sydenham entry. It should be pointed out that the notebook is not strictly chronological. The case for this range of dates is spelt out in Walmsley, ‘Sydenham and Locke’s Natural Philosophy’, pp. 81–2.}
2. the fact that Sydenham interpolated a remark on the first page of ‘Anatomia’
3. the fact that ‘Anatomia’ is most likely part of a longer work on medical methodology of which ‘De arte medica’ is the introductory essay
4. the fact that there is no other known methodological work by Sydenham from this period

one might be tempted to infer, with Dewhurst and Bates, that Ward’s entry refers not to a projected work by Sydenham that had substantial overlap with both the dubia, but to the dubia themselves.\footnote{This is at least more plausible than Romanell’s thesis that the diary entry refers to Sydenham’s ‘Medical Observations’ since that collection of essays does not discuss the usefulness of anatomy at all. See Romanell, \textit{Locke and Medicine}, p. 164.} Furthermore, the fact that Ward records that it is Sydenham who is writing this anti-Galenic work warrants the further inference that, if Ward’s comment refers to one or both of the dubia, then Sydenham is the likely author.

This line of speculative reasoning has two interesting consequences. First, if Ward’s entry refers to one or both of the dubia, then this would enable us to establish a fairly accurate date for the composition of both essays. Second, if Ward’s entry is reliable and Sydenham is its source and if the weight of other evidence favours Lockean authorship, we can make a further speculative inference that Sydenham may have been appropriating Locke’s own methodological writings. For the sake of thoroughness we believe that it is worth spelling out the nature of these consequences, even though the evidential basis upon which they are founded is weak.
On the question of dating, we saw above that ‘Anatomia’ must have been composed some time soon after 14 December 1668. ‘Anatomia’ is endorsed ‘1668’ and ‘De arte medica’ is endorsed ‘1669’. Since Locke dated his letters according to the Julian calendar in the mid-1660s, we might set a terminus ante quem for ‘Anatomia’s’ composition at 25 March 1668/9. However, in the mid-seventeenth century it was normal to consider the new year as beginning on 1 January. Thus, we find Locke’s Journals begin the new year on 1 January and, more importantly, his memorandum book for 1669 begins on 1 January. Now, Ward’s diary entry is datable to between 27 December 1668 and early February 1668/9, and given that Ward’s comment suggests a connection with ‘De arte medica’, we might infer that ‘De arte medica’ was already written by early February 1668/9. If this is the case, given that Locke endorsed ‘De arte medica’ as being written in 1669, it is most plausible, though far from certain, that he was dating the new year from 1 January and that the terminus ad quem for ‘Anatomia’ is 31 December 1668, that is, we could then pin down the date of composition of ‘Anatomia’ to within a period of two weeks.

A consequence of this inference, in turn, is that ‘De arte medica’ would have been composed some five months before the first explicit discussion by Sydenham of the method of natural history of diseases and the first evidence of Locke acting as amanuensis for Sydenham. Ironically then, should Ward’s diary entry refer to ‘De arte medica’ it would negate other evidence appealed to for Sydenham’s authorship of the dubia, namely, the claim that they were written when Locke was acting as Sydenham’s amanuensis (S2) and that Locke was appropriating Sydenham’s ideas (S5).

As for the speculative consequence that Sydenham might have been appropriating Locke’s ideas, there is ample other evidence of such appropriation on Sydenham’s part. Meynell has argued convincingly that Sydenham was indebted to Locke for material included in the chapter on the plague in the second edition of the Methodus. More recently, Meynell has also argued on stylistic and thematic grounds that Locke had a hand in the composition of parts of the methodological preface to the Observationes medicae of 1676. While Sydenham does not explicitly acknowledge Locke’s input in the preface, his comment in the epistle dedicatory that Locke had ‘closely and exhaustively examined the question [of method] and that Locke ‘agrees with me as to the method that I am speaking of’ is perhaps tacit acknowledgment of Locke’s influence on the work. Thus we have two likely examples of Sydenham’s use of Locke’s knowledge and expertise and, quite possibly, Locke’s own writing.

Furthermore, we know that Sydenham probably drew from Willis’s De febribus for his Methodus and that Henry Stubbe claimed that Sydenham had, in effect, plagiarized Whitaker’s Elenchus. It is, therefore, not an implausible conjecture that Sydenham’s interpolation in ‘Anatomia’ and the comment recorded by Ward (assuming it derives from Sydenham) on a projected work on the method of physic were acts by Sydenham of appropriation of Locke’s own ideas and writing. One must not, of course, assume that such

\[115\] British Library Add. MS. 46470. The memorandum book is bound with Goldsmith 1669. An almanack for the year of our Lord God 1669, which also begins on 1 January.

\[116\] Wellcome Library MS. 1673 contains an entry dated 27 December 1668 on p. 944 which precedes the Sydenham entry, and an entry datable to early February 1669 on p. 968. It should be pointed out that the notebook is not strictly chronological. The case for this range of dates is spelt out in Walmsley, ‘Sydenham and Locke’s Natural Philosophy’, pp. 81–2.


appropriation was regarded in the period in the same manner in which we regard a breach of intellectual property rights today, or that Locke would have objected in any way to such a move on Sydenham’s part. Indeed, all indications are that Locke would have acquiesced, and perhaps did, in Sydenham’s appropriation of his ideas and even his writing.

It is time now to take stock and to draw the threads together of the foregoing analysis of the arguments for and against Lockean authorship of the dubia. The foregoing discussion has provided important historical and textual evidence in support of the claims for Locke’s authorship of the dubia and against the claim that Sydenham was their author. Whether we examine Locke’s clinical experience in physic around the time of their composition, the contents of the dubia themselves and their relation to Sydenham’s *Methodus*, the relative social standing and circles of acquaintance of Locke and Sydenham, or the wider polemical background to the essays, at every turn the evidence weighs in favour of Locke’s authorship. The only exceptions are John Ward’s diary entry referring to a projected work by Sydenham and Sydenham’s interpolation in ‘Anatomia’, but neither of these provides decisive evidence either way. However, the one feature of the case for the authorship of the dubia that has not yet been examined is the literary style of the essays. Happily recent decades have seen the development of very powerful techniques for analysing literary style and these techniques are applied to the dubia in Part Two.

Part Two: The computational evidence, by John Burrows

2.1 Background and preparatory work

Peter Anstey has asked me to employ the methods of computational stylistics to assess the likely authorship of two late seventeenth-century manuscripts treating of medical topics. One, entitled ‘Anatomia’, is a text of some 4491 words. The other, which runs to only 2600 words, is entitled ‘De arte medica’. Both lie within National Archives PRO 30/24/47/2, where the former occupies ff. 31r–38v and the latter ff. 49r–56r. They are both fragmentary drafts, heavily revised. Internal evidence affords a possible place for ‘Anatomia’ as Section 5 of a larger-scale ‘De arte medica’ but it seemed prudent to let each of them speak for itself.

I knew from the first that the authorship of both documents is disputed and that the philosopher, John Locke, and the celebrated physician, Thomas Sydenham, are the putative rivals. After inquiring whether there might be other candidates and being told that no one else has ever been mentioned, I asked Anstey not to tell me his own opinion until I had offered him my findings. We held to this position until that time came, seeking in this way to secure an entirely independent assessment of the question. I have become accustomed, in recent years, to being asked for an opinion in cases where traditional methods offer no firm scholarly consensus. The virtues of computational stylistics are that it affords an altogether fresh perspective and that, in suitable cases, it yields highly probable conclusions. Its limitation is that, being statistical in character, it can never bring certainty.

Since both documents are in Locke’s hand, it seemed strange that the matter should be disputed. I have since learnt, however, that there are indeed some manuscripts in which Locke acted as an amanuensis for Sydenham. At that time the two men were associated, as medical practitioners, while Locke was living in the household of Anthony Ashley Cooper, then Lord Ashley but better known afterwards as the first Earl of Shaftesbury (and Dryden’s Achitophel). Through Locke, it seems Ashley sought Sydenham’s medical advice on at least one grave occasion. Locke, of course, was to continue in that household as a secretary and confidant, and was later to become the mentor of Shaftesbury’s philosopher grandson, the third Earl. But Locke had begun his career as an Oxford graduate with a strong interest in medicine and natural philosophy; and he wrote at least one undisputed medical piece, a little essay entitled ‘Morbus’ (in British Library Add. MS. 32554).
All these Latin titles point to a major stumbling block. Both dubia are in English. But, at that time and long afterwards, medical discourse was usually conducted in Latin. Locke’s wide-ranging English corpus lacks substantial medical texts of a kind that would allow close comparison with our dubia. And Sydenham’s extensive published work is almost all in Latin. To effect the sorts of comparison required, it seemed best, on Locke’s side, to range widely both in subject and in date of writing and to hope that diversity would alleviate the difficulty mentioned. On Sydenham’s side, I had to make do with two sizeable texts, one medical and one theological, and a small body of letters on medical topics. Nothing else in English, it seems, is his beyond dispute.

On Locke’s side, then, diversity rather than careful deliberation was to guide our choice of texts. At my request, Peter Anstey supplied long extracts from Locke’s *Essay concerning Human Understanding* (the opening Epistle to the Reader and Book I, chapter 1) and from his ‘Second Treatise’ of *Two Treatises on Government* (chaps 14–19 paragraph 211). Peter Anstey introduced *An Essay concerning Toleration* (1667). (This work is not to be confused with the better-known *A Letter concerning Toleration*, which is a translation by William Popple of Locke’s Latin original.) Anstey also added texts of *The Elements of Natural Philosophy*, ‘Morbus’, and a diverse selection of Locke’s personal letters. These letters fell easily into two groups. The larger consists of letters to various people on many subjects, most of them written when Locke was in France at different times. The smaller group, addressed to a medical friend, John Mapletoft, is dominated by one of the earliest clinical accounts of a severe bout of trigeminal neuralgia (Tic Douloureux). The patient was Lady Northumberland, wife of the Ambassador to the French court. She was treated by Locke, who was visiting the house at that time. These letters amount to urgent reports to Mapletoft (and through him to Sydenham), in London, seeking reassurance and advice about the regimen he is pursuing. Nothing else Locke wrote has so much in common with Sydenham’s usual line of country.

On the other side of the inquiry, Anstey supplied me with texts of a large portion of a treatise of Sydenham’s on the diagnosis and treatment of various fevers (Royal College of Physicians MS. 572), which was first published in 1991 as ‘Medical Observations’; his *Theologia Rationalis*; and a full set of his surviving letters. Unlike Locke’s, these letters are all much of a kind and are devoted almost entirely to medical topics. Anstey also provided texts of the two dubia. And, finally, he provided an essay entitled ‘Tussis’. Like the two dubia, the manuscripts of this text are in Locke’s hand but he himself ascribes it to Sydenham (Bodleian MS. Locke c. 42 [first part], pp. 258–9; and NA PRO 30/24/47/2, ff. 75r–78r). This essay, which runs to 2678 words, will be set beside the dubia as an independent specimen of much their kind. This allows it to serve as a useful benchmark.

Since the manuscript material was full of the vagaries, inconsistencies, and contractions of seventeenth-century spelling, I considered that we should modernize throughout. To do so is to gain a valuable consistency at the cost of some rather erratic idiosyncrasies. Passages of quotation, mostly in Latin, and medical prescriptions were excluded. Some contracted forms were expanded. A few very frequent words were tagged so as to distinguish forms like ‘to’ (infinitive particle) and ‘to’ (preposition). But it is time to turn from these preliminaries towards our methods of analysis.

2.2 Computational stylistics: a sketch of the discipline

As Harold Love has shown, in a searching assessment of both traditional and computational practices, the scholarly discipline of stylistics has its roots in antiquity. It has always embraced, without being confined to, studies in the attribution of authorship.

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(In that application especially, it has often been called ‘stylometry’.)\(^{121}\) In all its forms, stylistics draws upon the observation that individual authors have habitual turns of expression that distinguish their work from that of others and upon the not unnatural inference that such habits might make it possible to establish the authorship of anonymous and disputed texts. Such habits, it has come to be held, may lie in the choice of favourite words and phrases or even in characteristic forms of sentence, whether simple or elaborate. Whatever their form, they might be expected to manifest themselves in their relative frequencies of occurrence in one author or another. The advent of computer technology, in the last quarter-century or so, has enriched and strengthened research along these lines and enabled us to speak of ‘computational stylistics’. Whereas an earlier scholar, like G. Udney Ule\(^ {122}\) or the redoubtable Josephine Miles,\(^ {123}\) would observe a phenomenon and then undertake enormous labours to establish whether it was truly idiosyncratic, it is now possible to make exhaustive comparisons across an ever-broadening range of electronic texts. It is now possible, moreover, to extend an inquiry into areas of vocabulary, especially the most frequent words of the language, so unobtrusive though ubiquitous that their frequency-patterns had never been given much attention. All in all, our methods of analysis are becoming increasingly stringent and our results increasingly reliable. These last assertions rest upon extensive trials in which, the truth being known, our tests themselves are tested.\(^ {124}\)

The present article concerns a problem of authorship attribution. But it is worth pausing to note that computational stylistics also bears on the central interpretative work of literary scholarship. Unless we can reliably distinguish writings by one author from those of others, much of our commentary can never be robust. And although our analytical tools are of recent origin, our work is grounded in close textual comparisons and so takes its place in a long and honourable scholarly tradition.

But whether the task be to identify the likely author of a doubtful text or to investigate a given author’s known writings, the premise that authors have consistent and idiosyncratic habits of expression should not go unquestioned. To what extent do such habits persist when an author shifts from one literary form, one genre, to another — from prose fiction to verse, from private letters to a formal report? And to what extent do such habits persist over a long literary career? Recent work shows that, while differences of genre exert marked effects on authorial styles, some idiosyncrasies do persist strongly enough to justify our labours. And while the matter of change over time in the work of a given author has not been investigated as fully as it deserves, most authors write consistently enough to remain identifiable. The exceptions (and they are rare) usually arise when, over a long career, a writer makes particularly sharp changes in both subject and genre. Edmund Waller, for example, passes from youthful love lyrics to a middle phase of political and occasional verse, and on again, in his old age, to vast Biblical epics. A few ‘Wallerian’ idiosyncrasies survive but the links are a little tenuous.

By taking account of the whole vocabulary of sufficiently representative authorial samples, we can surmount another obstacle. There is an element of self-fulfilment in work that begins in the observation of some stylistic phenomenon and goes on to demonstrate its presence. Such procedures are not necessarily circular because a proper range of comparisons may show that the phenomenon is not truly idiosyncratic. Even so, there is much to be said, now that computers make it possible, for taking everything into account and

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allowing it to speak for itself. An holistic approach has yielded some promising results.\textsuperscript{125} But it is desirable, I believe, to accept that different strata in the frequency hierarchy of the language call for different sorts of stylistic test.\textsuperscript{126} In the topmost stratum, which comprises the most frequent words, like the and of, words that we use whenever we write or speak, any authorial idiosyncrasies will manifest themselves in concomitant variations of frequency. A second stratum comprises words that one author uses relatively often, another seldom or not at all. The bottom stratum comprises words that one author uses, however rarely, while others do not use them. In the following discussion, each stratum will be tested in its turn.

In inquiries of this kind, the establishment of an appropriate word-list is an important step. My first attempts, in the present case, used a list derived from my existing set of essays by twenty authors of the period. This list proved unduly redolent of a vocabulary like Locke’s because the set dealt not in medicine but leaned rather to philosophy, politics, economic thought, aesthetics, and literary criticism. If there had been other candidates for the authorship of the dubia, one might have added other seventeenth-century medical writers to the set and so produced a more appropriate word-list. As things stood, however, it seemed feasible to effect a suitable balance by constructing a list drawn exclusively from Locke and Sydenham. Only part of their work was used for this purpose, some being reserved, along with the dubia, as independent specimens.

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Table 1. List of texts


The chosen sample of Locke’s work comprised the Epistle to the Reader from the Essay, the Essay concerning Toleration (1667), and ‘Morus’, the last of which contributed a little medical language. The sample might easily have been enlarged but the comparative dearth of material on Sydenham’s side was an unavoidable constraint. In the event, this sample, of 169,15 words, proved adequate. A Sydenham sample of 16847 words was made up of the first half of our sample of ‘Medical Observations’ and the whole of Theologia Rationalis. The latter, of course, supplied some of Sydenham’s non-medical vocabulary. Table 1 summarizes the foregoing account of all these preliminary matters. It also shows how the whole set of texts was broken up for the first series of analyses. In the Table’s first entry, for example, the first column offers the labels L1–L6 that will be used in the first series of graphs. The second column offers a short title for the text. The third shows that this text is segmented into five successive sections of 2500 words apiece and a residual sixth segment. The attached footnote supplies more bibliographic detail than the Table.127

2.3. The evidence of the very frequent words

In the course of the last twenty years, it has become increasingly evident that mere word-counts of the words which occur most frequently in typical English texts (and likewise in other languages) carry rich and accurate information about the provenance of the texts themselves — information reflecting authorship, genre, historical era, and even authorial gender. The reason they can do so is not that any single instance of the or or or or I is unexpectedly rich in meaning. They do so through concomitant variations between text and text in their relative rates of occurrence. When the pronoun I occurs more (or less) often than usual, it is very likely that my and me will follow suit and not unlikely that you and your will do so. ‘Not unlikely’, I say but far from certain: older texts may use thou and thy; and, that aside, some authors, Thomas Sydenham among them, who make much use of the first person pronouns do not speak explicitly to their putative readers. Already we see small hints of historical change and of authorial idiosyncrasy. Genre makes itself felt when Sydenham turns from first-person reports of his medical proceedings to personal letters on just the same subjects. I and me flourish as before but they are now joined by an abundance of you and your.

The varying frequency patterns of other groups of common words are as powerful, though not always as easily understood, as those of the personal pronouns. Most prepositions occur more freely in serious, information-laden documents than in personal

letters or fictional dialogue. Among them, of and in are often close allies of the in writing of a descriptive cast. Strong intensifiers tend to occur more freely in texts by women writers. This is especially true of such absolutes as none and all, never and always. So, too, with the modal auxiliaries, which are markers of compound verbs and which (like the infinitive particle to) are usually most abundant when the past is being lamented, the future doubted or desired. Both Locke and Sydenham make some use of hath and doth, old-fashioned even then though not yet archaic. But Sydenham’s preference for them is more consistent and, unlike Locke, he rarely uses has and does, their ‘modern’ substitutes. More generally, Sydenham is among those writers of every era who use more archaisms than their fellows. Beyond all these classifiable cases and at every level of the word-frequency hierarchy, there is evidence like this, much of it unexpected, of authorial idiosyncrasy. Our task is to elucidate and apply it.

The overall stylistic contrast between Sydenham and Locke can be summed up as ancient versus modern. Any reader with an ear for seventeenth-century prose style would, I believe, find echoes of the past in Sydenham’s gnarled syntax as well as his archaic idioms. Locke’s style is altogether more up to date. It is in keeping with the sort of prose recommended by Thomas Sprat and promulgated by the newly founded Royal Society. It looks forward to Addison and the era when his Spectator was seen as a model for English prose.

Reverting to the very frequent words, we know that such phenomena as I have glanced at have their part in our every utterance and have always done so. The advent of computing has made their varying frequencies more accessible and enabled us to study their behaviour more thoroughly. Some long established statistical procedures have been used for the purpose and new ones are continually being introduced and tested.

One sometimes encounters a passionate, almost a superstitious belief that, with words as also with people, such procedures as counting and measuring violate a unique integrity. Now it is true that any word does its work, has its full being, in its context. The same thing can be said of a man like me. That should not preclude our putting words or men among their fellows, counting them as instances and comparing facets of their behaviour. As I write, the voting intentions of the Australian public are being assiduously studied. Everyone who expresses an intention is other and far more than that expression. Those who express the same intention will differ in many ways. Yet if those expressions are gathered in sufficient numbers and rest upon proper sampling, they shed light on our nation’s future. In an era when statistical procedures are ubiquitous, it is not self-evident that words should be exempt.

In the matter of word-counting, the texts analysed need to be of adequate length, the words need to be chosen in a manner that does not pre-empt the outcome, and the procedures employed need to be appropriate to the case. In the present instance, the texts are all long enough for confident analysis. I have already described the manner in which an appropriate word-list was established. As for choosing an appropriate statistical method, the relationships among these texts proved too complex for cluster analysis, which is often one of the more useful techniques. This approach regularly placed ‘Anatomia’ and ‘De arte medica’ with Locke, ‘Tussis’ with Sydenham, all results of real interest. But my various exercises in cluster analysis often placed Sydenham’s Theologia Rationalis with Locke and seldom found an easy home for Locke’s Elements. Such outcomes were suggestive but could not be seen as thoroughgoing evidence of authorship.

These were not adventitious difficulties. Besides their differences of subject, the speculative style of Theologia and the bald expository style of Elements are not at all typical of their respective authors. But a statistical procedure known as principal component analysis proved able to recognize and then to accommodate these departures from their more characteristic work.
Principal component analysis assesses scores for a given range of variables in a chosen set of specimens. In the present case, the variables are the ninety-nine most frequent words in the two main sets — some 32000 words comprising the Locke miscellany, the first half of Sydenham’s ‘Medical Observations’, and the whole of his Theologia. Raw frequencies for each of these variables were extracted from thirty-five specimens of text, segmented as shown in Table 1. These raw scores were then standardized as percentages to allow for differences of length among the specimens. The outcome is a table of thirty-five columns, each ninety-nine rows deep. Ninety-nine variables are as many as our statistical software can accommodate for the necessary calculations. Since the topmost ninety-nine word-types embrace over sixty percent of all the word-tokens in any ordinary English text, the limit still allows us ample evidence.

This array of data yields a correlation matrix, a table in which affinities and disaffinities among the word-counts reveal themselves. The closest affinities, as between I and me, yield correlation coefficients of 0.800 or more, still some way short of 1.000, the mark of a perfect affinity. The strongest disaffinities, such as often arise between I and the, tend to lie beyond -0.700, still well short of -1.000. The correlation matrix, then, is a table of relationships among the scores for all ninety-nine variables, each compared with every other. The most an unassisted human observer can do with a table of almost ten thousand entries is to search patiently for unusually strong scores, positive or negative, or to seek out the partnerships formed by chosen variables.

Principal component analysis, however, has the capacity to assess the whole range of partnerships and pick out whatever patterns of concomitant variation may be present in the chosen range of texts. The strongest pattern, reflected in the first principal component, is shown as a ‘vector’, a sequence of scores ranking the variables in terms of their strongest pattern of resemblances and differences. The second component yields a vector expressing the next strongest pattern. And so on, through a series of patterns ever diminishing in force.

At this stage, the patterning of chosen vectors, usually the first two, can be shown in a scatter-plot like Figure 1b. But, before turning to the stylistic information it reveals, let us consider Figure 1a, in which the texts themselves are arrayed according to their conformity with those stylistic patterns. It is as if Figure 1a were a parliamentary chamber in which the various partisans joined with others of like mind and then took their seats in accordance with a scheme designated in Figure 1b.

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129 The linguist’s distinction between types and tokens is simple but important. The word-type and comprises such word-tokens or instances of and as are to be found in a given body of text.
In Figure 1a, the Locke entries, labelled L1–L19, lie to the right while the main body of Sydenham entries, S1–S10, lie to the left. S1–S4 and L1–L4 represent the largest texts used in the creation of our word-list. Most of these entries lie out towards the two extremities. While that is not a strict necessity of the case, it is to be expected: the most frequent words in such a set will include not only those of which both authors make free use, but some that one or other uses in particular abundance. L6, however, the entry covering Locke’s ‘Morbusic’, also a participant in making the word-list, does not comply. It lies well on Locke’s side of the authorial boundary but not on the extreme right. Like L18, which embraces the letters to Mapleton, it shows that Locke’s medical writing can be distinguished from Sydenham’s. Set against that background, the behaviour of the dubia and ‘Tussis’ is instructive. ‘Anatomia’ and ‘De arte medica’ are both in Locke’s territory, ‘Tussis’ in Sydenham’s.

Although they lie, as they should, nearer to Locke’s group than to Sydenham’s, the three entries for his Elements (L15–L17) are well apart from his other, more characteristic work. Where cluster analysis yielded equivocal results, principal component analysis proves able to mark the text as Lockean while showing that it is atypical.

The main anomaly in Figure 1a, the location of entries S11–S13, is a little harder to resolve. These entries, representing Sydenham’s Theologia, lie deep in Locke’s territory on the horizontal axis of Figure 1a and within its upper range on the vertical axis. But, when the third principal component is introduced as the vertical axis of Figure 1c, this anomaly is partly resolved. The three entries now stand well apart from Locke, though still not close to Sydenham’s main group. The addition of this third dimension means that our parliamentary chamber should now be seen as a fish-tank. Besides looking from above, we are now able to look through the side wall. The fish cluster not only at either end and towards either side but also at different depths. And, as if this were a microcosm of Marvell’s Ocean, ‘each kind, | Does straight its own resemblance find’. For the outcome of the analysis, as registered by its three most powerful vectors, is an accurate separation between the two sets of authorial entries despite their heterogeneity of style and subject. As for the dubia, the principal component analysis, like the cluster analysis before it, associates ‘Anatomia’ and ‘De arte medica’ with Locke in both graphs. It locates ‘Tussis’ with Sydenham.
Why should all this be so? Figure 1b, from which Figure 1a is derived, has much light to shed. The first thing to catch the eye, I think, is a small group of lexical words at the extreme left. That is Sydenham’s territory, as we have seen, and fever, blood, and patient occur freely in his vocabulary. They might, of course, be excluded from the word-list as being less authorial than topical. Such ‘cherry picking’ is objectionable in principle because, once begun, it is too easily extended and can lead to a manipulation of the results. In practice, the interrelationships among large numbers of words, as in Figure 1b, are resilient enough to withstand some interference of this kind. Time, for example, is not usually medical in colour. Yet it stands out at the left beside patient, blood, and fever because Sydenham, as medical observer, has much to say of the time of year and time of day. Words like this, very, most, when, at, and same are also associated with the details he records. Even his preferred auxiliary verbs, was and were, flourish in his accounts of ‘what I saw’, ‘what I did’, and how admirably it took effect. There is, in short, no clear way to draw the line. By the time one had culled all the words that seemed topical rather than authorial, few would survive. It is better to allow the word-list to select itself and to study an outcome free of intervention except for that entailed by the original choice and editing of the authorial samples.

The right-hand extremity of Figure 1b, Locke’s end of the continuum, does not speak so clearly of a single topic because Locke’s texts range more widely. But the fact that three medically-oriented texts lie on this side of the border in Figure 1a makes it clear that the horizontal axes of both these Figures do not reflect a simple division between medical and non-medical topics. Some other influence, most likely that of authorship, must be at work.

The presence, towards the right-hand extremity, of man, men, and all the third-person pronouns (except she and her, both absorbed with woman in the old generic masculine) reflects a strong emphasis on human behaviour. The proximity of the relative pronoun who to these nouns and pronouns reflects one of Locke’s favourite idioms, where ‘he who’ and ‘a man who’ lead into generalizations, often derogatory in cast. (‘Those who’ is another variant.) All and no, these and those (as opposed to Sydenham’s this), such and what help to give an air of generality. The abundance of present-tense verbs gives Locke’s work a disquisitory bearing. As to syntax, the conjunction that, the sign of most noun-clauses, the inferential conjunction for, and two of the three main relative pronouns all testify to Locke’s stylistic amplitude. And the confident appeal for agreement in we/our — ‘what we know’ and ‘what we may suppose’ — is the mark of a speaker quite distinct from Sydenham’s I.

Figure 1b. Locke, Sydenham, and three test-pieces. Principal component analysis of the 99 most frequent words.
If I leans towards Sydenham on the horizontal axis, it also lies with me and my at the upper vertical extremity. As the corresponding placement of entries S9, S10, L18, and L19 in Figure 1a indicates, this is the territory of the letters — not easily distinguishable in authorship until they are taken aside and set in direct contrast with each other. It is here, naturally enough, that we find am, shall, will, had, and have. The infinitive particle is topmost of all and would and should are fairly near at hand. You and your are conspicuous absentees: the writers’ letters did not contribute to the selection of the word-list and so they lost their usual place among the most frequent words.

The lower extremity of Figure 1b is dominated by the definite article and the most frequent prepositions, markers, as noted earlier, of descriptive and expository work like Locke’s Elements. The vertical axis, then, offers a strong contrast in genre to complement the predominantly authorial contrast of the horizontal. The point to note here is that authorship and subject have subverted the usual predominance of the opposition between I and the, along with their respective associates. Douglas Biber and Edward Finegan are among those who have stressed the power and importance of this opposition.130 When principal component analysis is applied to textual analysis, I/the are usually among the drivers of the first principal component and of the horizontal axis. Their relegation in the present case shows how greatly these sets of texts differ from each other on the basis of their authorship and reinforces my findings about the dubia.

The third principal component, which governs the vertical axis of Figure 1c, deserves attention because it distinguishes Sydenham’s Theologia from Locke’s work. I have not offered the fourth scatter-plot, a Figure 1d, because the words that stand out there are few enough to be itemized as follows. Since this is rational theology, nature and being and things and made occur more frequently than elsewhere, as do yet and though. Should is fairly prominent but would lies at the opposite extremity. A low count for if may mark a time of confident belief. There are low counts, too, for any, one, and or, all of which are associated

with particularity as opposed to generality and, likewise, for the prepositions *at* and *on*, which usually have to do with the concrete rather than the abstract. Sydenham’s *Theologia Rationalis*, which governs the vertical axis of Figure 1c, is far from the transcendental but, in its abstraction and generality, it is theology none the less. The texts, not individually labelled, at the lower extremity of Figure 1c are those where the concrete and the particular abound. They are entries S9–S10 and L18–L19, representing the personal letters of both authors.

2.4. The evidence of less frequent words

In a recent article,\(^{131}\) I wrote of my trials of two new methods of analysis designed to offer comparatively independent tests of authorship to complement those treating of the very frequent words. Subsequent work of my own and trials, as yet unpublished, by Hugh Craig and by David Hoover, confirm their value and show that they are especially reliable in cases like the present one, where only two candidates need to be considered. Even though they employ radically different word-lists, the various tests cannot be said to be entirely independent of each other because there are subtle affinities between different frequency strata of a vocabulary. Where *fever* and *patient*, to take an immediate illustration, are among the most frequent words, words like *temperature*, *treatment*, *lesion*, *febrile*, and *morbidity* are more than usually likely to occur somewhere nearby. And yet, with that allowance made, word-lists derived from the different frequency strata remain substantially independent of each other.

In their two-candidate form, both these new tests compare sizeable bodies of work by each of the authors in question in order to identify words that each author uses more freely than the other. We are no longer dealing in concomitant variations of frequency among words we all use in everything we write. We are now looking at presences and absences among less ‘obligatory’ words. This is to postulate that the candidate who has made some use of a given word is rather more likely to use it again, in a separate text, than is an author who has made little or no use of it before.

The ‘Zeta’ test, as I call it, uses stipulations of consistency to identify those words to which one author demonstrably returns whereas the other does not. The ‘Iota’ test takes up the residue of all the words that the first author uses even once, the second author only once or not at all. Both tests tend, by definition, to exclude almost all of the very frequent words: any exceptions can easily be excluded so as to avoid overlapping from test to test.

Either of the main authorial samples of text is taken as a ‘base set’, the other as a ‘counter-set’. The whole vocabulary of the base set is then arrayed in descending order of frequency. Frequency counts for all these words are then extracted from equal segments — say, five segments — of the base set, from the whole counter-set, from a further body of ‘trial texts’ for each candidate, and from such dubia as are to be tested for their authorship. Appropriate rules of consistency for the Zeta test are then introduced and tested on the trial texts.

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\(^{131}\) John Burrows, ‘All the Way Through’ (cited in n. 126).
**Table 2. Locke, Sydenham, and four test-pieces. Zeta and Iota scores, with Locke as base.**

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Table 3. Sydenham, Locke, and four test-pieces. Zeta and Iota scores, with Sydenham as base.
The 16915 word-tokens of Locke’s Miscellany comprised 2543 distinct word-types. Sydenham’s 16847 comprised 2519. The sharp internal contrast between Sydenham’s ‘Observations’ and his Theologia Rationalis meant that the stipulation for consistency needed to be set at a high level. To be sufficiently Sydenham’s for our purpose, a word-type needed to occur in either four or all five segments of his base set. When those among them that occurred more than twice in Locke’s counter-set were excluded, only forty-four of the original 2519 survived. When the game was reversed and the same stipulations were applied to Locke, as base set, and Sydenham as counter-set, only forty-three of Locke’s original 2543 survived. These word-lists, forty-three for Locke and forty-four for Sydenham, yielded the Zeta results shown in the centre panel of Tables 2 and 3 respectively.

For the Iota tests, as shown in the right-hand panel of Tables 2 and 3, only such word-types of each base set as occurred in no more than two of its five segments met the first stipulation. This stipulation was satisfied by 2077 of Locke’s 2543 word-types and, in the reverse case, by 2012 of Sydenham’s 2519. Such of these as occurred even once in the corresponding counter-set were then excluded. The survivors amounted to 1420 when Locke supplied the base set, 1380 when that role fell to Sydenham.

In Table 2, Locke supplies the base set and Sydenham the counter-set for both tests. In Table 3, their roles are reversed. The texts are identified in Columns A–C. They do not all match the list given in Table 1 and used for the principal component analysis. Serving now as base set and counter-set, the two main authorial miscellanies can no longer take a place among the trial-pieces. To help compensate for this shortfall and to admit more exact comparisons, ‘Anatomia’ and the authors’ letters are now taken in segments approximating to 2500 words.

The Zeta outcome can be seen in Columns D–G and the Iota outcome in Columns H–K. Column D shows how many of Locke’s forty-three ‘Zeta’ word-types occur in each text in turn. Column E adjusts for different text-lengths by translating these raw frequencies into ‘hit-rates’ per thousand words. Columns F and G show the corresponding frequencies and occurrence-rates for the full body of word-tokens embraced by these forty-three word-types. (Columns H–K can await their turn for discussion.)

The upper rows of scores — the first five and the pair that follow — reveal no more than that, as they should, the stipulations imposed on the main sets yield a strong, pre-defined contrast: in Columns E and G, the base set outscores the counter-set by almost two to one in hit-rates and by almost twelve to one in occurrence-rates.

But the value of the Zeta test lies in the lower part of the table where corresponding scores are obtained from the independent texts. Among the hit-rates in Column E, none of Sydenham’s entries is as high as Locke’s mean-score (though three lie within a standard deviation of it). A similar but rather stronger pattern obtains among the occurrence-rates of Column G. The two authorial groups of independent trial-pieces, that is to say, stand in an overall contrast in which Locke outscores Sydenham. But, as often happens, mean-scores admit exceptions. In Column E and likewise in Column G, the rates for Locke’s Elements fall below his norms. With these middle-order words, as with the very frequent ones considered earlier, the language he employs in this little work of scientific exposition is far removed from that of his philosophical writings or his letters.

Meanwhile, in both hit-rates and occurrence-rates, ‘De arte medica’ and both parts of ‘Anatomia’ score within Locke’s range while ‘Tussis’ shows even more affinity for Sydenham.

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132 The value and the limitations of averages (or mean-scores) are widely understood. The role of standard deviations in measuring divergences from a mean may not be. For a lucid brief account, see Anthony Kenny, The Computation of Style: An Introduction to Statistics for Students of Literature and Humanities (Oxford, 1982). The immediate point is that, drawing on the scores for nineteen specimens, the means and standard deviations offered for Locke can bear a little weight. For Sydenham’s six specimens, however, the mean scores are merely indicative and the standard deviations are not worth calculating.
than in our earlier analyses. In the corresponding set of Zeta results in Columns D–G of Table 3, Sydenham provides the base-set and the higher range of scores. In hit-rates, even his lowest scores exceed any of Locke’s; in occurrence-rates, they exceed all but two. ‘Anatomia’ and ‘De arte medica’ clearly align themselves with Locke and ‘Tussis’ with Sydenham.

Figure 2. Locke, Sydenham, and four test-pieces. Zeta hit-rates per thousand words for twenty-nine specimens.

Figure 2 unites the Zeta hit-rates from Tables 2 and 3. These are taken from Column E in each table. For this illustration, the hit-rates offered a more conservative picture than the occurrence-rates. A preference for the hit-rate in this case is not arbitrary: whenever a single unit of standard deviation rises to half or more of the corresponding mean-score, as in Column G of each Table, the scores are too volatile for comfort.

In Figure 2, the scores along the horizontal axis grow more like Locke as they increase. In the same way, the vertical axis shows an increasing affinity for Sydenham. Where an individual entry is of particular interest, it can readily be identified by returning to the tables of data. An entry that scores low on both axes is not much like either author. Hence the location of the first two segments of Locke’s Elements, far out in the lower left hand quadrant. The members of Sydenham’s set of entries that overlap Locke’s set on the horizontal axis stand quite clear of it on the vertical axis. ‘Tussis’ lies deep in Sydenham’s territory while ‘Anatomia’ and ‘De arte medica’ are firmly ensconced among Locke’s entries.

It is time to return to Tables 2 and 3 in order to inspect the outcome of the Iota test. These are set out in the right-hand panel of each table. As before, the frequencies of word-types and word-tokens are converted into rates per thousand. These run much higher than the corresponding Zeta rates because, infrequently though each one of them occurs, we are now dealing with lists of around fourteen hundred members — over half the word-types in each main set.

As before and as might be expected, Locke prevails over Sydenham in Table 2 while Sydenham is ascendant in Table 3. There is less overlapping between set and set and, especially in Table 2, the standard deviations for Locke are relatively low. ‘Tussis’ yields scores like Sydenham’s and the entries for ‘Anatomia’ and ‘De arte medica’ continue to resemble Locke.
All this is illustrated in Figure 3, which can by now be allowed to speak almost entirely for itself. As before, I have used the hit-rates rather than the more flamboyant occurrence-rates for this graph. Either way, the Iota test effects an even clearer separation between the two authorial groups than did the Zeta test. The letters to Mapletoft about Lady Northumberland show a little more affinity for Sydenham, who did not write them, than for Locke, who did. My colleague, Hugh Craig, describes such phenomena as virtuous exceptions, salutary reminders that in this kind of work (as in life at large) we do not deal in certainty.

And yet, by virtue of their behaviour throughout my whole series of analyses, I believe that there can be no reasonable doubt that John Locke, rather than Thomas Sydenham, wrote ‘Anatomia’ and ‘De arte medica’. The various tests show that Locke’s known work can be distinguished from Sydenham’s. They show, as they should, that it is in their personal letters that the two writers most resemble each other. They show, as they should, that Locke’s Elements differs from a wide-ranging sample of his other work and that Sydenham’s Theologia differs sharply from his ‘Medical Observations’. Among the medical essays, the benchmark ‘Tussis’ stands unequivocally with Sydenham and the two dubia with Locke. At this point, it is time to move out of the arithmetician’s closet. It is time for this matter to re-enter history (as Harold Love, so sore a loss to scholarship, would say). Although I did not know it until my analyses were complete, they firmly support Peter Anstey’s evidence that Locke wrote the dubia. And, as he shows in Part One of the present study, the authorship of these documents is not a mere titular dispute about two manuscript fragments. They mark a significant moment in the history of English empiricism and their authorship defines an important line of influence.
3. Conclusion

It is clear from the foregoing study that ‘Anatomia’ and ‘De arte medica’ were written by John Locke. The analysis of these medical essays using computational stylistics together with a detailed analysis of the context of writing and content of both essays has put this question beyond doubt. Once these essays are viewed in the wider context of the medical disputes of their day and the more specific context of Locke’s other medical remains from the period, much of the evidence for the claim that Sydenham was their author quickly evaporates. They simply do not reflect Sydenham’s greater clinical experience, nor do they contain ideas unique to Sydenham or ideas that Locke could only have derived from Sydenham at the time that they were composed. If it is the case that John Ward’s diary reference to a proposed work by Sydenham refers to the dubia, this enables a very precise dating of the essays and places them far earlier than Sydenham’s first discussions of the method of natural history of diseases and the earliest datable writings by Sydenham in Locke’s hand.

In conclusion, we move from the question of authorship to the question of influence. There is a widespread view amongst Locke scholars that, regardless of who composed the dubia, Thomas Sydenham exerted a profound influence in the late 1660s on Locke’s methodological thought, an influence that can be traced through to the early drafts of *An Essay concerning Human Understanding* (1690). It is our view that the manuscript evidence does not bear this out. Rather, if a direction of influence is to be inferred from the relevant manuscripts and published works, the weight of evidence favours the view that it was through the mediation of Locke that Sydenham came to understand the power of the new methodological ideas in medicine.

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[133] See, for example, Walmsley, ‘Sydenham and Locke’s Natural Philosophy’ and Roger Woolhouse, *Locke: A Biography* (Cambridge, 2007), pp. 80–1. We would like to thank Michael Hunter and J. R. Milton for helpful comments on an earlier version of this paper.