

John Locke and Helmontian Medicine

Peter Anstey[©]

University of Otago

Introduction

What sort of physician was John Locke? In asking this question I am not inquiring as to how effective he was in his medical practice, but rather how best can we characterise his approach to physic. An accurate answer to this question requires a thorough survey of Locke's medical milieu, the influences on Locke, his medical remains and other relevant writings. Surprisingly, such an appraisal of Locke as a physician has never been undertaken.¹ One of the reasons for this, I believe, lies in the general neglect of what today are known as the 'life sciences' in the interplay between the historiography of the scientific revolution and the neo-Kantian categories of Rationalism and Empiricism through which much early modern philosophy has been interpreted. A second related reason is the poverty of our understanding of early modern chymistry until the last two decades.

There is no need to substantiate these claims about the effect of recent historiography on Lockean interpretation here. But it is important that a positive alternative set of terms of reference be substituted for Locke the empiricist and Locke the mechanical philosopher. I have argued elsewhere that the historical distinction, a distinction which informed Locke's own thought, between experimental and speculative natural philosophy provides an illuminating and historically grounded way of ordering and highlighting the methodological, natural philosophical and even medical doctrines which flourished in mid-seventeenth-century England.² It can also help to illuminate the medical thought of John Locke.

In this paper I intend to use this distinction between experimental and speculative natural philosophy as the background terms of reference for a survey of the salient aspects of Locke's medical thought, that is, of Locke as a physician. The survey will not be uniform in its coverage because detailed treatment of some of the issues has appeared in other studies which can simply be summarised here. But the cumulative picture will, I hope, provide an insight into the salient features of Locke's medical thought. To this end, after a summary of

¹ Sir William Osler's 'An address on John Locke as a physician' of 1900 provides a sketch of Locke's biography, his relations with Sydenham and transcriptions of some of the manuscript materials relating to Ashley's operation. Kenneth Dewhurst's *John Locke (1632-1704: Physician and Philosopher)* (1963) provides a more detailed medical biography, but needs to be approached with caution because of its many errors. Its value lies in the transcription of the medical notes in Locke's Journal. Robert G. Frank Jr discusses Locke's involvement with the Oxford physiologists in his *Harvey and the Oxford Physiologists* (1980).

² See Anstey 2005 and Anstey forthcoming.

the medical context, the survey covers Locke's medical methodology, his chymistry, his nosology (or theory of disease) and therapeutics, and his approach to physiology.

Medicine in England in the 1660s

From around 1659 through to early 1667 Locke invested considerable effort to equip himself in the cognate fields of medicine and chymistry. This period of self-directed study and practice coincided with an extraordinarily vexed phase in the history of English medicine. The institutional and theoretical status of the College of Physicians, and Galenic medicine as a whole, were subject to serious challenges and much of the debate was centred on physicians, chymists and natural philosophers within Locke's ambit. It is, therefore, impossible to understand the contours of Locke's medical remains from this seminal period of his development without first coming to grips with the storm that erupted around him.

In mid-seventeenth-century England qualified physicians received their training in the universities where they were taught the principles of medical theory and practice. This included the physiological, pathological, semiotical, hygenical and therapeutical parts of medicine. The dominant authority in the teaching of each of these subjects was Galen whose medical methodology was founded upon a largely Aristotelian natural philosophy. To be sure, medical students read widely amongst the recent medical authorities, but the underlying conceptual framework remained that of Galen while the *methodus medendi* studied, included both ancient authorities and the methods of treatment that had built up since the rediscovery of Galen's works in the sixteenth century.

Thus, for example, disease was conceived in terms of imbalances of the humours of the body and diagnosis and therapy were carried out by the application of the Aristotelian theory of qualities. From the time of Paracelsus there had been calls for the reform of medicine and these gathered in intensity in the writings of Francis Bacon and Joan Baptista van Helmont. Pressure for medical reform intensified as new discoveries in anatomy and physiology undermined the authority of Galen, as alternative natural philosophies emerged as rivals to Aristotelianism, and as new chymical remedies were developed by Paracelsian and Helmontian chymists. A group of outspoken chymists and chymical physicians emerged in London and Oxford in the 1650s who began to challenge the Galenists or Methodists (who applied the *methodus medendi*). One of the severest critics of the traditional practice of physic was the American émigré George Starkey who accused Galenic medicine of being "erroneous and defective, dangerous and impotent, partly lame and ridiculous, partly lamentable and desperate".³

The situation came to a head in 1664 when a bill to approve a new charter for the bastion of the Galenists, the College of Physicians, was defeated in

³ Starkey 1657, Sig. A6v-7r.

Parliament. Soon a rival College of Chymical Physicians was proposed and the 'chymical physician' Thomas O'Dowde published an 'engagement' giving notice of the intention to incorporate the new society.⁴ Reinforcing moves by the chymical physicians on the political front, Marchamont Nedham published a scathing attack on the College in 1665 called *Medela medicinae*. A bitter and highly charged pamphlet war immediately broke out between the chymical physicians and the Galenists which was to continue into the early 1670s.

The parties to the ongoing dispute can be roughly divided into five groups. First there were the traditional Galenists, often members of the College (Henry Stubbe, Robert Sprackling, John Twysden); second there were the chymical physicians most of whom had not received university training in physic (George Starkey, Thomas O'Dowde); third there were the promoters of the Royal Society, the new rival institution of the natural philosophers (Thomas Sprat, Joseph Glanvill); fourth there were those who are styled the 'virtuoso-physicians' who were sympathetic to the new natural philosophy and often members both of the Royal Society and the College (Timothy Clarke, Daniel Coxe); and fifth there was a small group of natural philosophers and physicians (Boyle, Sir George Ent, Thomas Willis) who somehow transcended the debates and whose views and authority was appealed to by both sides.

This was the highly charged and complex medical milieu in which Locke undertook to equip himself as a physician. Locke was not merely fully apprised of these disputes,⁵ but was actually acquainted, in some cases intimately, with many of the main actors, including some of the signatories to O'Dowde's 'Engagement'. The key evidence for this connection has only recently come to light in the correspondence of the itinerant chymist John Read. Read had an altercation with Locke around April 1665 over Read's and Thomas Williams' refusal to reveal the recipe of a secret substance to Locke, a substance by which Locke thought, according to Read, 'all nature might be discovered'.⁶ Locke was angered by Read's refusal, especially in view of the fact that Locke had introduced him to Williams, one of the agitators for the establishment of a Society of Chymical Physicians and a signatory to O'Dowde's 'engagement'. Read later wrote to Locke via Boyle, apparently in early 1666, in an attempt to appease him by revealing to him something of the 'holy water' which he had previously refused to divulge. The whole incident is of great interest, because of what it reveals about Locke's and Boyle's knowledge of the Society of Chymical Physicians in this most critical stage of plans for its establishment. Apart from the fact that Read should choose to communicate to Locke about the holy water and the Society through Boyle, thus reinforcing the evidence for their close association in chymical matters during this period, we also learn that Read included for Locke a letter to Marchamont Nedham which contained not only information about the holy water, but also many details about the Society and

⁴ O'Dowde 1665, pp. 93–5. The secondary literature on the Society of Chymical Physicians is now extensive. For seminal studies see Thomas 1953, Cook 1986 and Cook 1987.

⁵ Locke's library contains most of the major publications in the pamphlet war. See Anstey and Burrows 2009.

⁶ John Read to Robert Boyle, 1666, *Correspondence of Robert Boyle*, 3, p. 3. The various letters are printed in *ibid.*, pp. 2–14.

Read's hopes to be affiliated with it. Before this correspondence came to light there was no known connection between Locke and the Society, nor of Locke's early connection with Williams who went on to become chymical physician to Charles II.⁷ Nor was there such clear evidence of Locke's interest in alchemical secrets or his knowledge of Nedham and the latter's central role in the Society.

Methodology

The chymical physicians were a diverse bunch in both their theoretical commitments and the practical applications of their chymistry. They were, however, united by their opposition to Galenic medicine and by a loose cluster of methodological doctrines. The chymical physicians, to a man, called for an instauration in physic, but what each one thought should replace the hegemonic Galenism varied. Few, for example, would subscribe to the somewhat bizarre 'wormtack' theory of disease espoused by Nedham. As for their methodological views, many denied the utility of anatomy; some even denied the usefulness of botanics. In keeping with the new experimental philosophy they all privileged observation and experiment over learning based upon authority, and they decried the use of speculative theories and hypotheses in physic. Many were highly critical of some of the mainstays of the Galenic *methodus* such as phlebotomy and purging, and most of them based their criticisms of the *methodus medendi* on their critique of the humoral theory of disease and its concomitant theory of qualities.

Locke's medical writings from the 1660s subscribe to most of these methodological doctrines. His essay 'De arte medica' is an attempt at the reform of physic and contains a strong denunciation of speculative hypotheses and concomitant championing of observation and experiment. His essay 'Anatomia' is a critique of the efficacy of gross anatomy for physic. His essay on disease, 'Morbus', contains a seminal theory of disease that is typical of the writings of the chymical physicians such as George Thomson.⁸ Thus, it is clear that Locke aligned himself with the chymical physicians and against the Galenists.

However, once we descend into the details of Locke's views, we find that his position has its own subtleties and emphases which are best set in sharp relief by contrast with the views of other chymical physicians with whom he was broadly aligned. For example, in 'Morbus' he does not merely develop a pathogenic theory of disease in opposition to the humoral theory, but announces that he is seeking a *via media* between Galenists and Paracelsians – in fact he espouses an Helmontian theory (see below). Furthermore, in contrast to some chymical physicians Locke maintained an active interest in botany, assembling his own herbarium in the summer months of 1664 and 1665,⁹ and he never opposed bloodletting.

⁷ It has been long acknowledged that Locke recorded chymical notes from a Dr Williams, but he does not seem to have been identified. For more on Locke and Williams see below.

⁸ See Thomson 1666.

⁹ See Anstey and Harris 2006.

Now by the 1670s much of the heat had dissipated from the debate between the chymical physicians and the Galenists and while Locke's other intellectual and vocational pursuits competed and often obstructed his interest in physic, he continued to practise physic intermittently for the rest of his life. It would be wrong, therefore, simply to characterise Locke as a chymical physician if this appellation only connotes his polemical stance and affiliations in the formative 1660s. Furthermore, it would be wrong to characterise Locke as an open critic of the College of Physicians. As it happens, arguably the most important experience of clinical medicine that he was to have in his life involved the advice of a handful of the most eminent members of the College.¹⁰ This was his close involvement in the Anthony Ashley Cooper's operation in June 1668 to drain a large hydatid cyst above his liver and this. Furthermore. It appears that Locke remained on good terms with Sir John Micklethwaite whose advice he sought on a later occasion and who remained faithful to Ashley during his time in the Tower.¹¹ Thus, we must resist defining Locke the physician solely in terms of the polemical context in which his views were forged and examine more closely the actual contents of his medical and chymical remains.

Chymistry

Mention of Locke's 'medical and chymical remains' brings us to the important question of the relation between physic and chymistry in Locke's day. By the early seventeenth century the preparation of medical remedies was the primary application of chymistry. In fact, the German Paracelsian chymist Henricus Crollius had said in his *Basilica chymica* (1609) that 'Medicine and Chemistry can not be separated'.¹² Likewise, Daniel Sennert claimed,

Chymistry is not a peculiar Art, but belongs to Physick, and is the perfection of it, for it is the part only of the Physitian to use and apply Chymical medicines for cure, and [he] may be called then a Chymical Physitian, and the Medicines Chymical, which are the perfection of Physick.¹³

The theory of disease, its diagnosis and treatment, as well as many facets of animal physiology, such as respiration and digestion, were founded upon chymical theories of one sort or another. Virtually every leading chymist in England in the 1660s practised physic.¹⁴ The diversity amongst them can be

¹⁰ They were Francis Glisson, Sir George Ent, John (later Sir John) Micklethwaite and Timothy Clarke.

¹¹ See John Mapletoft to Locke, 3 December 1677, *Corr.*, 1, pp. 530–1 and the enclosure from Micklethwaite, *ibid.*, p. 532. For Micklethwaite's role in aiding Shaftesbury in the Tower see Haley 1968, p. 662.

¹² Crollius also claims that 'Chymia est solidae philosophiae fons, clavis sapientiae, anima & medulla physices, medicinae radix, & meta, in quan viri sapientes collimant', cited in Debus 1990, p. 182. See *ibid.* for further discussion of the relation between chymistry and medicine.

¹³ *Ibid.*, p. 174.

¹⁴ The one notable exception is Boyle. For a discussion of the relation between his chymistry and medicine see Principe 1998, pp. 186–8, 305, 307. For Boyle on the Galenists see Hunter 2000. For Starkey see Newman 2003, pp. 176–7 and Starkey's 'A Book on Paper of George Starkey', Newman and Principe 2004, pp. 319–27.

accounted for, in part, by the differences in the respective chymical theories and techniques that they deployed.

Locke's involvement in chymistry, and therefore in chymical medicine, probably began in 1659 and continued well into the 1690s. There were two important strands to Locke's chymistry. First, it is clear that he was deeply influenced by and practised chymistry in conformity to the mercurialist school who believed that the Philosophical Mercury, an essential ingredient in preparing the Stone, could be derived from common mercury. But there is a second, Helmontian strain in Locke's chymistry which is evident in his chymical notebooks, his correspondence and his medical receipts and which is easily account for in terms of important sources of influence such as Boyle and his good friend, the Helmontian physician David Thomas. To be sure it is slightly artificial to separate out these two strands of Locke's chymical thought and practice, and yet it is true to say that the mercurialist strand is the most fascinating in terms of Locke's chymical practice, while the Helmontian elements are most important for understanding Locke's approach to physic. I will deal with each of these strands of Locke's chymistry in turn. The evidence presented is illustrative rather than exhaustive.

Locke and mercurialist chymistry

The derivation of the Philosophical or 'Sophic' Mercury involved two processes: first the removal of 'external' impurities using well-established purification techniques such as washing, grinding and distillation; second the removal of internal impurities. It was this process that was believed to be essential for the animation of the Sophic Mercury. Once purified the Sophic Mercury is then able to liberate and nourish the seeds of gold and so enable transmutation.¹⁵ The actual process that Boyle used to develop the Sophic Mercury involved combining mercury with an alloy of pure metallic antimony and silver. William Newman has shown that Boyle learnt the technique from George Starkey who in turn had derived it from Alexander von Suchten. Where does Locke fit into all of this?

On 20 May 1660 Dr Ayliffe Ivey wrote to Locke at Oxford hoping for Locke's assistance:

I hope Sir, you will lett slippe noe occasion whereby you may better your selfe, and soe me, by your acquaintance with Mr. Boyle, I longe to have an accounte of my Quæries; I made Panacæa¹⁶ Last weeke and have sent you two dragmes, tis the First preparation calcined via humida, liquore alkahestico then, washed and dryed you may go higher and with spirite of wine acuated etc. drawe off his perfect tincture; but truelye this worketh

¹⁵ Summarising Principe 1998, pp. 153–5.

¹⁶ Glauber's panacea is probably Antimony pentasulphide, an expectorant. See BL MS Locke f. 25, p. 279 and BL MS Locke d. 9, p. 288 for entries on panacea.

admirable well and noethinge standeth in his way, and tis most safe to administer it secundum Glauberi modum ...¹⁷

Ivye's request suggests that he had sent some chymical queries to Boyle and that he hoped that Locke would follow them up for him. It is clear from this letter that Ivye believes that Locke is interested in his chymical preparations, not least because he had sent Locke two dragms of his Panacea and some details of his method of preparation of the expectorant: he refers to the *via humida* (the use of liquid solvents), alludes to van Helmont's alkahest and refers to the method of the German chymist Glauber. Moreover, this is the earliest known connection between Locke and Boyle and it suggests that Boyle and Locke were already discussing chymistry together by May 1660.

Three months later we find Locke writing to one J. O. that he had failed to find in the study of Mr B, that is Robert Boyle, the second part of a work by Alexander von Suchten (which he had promised him) and that instead he was sending a newly arrived work by Glauber (so fresh off the press that it had not even been bound). In fact, Locke had promised J. O. a manuscript translation of the second treatise of von Suchten's work on the secrets of antimony *Tractatus secundus de antimonio vulgari* (1604).¹⁸ He is almost certainly referring to the translation of von Suchten that now exists in volume thirty-four of the Boyle Papers.¹⁹ It is important not to be misled by Locke's comment in this letter that 'Mr B prefers Glauber to Sutchen' because, as mentioned above, von Suchten's method of preparing his Sophic Mercury as spelt out in the second treatise to which Locke refers, was absolutely crucial to George Starkey's preparation of the Philosophical Mercury and that Starkey taught Boyle von Suchten's method.²⁰ And, of course, we now know that Boyle was preoccupied with the preparation of the Sophic Mercury for over four decades because the preparation of Philosophical Mercury was thought to be a necessary preliminary to the preparation of the Philosophers' Stone.²¹

Was the young Locke cognizant of all of this? His chymical remains reveal that indeed he was. For in Bodleian Library (BL) MS Locke f. 18 which he used from 1659–1660, that is at the time of his correspondence with Ivye and J. O., Locke records his opinion of a substance called Hews Powder as described by his chymical friend and physician Dr William Currer (d. 1668). Currer, it should be noted, who was later to be a signatory to O'Dowde's 'engagement', had had an acrimonious dispute with Starkey in 1657–8.²² Locke says of him,

¹⁷ Ivye to Locke, 20 May 1660, *Corr.* 1, pp. 146–7. For notes from Ivye see BL MS Locke d. 9, p. 6; BL MS Locke f. 27, pp. 24, 38; BL MS Locke f. 25, pp. 117, 185, 262, 271, 305, 317a.

¹⁸ Alexander von Suchten, *Tractatus secundus de antimonio vulgari*, Leipzig, 1604.

¹⁹ Royal Society Boyle Papers (BP) 34, fols 1–152. Another translation exists at BP 14, fols 47–74.

²⁰ Newman 2003, pp. 135–41; Newman and Principe 2002, pp. 50–6

²¹ See Principe 1998. Interestingly, in a diary entry of 1681, during a period or renewed chymical activity between Locke and Boyle, Locke records the following comment by Boyle, 'Suckten a very good chemist', Dewhurst 1963a, p. 207.

²² For Currer's dispute with Starkey see Newman 2003, p. 190.

My opinion is Hews his powder is noething but mercury of antimony fixed with gold which worketh as this doth witsesse Suchtenius²³

We learn from this entry that Locke knew of Suchten's mercury of antimony either from Boyle's Latin translation of the Suchten's work and/or from conversation with Boyle himself. But was Locke, under the influence of Boyle, to become a covert chrysopoeian seeking the recipe for the Sophic Mercury? Was he a mercurialist when it came to developing techniques for generating the Stone? Did he also seek the alkahest, the universal solvent, through the purification of salts after the manner of van Helmont and Boyle? Was Locke a philosopher by fire? And most importantly, what light does this shed on Locke's views on the nature and practice of physic?

Around 1660 there was clearly a need in Oxford for some sort of instruction in chymistry for the clutch of young talented physicians that were associated with those practising the new philosophy there. To this end Boyle arranged for the German chymist Peter Stahl to teach a course in chymistry and Locke attended a course from 23 April to late May 1663.²⁴ Detailed notes from this course survive in BL MS Locke f. 25 and together with similar notes recorded by other we can glean a fairly clear picture of what Locke was taught. Stahl was a physician and he taught basic laboratory techniques for preparing chymical remedies much of which, according to John Ward, derived from Crollius a student of the German chymist Hartman.²⁵ If there is any truth to Anthony Wood's charge that during the course Locke was 'prating and troublesome' it might be because Locke had already been inducted into the chymical arts and had well developed chymical views of his own.²⁶

But BL MS Locke f. 25 contains far more than simply notes from the course with Stahl. Interestingly, it includes extensive entries relating to antimony and mercury and in particular the antimony of mercury, the alkahest and even the Philosophical Mercury.²⁷ Their presence is strong evidence that an important seam in Locke's own chymical outlook was mercurialist and that the various preparations relating to antimony were conceived within the theoretical framework deriving from the lineage of von Suchten→Starkey→Boyle. On the whole Locke's preoccupation was with chymical preparations that had some application in physic and the entries in BL MS Locke f. 25 coincide with period in which Locke was equipping himself as a physician. So, for example, the fact that John Read could write to Locke asking him 'What it is in mattells & Minnerall that

²³ BL MS Locke f. 18, p. 52. The entry begins on p. 43 and continues on p. 52. It was later copied to BL MS Locke f. 25, pp. 317a–b.

²⁴ See Walmsley and Milton 1999.

²⁵ 'Stall hath most of his praeparations out of Crollius and others notwithstanding what hee pretends of their being left him by his father', John Wards Diary, Folger MS V.a.291, fol. 90r. (Michael Hunter provided me with this reference.)

²⁶ Wood, 1, p. 472.

²⁷ The same is true of the chymical entries in BL MS Locke f. 27. See for example the entry on *Aurum* on pp. 434: 'to purify gold, melt the gold & put to it 2 or 3 times its weight of antimony that takes away the impuritys of the gold, & to carry away the Antimony put to it a quarter of its weight of sublimate to know whether the sublimate be good put it upon the tongue and it will stick to it'.

is Medicinal',²⁸ indicates that Locke was associated with the medicinal applications of chymistry. Moreover, it is, as we have seen, but a small step from the medical applications of the mercurialist theoretical framework to a full engagement in the teleological structure of this approach to chymistry, the quest for the Stone. Yet soon after this Read and Williams were to run into trouble over a chymical substance through which Locke feared 'all nature might be discovered'. Is it surprising then, that Locke supplied Boyle with his own recipe for an antimony of mercury *sub sigillo*, in secret, which still survives in the Boyle Papers?²⁹

Locke's chymical notebook (BL MS Locke f. 25) also contains records of recipes derived from various chymists and chymical physicians within his ambit, including William Currer and Thomas Williams (with whom Locke had had the altercation).³⁰ The most important of these is Boyle himself, and in fact, Boyle remains the single most important source of chymical advice and opinions in all of Locke's notebooks and many of Locke's chymical connections triangulate in various degrees with Boyle. One important example is Dr Scardius whom Locke met on his visit to Cleves during the winter of 1665–6. Locke had complained to Boyle of Cleves that 'their physicians go the old road, I am told, and also guess by their apothecary's shops, which are unacquainted with chemical remedies. This, I suppose, makes this town so ill furnished with books of that kind, there being few here curious enough to enquire after chemistry or experimental learning'.³¹ But his meeting with Scardius was productive. The many chymical recipes from Scardius in BL MS Locke f. 25 derive from the notebook BL MS Locke f. 27, which Locke took with him to Cleves and BL MS Locke f. 27 reveals that Locke almost certainly spent time in Scardius' chymical laboratory and that in addition to the preparation of various chymical remedies, they worked on antimony of mercury•.³²

After his return from Cleves in February 1666 Locke engaged in another period of chymical experimentation for which notes also survive in BL MS Locke f. 25. 1666 was also an important year in Locke's development as a physician and we will have cause to examine his medical writings from this period below. Locke seems to have been practising chymistry with his friend Dr David Thomas throughout the period from his return from Cleves on 18 February 1666 to the time of his departure for the household of Anthony Ashley Cooper in early April 1667. On 18 November Thomas wrote to Locke, who was visiting Lord Ashley in London, saying 'If you bring with you mercury ... we will make mercury sublimate our selves which wilbe much cheaper then to buy it'.³³ Once

²⁸ John Read to Locke, *Correspondence of Robert Boyle*, 3, p. 14.

²⁹ BP 26, fol. 102.

³⁰ For William Currer see MS Locke f. 25, pp. 23, 63, 277, 317b, MS Locke f. 27, pp. 47, 51 bis. For Thomas Williams see MS Locke f. 25, fols 39, 60, 249, 316, 359, 361, MS Locke f. 19, p. 207, MS Locke c. 44, pp. 60–1. Locke even received some receipts from Prince Rupert such as a recipe for *Auri tinctura*, BL MS Locke d. 9, p. 16. For Locke and Prince Rupert see Dewhurst 1963b.

³¹ *Corr.*, 1, p. 228.

³² BL MS Locke f. 27, p. 75, [Check entry•] Locke's drawings glassware and descriptions of apparatus (pp. 72, 80–1, 90) render it very likely that his notes were made in Scardius' laboratory.

³³ David Thomas to Locke, 18 November 1666, *Corr.*, 1, p. 296.

established in Ashley's household he wrote to Boyle that his fingers till itched to practise chymistry again.³⁴ In fact, while there is evidence that Locke assembled a chymical laboratory at Exeter House there is little evidence of his engaging in chymical experimentation. He did however practise physic and the period from September 1667 to September 1670 which proved to be the most intense years of medical practice that Locke was ever to experience. During these years Locke was able to start to apply some of the vast knowledge of chymical remedies which he had begun to accumulate in the late 1650s.

Locke's chymical interests never waned. There are chymical preparations notes and observations in his journal that testify to his ongoing interest in chymistry during his travels in France. Of particular interest is his discussion of Samuel Cottereau Duclos' potable gold, one of the most prized medicines in the armoury of the mercurialist chymist. Locke's entry for 22 June 1678 provides the recipe for Duclos' potable gold which had apparently 'cured quartans and dropsy', though Locke records that 'Mr. Briot told me Duclos was a great liar'.³⁵ He goes on to enter a query which he intends for Thomas Williams with whom he had clashed over the *sal circulatum* in 1665.

Q. of Sr T. Williams concerning the processe of this aurum potable of Dr. F. Anthony found amongst the papers of the Bishop of Winchester.³⁶

Later, near the end of Locke's exile in the Netherlands Thomas wrote again to him, this time about the potable gold.

I received the chymicall processes and have read Philalethes³⁷ more then once and doubt whether water in the receavor in the purification of the mercury may prejudice it That being in other processes prescribed. I desire you to read Jodocus Greverus in Theatr Chym vol. 3: p. 699 to the same purpose. I entend and am now preparing materialls for the potible gold which Mr Boyle assures though formerly of a contrary opinion is of very greate use and efficacy in physicke.³⁸

Boyle had indeed been sceptical of the potable gold in his *Usefulness of Natural Philosophy, II, i*, published in 1663.³⁹ However, his view changed, perhaps due to his involvement with the mysterious ambassador of the asterism Georges Pierre who sent him a recipe for the potent medicine. In fact, Boyle finally published his own recipe for the potable gold in his *Observationes physicae* in 1691.⁴⁰

³⁴ Locke to Boyle, 12 November 1667, *Corr.* 1, p. 315.

³⁵ Dewhurst 1963a, p. 128.

³⁶ Quoted from Dewhurst 1963a, p. 128. A copy of this entry is in BL MS Locke f. 28, p. 184. Francis Anthony (1550–1623) had a run in with the College of Physicians over his potable gold. See Debus 2002, pp. 184–5 for a summary discussion and references.

³⁷ Thomas refers to Philalethes Eirenaeus' *Introitus*, first edition Amsterdam, 1667. Unbeknownst to Thomas and Locke, this was written by George Starkey (LL 1554).

³⁸ David Thomas to Locke, 20 October 1688, *Corr.*, 3, p. 511.

³⁹ *Usefulness of Natural Philosophy, II, I*, *Boyle Works*, 3, pp. 381–2. For Starkey's attempts to make von Suchten's potable gold see Newman and Principe 2002, pp. 107–14.

⁴⁰ *Observationes physicae*, *Boyle Works*, 11, p. 419. For George Pierre and the potable gold see Pierre to Boyle, 3/13 May 1678, *Correspondence of Robert Boyle*, 5, pp. 77–8. For further discussion see Principe 1998, p. 145.

After Locke's return from France, his friend, the Helmontian physician David Thomas wrote to him on 16 January 1682 hoping to see Locke because 'this wilbe a convenient time for chemistry' and expressing to Locke that he believed that he could make a 'principall remedy' approaching the alkahest.⁴¹ The next notable episode in Locke's chymical engagements involved Francis Mercurius van Helmont, the son of the great Flemish chymist, whom Locke met in Amsterdam in late 1686 while in exile. Francis Mercurius van Helmont had edited his father's literary remains which were published as *Ortus medicinae* and *Opuscula medica inaudita* in 1648. Locke was reading them carefully as early as 1657/8.⁴² Francis Mercurius van Helmont was a peripatetic chymist and theologian whose most distinctive views concerned the transmigration of souls. In fact, it is most likely that the younger van Helmont's views on the nature of souls provided an important stimulus to Locke's later thoughts on the nature of personal identity. Be that as it may, we find that in December 1690 after Locke had returned to England Francis Mercurius van Helmont is providing him with a new furnace.⁴³ This signals a return to chymical trials on Locke's part that is almost certainly tied to his involvement with Boyle.

We now know that some months before Boyle's death, Locke received from Boyle a recipe for the Sophic Mercury. It is recorded in shorthand and code in Locke's Journal entry for 25 September 1691. A month later he mentioned in a letter to Boyle that 'I have water, and I have vessels, I only want soap to be at work'.⁴⁴ Lawrence Principe has shown that the 'soap' is the cleansing alloy for the internal process of purification of common mercury. After Boyle's death Locke corresponded with Newton concerning the preparation of the Sophic Mercury.⁴⁵ He made sure too that while he had access to Boyle's chymical papers he had about two hundred of them copied, including the crucial letter from Starkey to Boyle of early 1651 outlining the method of von Suchten for preparing the Sophic Mercury.⁴⁶ There is no doubt then, that in the early 1690s Locke was still keenly interested in Boyle's chrysopoeian ambitions and that he himself took measures to record them and to try them out experimentally.

Finally, in October 1694 a letter to Locke James Tyrrell says, 'I have no more but to assure you that as for the Manuscript you mention of the Course of Chymistry I doe not remember I ever so much as saw it'.⁴⁷ This suggests that even as late as 1694 Locke remained interested in chymical matters. It also seems likely that the manuscript containing the 'Course of Chymistry' is BL MS Locke f. 25 which we have discussed above. All of this evidence shows that Locke maintained a keen interest in mercurialist chymistry over four decades.

⁴¹ David Thomas to Locke, *Corr.* 2, p. 474.

⁴² See BL MS Locke e. 4, pp. 43-4 and 123-5.

⁴³ *Corr.* 4, p. 188.

⁴⁴ Locke to Boyle, 21 October 1691, *Corr.*, 4, p. 231.

⁴⁵ Locke to Newton, 26 July 1692, *Corr.*, 4, p. 485.

⁴⁶ Newman and Principe 2004, pp. 12-31.

⁴⁷ James Tyrrell to Locke, 16 October 1694, *Corr.*, 5, p. 163.

Locke and Helmontian chemistry

A natural concomitant to the chymistry of the mercurialists was a commitment to the chymical explanatory framework and, to a lesser extent the ontology, of the Flemish chymist Joan Baptista van Helmont. Van Helmont died in 1644 and his substantial manuscript remains were published by his son Francis Mercurius van Helmont in 1652. His writings exerted a significant impact on the Hartlib circle including George Starkey and the young Robert Boyle. By 1660 when Locke was beginning in chymistry Helmontian iatrochymistry was embedded in and had become one of the mainstays of reformist English medicine.⁴⁸

The story of the transmission and assimilation of Helmontian ideas in England from the 1650s is multifaceted. However, as is the case with the mercurialist approach to chymistry, Locke's main instructor in the application of Helmontian ideas for Locke was Robert Boyle. But also Locke read widely amongst the works of van Helmont and counted a number of Helmontian physicians amongst his friends. Of special note in this regard is David Thomas whom Locke seems to have befriended in the mid-1660s and who remained one of his closest friends.

Van Helmont's chymistry is predicated upon the view that the principles of matter are water and air and that water is the primal principle to which all substances can be reduced. Van Helmont claimed, following Paracelsus, that there is a universal solvent, the alkahest, which can reduce vegetables and minerals to their constituents and then to primal water. He identified Paracelsus' *sal circulatum* with his own alkahest. The alkahest operates by stripping substances of their forms, which forms are produced by the seminal principles that reside in the substance. Once the reduction has taken place the alkahest can then be separated off and reused because it is not affected by that which it works upon. Of particular importance for medicine was the fact that the alkahest could work on the essence of a substance and isolate the active ingredient within a substance from its inert and noxious matrix. This in turn enabled the development of more powerful specific medicines which, stripped of their noxious matrix, were able to override the *archeus* of each person and be absorbed by the intestines and thence ameliorate the diseased condition of the patient. By contrast, Galenic remedies were rejected by the *archeus* which purged the body of their gummous poisons. Moreover, the alkahest on its own had medicinal virtues in so far as it strengthened the *archeus* of the patient.

According to van Helmont, other substances over and above the alkahest had medicinal value. Of particular importance was the volatile salt of tartar which worked, not on the essence or crasis of the substance to be ingested, but on its noxious impurities. This process converted natural substances into perfected sulphurs which were by this process prepared for ingestion by the patient. There is a sense then in which the alkahest worked on the quintessence of the natural substance and the salt of tartar worked on its surrounding matrix.

⁴⁸ See Clericuzio 1993. Newman and Principe claim that 'Van Helmont's writings constituted what was probably the most wide-ranging and influential chymical theory of the second half of the seventeenth century', 2002, p. 296.

The volatile salt of tartar was, therefore, an important supplement to the alkahest in Helmontian medicine. Other Paracelsian medicines promoted by van Helmont include the tincture of Lile and *Mercurius diaphoreticus*.

It was mentioned above that van Helmont identified his alkahest with Paracelsus' *sal circulatum* and thus regarded it as a special species of salt. In fact, van Helmont had a well-developed classification of salts and a theory concerning their manner of interacting with other chymical substances. Van Helmont's tripartite distinction between acid, alkaline and urinous salts was taken up and adapted by Boyle who also derived a further tripartite division of spirits from Starkey. Boyle also adopted the Helmontian theory of exantlation by which it was supposed that acids lost their corrosive power which Boyle explained in terms of the mechanical affections of the subtle bodies involved rather than in the more vitalistic explanatory categories of van Helmont.⁴⁹

Now van Helmont deployed two features derived from Renaissance chymistry in the service of his iatrochymistry. First, he developed and applied quantitative techniques of gravimetrics for his chymical analyses of substances. Second, he used corpuscular explanations of the sub-microscopic material changes that gave rise to the chymical phenomena that he observed. He also developed the Paracelsian ontological conception of disease as pathogenic *semina* which have their own *archeus* which comes into conflict with the *archeus* of the patient. This conception of disease was naturally tied to the chymical theory of the therapeutic applications of the alkahest and volatile salt of tartar, but also had radical implications for the traditional Galenic *methodus medendi*. No longer was disease to be considered in terms of humoral imbalance and treatment determined in terms of addressing excesses and privations of the Aristotelian primary qualities, hot, cold, wet and dry. Instead, van Helmont decried the use of venesection and other traditional therapeutic techniques and advocated the development of chymical remedies based upon his conception of the operation of the *archeai* and the transformative power of his solvent and salts.⁵⁰

Van Helmont's was not the only conception of the alkahest, nor is it clear that the term 'alkahest' referred to one determinate substance in his *oeuvre*.⁵¹ Others such as the German chymist Glauber developed and applied their own alkahests.⁵² There was also a plethora of seminal theories of disease deriving from Paracelsus. In this regard, the views of the Dane Severinus provide a nice counterpoint to the Helmontian seminal theory of disease.⁵³ However, Helmont's ideas and laboratory techniques were undoubtedly the most influential in mid-seventeenth-century English medicine, and the most important locus of their development and deployment was in the work of Starkey and Boyle.

⁴⁹ Newman and Principe 2002, pp. 289–96.

⁵⁰ For a thorough treatment of van Helmont's theory of disease see Pagel 1982, pp. 141–61.

⁵¹ Porto 2002.

⁵² For Glauber's alkahest see Roos 2007, pp. 33–46.

⁵³ For Glauber's alkahest see Roos 2004, pp. 33–46. For Severinus see Shackelford 2004 and for a survey of theories of *semina* from the Renaissance to the period up to Boyle see Hirai 2005.

As it happens, all of these Helmontian substances and notions (the efficacy in physic of the alkahest and the volatile salt of tartar; the theory of salts; the seminal theory of disease; a concern with quantitative chymical experimentation and the application; and even the *archeus*) are to be found in Locke's chymical and medical notebooks and correspondence. Locke also sought out specific receipts deriving from van Helmont. Let us first examine the trail of Helmontian ideas Locke's chymical notebooks and his correspondence before turning to his more focused treatments of the nature of disease and animal physiology. We turn first to the alkahest. In late 1666 Locke wrote,

Sal Circulatus Paracelsi est Alkahest Cellaris p. 26 61⁵⁴

Clearly he is aware of the relation between van Helmont's solvent and Paracelsus' circulatory salt. In the same year he recorded a long note on Scardius' recipe for the alkahest in BL MS Locke f. 25, p. 194. Another entry from around the same time records Boyle's view of the medicinal value of the alkahest or similar substance,

Alkahest	Or a menstruum like it dissolv'd crud antimony, & when drawn of<f> left christall
	of very great efficacy in physick, pou'd upon salt of tartar & drawn of<f> & the remainder dissolv'd in water afforded strange chrystalls Mr Boyle

Just before leaving for London to join Ashley's household Locke wrote to Boyle concerning one of van Helmont's recipes for the use of warts cut from horses. Locke wonders

[w]hether they are to be taken from live horses, since (if I forget not) Helmont some where says, that if in hysterical fits, (for in that disease he commends them) you use those that are taken from an horse, *æstuante venere*, they have different effects from others.⁵⁵

Locke also seeks from Boyle advice on the correct dosage of *sal ammoniac*.⁵⁶

I thinke a principall remedy may be made by Armoniacke salts satiated with acid salts and volatilized which I beleeve may be by a short way effected and farther advanced to allmost the Alkahest.⁵⁷

Of course the alkahest was not the only Helmontian substance in which Locke took an ongoing interest. He also seems to have adopted, probably via Boyle, Helmont's theory of salts. For example in BL MS Locke d. 9 we find a signed entry implying a belief in the Helmontian tripartite division.

⁵⁴ BL MS Locke f. 25, p. 33. The work by Andreas Cellarius is *Harmonia macrocosmica*, Amsterdam, 1661 (not listed in Locke's library). In BL MS Locke d. 9, p. 132 Locke has notes on Paracelsus' 'Hilech', 'Paracelsus vocat Hilech magnum et sal circulatis minor' and 'Alkahest Paracelsi index ce mercurius philosophorum est non circulatum minus quod est Alkahest Helmontii'.

⁵⁵ Locke to Boyle, 24 March 1667, *Corr.* 1, p. 309.

⁵⁶ *Ibid.*, p. 310.

⁵⁷ David Thomas to Locke, 11 January 1682, *Corr.*, 2, p. 474.

Whether volatil or urinous salts, acid & alkali may by any art of chymistry be changed one into another & what difference is to be found amongst the particulars of each of these 3 species JL⁵⁸

Locke is clearly aware of the Helmontian origins of this theory. The very next entry concerns the derivation of volatile salts from herbs with a reference to van Helmont's *Ortus*:

How the oyls of hearbs may be turned into volatil salts v. Helmont de Feb. c. 15 §7 52.⁵⁹

Moreover, as will become apparent below, the Helmontian view of salts and spirits plays an important role in Locke's views on the use of respiration in animals and humans.

It may be objected that much of what Locke appropriated from van Helmont was undergirded by a speculative theory that included abstruse ontological categories such as gas, blas and ferments and that this is inconsistent with the experimental philosophy with its opposition to speculation and hypotheses. However, this is to miss three crucial features of the Helmontian legacy in Locke's thought. First, it must be said that almost all of Locke's chymical notes concern practical chymistry and there is no sustained discussion of underlying ontological categories. Locke's Helmontianism was practically and therapeutically oriented. Where Helmontian notions do appear, such as in his theory of seminal disease (to be discussed below), there is no detail explanation of what these categories actually are.

Second, on the rare occasions when Locke actually does report explanations of what is happening at the sub-microscopic level in chymical reactions, he is either reporting Boyle's corpuscular explanations or providing corpuscular musings of his own. For example, a marginal comment in BL MS Locke f. 25, p. 309 for an entry on Mercury of Antimony *ascendendo ad mitrusum • calorem* says 'This calx fixes the oily parts, & ~~fastens~~ imbibes them to itself Mr Boyle'. The important point here is that, as Newman and Principe have shown,⁶⁰ Boyle tended to give mechanical explanations of Helmontian processes and it is this 'de-vitalised' Helmontianism that he transmitted to Locke.

Finally, van Helmont's renown as an experimenter and his gravimetric techniques had a great impact on Boyle and this appears to have been particularly conducive to Locke. Locke's chymical notebooks contain many very detailed descriptions of chymical apparatus, particularly furnaces and reveal a concern with measurement.⁶¹ For example, in BL MS Locke f. 27, p. 56 he records a measuring technique developed by Boyle using a cubic inch of water:

A way without ruler or compass or calculation to measure with great exactnesse the magnitude of smaller bodys whether regular or irregular. Finde out the weight of a Cubic inch of water which once obtained tis easy to discover by the

⁵⁸ BL MS Locke d. 9, p. 39.

⁵⁹ *Ibid.*

⁶⁰ Newman and Principe 2002, pp. 289–96.

⁶¹ See BL MS Locke f. 27, pp. 56b–57 for a description of Boyle's sand furnace.

weights to be added to that Scale at which the body to be measured hangs immersed in water, how many times it looses by that immersion a much weight as amounts to a cubic inch of water Mr Boyle.⁶²

By the time of the first drafts of the *Essay concerning Human Understanding* Locke had come to see the importance of the development of standards of measure in natural philosophy in general and it seems that from this point on he developed a keen interest in metrology.

Nosology and therapeutics

Turning now to Locke's views on the nature of disease, we find that they are typical of those held by the chymical physicians of the 1660s and that the salient doctrines were widely held amongst Locke's peers. The *locus classicus* of Locke's view of disease is his 'Morbus' entry in British Library Add. MS 32554 about which much has been written. This espouses a seminal theory of some diseases as a *via media* to the views of the Paracelsians and the Galenists. Locke's treatment of disease in this long entry from c. 1666 is strongly Helmontian and illustrates the manner in which Helmontian medical ideas were seen as being in opposition to Paracelsian notions.

Of particular interest in 'Morbus' is the strong corpuscularism that underlies the theory. Locke delimits generation to two kinds: generation by seed and generation by the mixtion of parts,

some things are produc'd by seminall principles, & some other by bare mistion of the parts, to which might be added the circumstantiall assistances of heat & cold &c, by seminall principles or ferments I meane some small & subtile parcelles of matter which are apt to transmute far greater portions of matter into a new nature & new qualitys, which change could not be brought about by any other knowne means, soe that this change seems wholly to depend upon the operation or activity of this seminall principle, & not on the difference of the matter its self that is changd⁶³

Note too the reference to the Helmontian notion of ferments which for van Helmont are equivalent to formative power of seeds. Locke also speaks of the *archeus* of the disease,

How these small & insensible ferments, this potent Archeus works I confesse I cannot satisfactorily comprehend, though the effects are evident but yet I believe 'twould be worth considering, to finde what deseases spring from these ferments, such as I beleive are contagions.⁶⁴

⁶² The note was made on 26 September 1665. This entry and its date provide important background to Boyle's note on 'Weight of a Cubick Inch of Water' which was published, with Locke's oversight, in Boyle's *General History of the Air* (*Works of Robert Boyle*, 12, p.67). The material was also reworked for *Medicina Hydrostatica*, *ibid.*, 11, p. 242.

⁶³ British Library Add. MS 32554, p. 232.

⁶⁴ British Library Add. MS 32554, p. 237.

This is strongly Helmontian in tone and is typical of the theories of disease which Locke was reading in the mid-1660s. The seminal ferments are regarded, following Van Helmont, as invasive pathogenic agents which have their own *archeus*. Interestingly, Locke's discussion contains a residue of Galenism in his references to temperaments.

it may be observd that in many deseases of this nature, the particular constitution of the body doth not make the deseases though some tempers be better fitted to be wrought on by this & some by that ferment, though if the seminall virtue be strong enough it will lay hold on any soe most seeds will grow almost in any soyle, though in some they they thrive much better & others starve & dwindle. soe sanguine complexions are observd most easily to admit the seminall principles of the plague easily melancholy tempers more difficultly⁶⁵

The seminal theory of disease combined naturally with the miasmatic view Fracastorius and others that was promoted by Boyle, Hooke and later Sydenham.⁶⁶ Locke's own later foray into environmental medicine with Charles Goodall was predicated on this miasma theory and is evidence for Locke's continued belief in the seminal theory itself. And in fact, we find in his Journal entry for 22 July of 1678 that he claims 'certain body types may carry seeds of certain diseases, or are more predisposed to contract them'.⁶⁷

As many scholars have pointed out, this ontological conception of disease lends itself to the view that there are different species of pathogenic agents and Locke seems to have been particularly attracted to this feature of Thomas Sydenham's approach to fevers in the 1670s and its susceptibility to the method of natural history which, probably under Locke's own influence, became the hallmark of Sydenham's medical methodology and to which Locke had, under the influence of Boyle, long subscribed.⁶⁸ It is important to stress, however, that Locke concedes that not all diseases have this cause,

Other deseases I suppose may probably be conceivd to be producd by a bare mision of two unfitt ingredient<s>, as when acid & volatile salts are mixd, there presently is producd an ebullition, & then the two differing salts coagulate into a 3^d substance far enough different from either of the ingredients. which I suppose not to be donne by any seminall principle⁶⁹

The implicit commitment to an Helmontian theory of salts which seems to have played an important role in Locke's understanding of his own medical receipts as he went on and practised physic in later years. The depth of this commitment to this common theory of salts is perhaps best illustrated in his short disputation on the use of respiration and it is to Locke's physiology that we now turn.

⁶⁵ British Library Add. MS 32554, p. 237.

⁶⁶ See Nutton 1990 and Keele 1974.

⁶⁷ Romanell 1984, p. 139 and Dewhurst 1963a, p. 136.

⁶⁸ For further discussion see Anstey 2002a and Anstey and Burrows 2009.

⁶⁹ British Library Add. MS 32554, p. 248.

Physiology

In 1666 Locke drafted a medical disputation on the use of respiration. It now survives in the Shaftesbury Papers in the National Archives in Kew. It is entitled 'Respirationis usus' and is written in small difficult Latin.⁷⁰ Before we examine some of its contents, a note of caution is in order. Locke despised the disputations of the Schools which he regarded as vacuous performances designed to titillate rather than to instruct. It seems most likely that he composed this disputation in order to cover himself or at least his conscience, in his bid to have the degree of Doctor of Medicine conferred on him without fulfilling the requirements of the degree. With this in mind, we can surmise that there was in Locke's heart a degree of reluctance as he composed this draft and that its contents were designed more for the occasion than to record his own precise theoretical reflections on a very vexed problem in animal physiology. In other words, we shouldn't take all of what Locke says in the 'Respirationis usus' too seriously, at least not as the definitive statement of his views. It was not composed as a record of research findings, but at an academic exercise, a necessary evil in order to secure a Medical Studentship at Christ Church.

With these preliminaries in hand, let us turn to the text. The first thing to notice is the dramatic disputational form that it takes. While this is most evident to the reader of Latin, there is enough in translation to capture the theatricality of the prose. It opens thus,

Nature never hides and flees from us more than when she seems to come forth openly and to show herself to anyone as obvious and easy. The vital breath of air that we draw in and expel with continuous labor from the first moment of life to its final extent seems merely to jeer at us. It pours itself into our inner breast only to slip away, and it cheats the embraces into which it rushed at first, and with the same subtlety it escapes the sharpness of both mind and eyes.⁷¹

And it is not long before the Helmontian themes start to leap off the page. After speaking of the 'vestal fire of life' that nourishes us we are told that it is not the function of respiration to cool this fire but rather

there are so many kitchens of digestion and coction in the body, hence there are such various ferments of the internal parts all of which appear to work together so that there is finally something that can be inflamed and so that the vital flame may have tinder; to this purpose above all else, respiration seems to be devoted⁷²

The kitchen metaphor is classic van Helmont and the reference to the 'various ferments of the internal parts' speaks of the Helmontian theory of digestion. Locke then moves on to the theory the role of fermentation in the generation of animal spirits in terms redolent of Van Helmont,

⁷⁰ National Archives PRO 30/24/47/2, fs. 71r-74v.

⁷¹ NA PRO 30/24/47/2, fol. 73r.

⁷² NA PRO 30/24/47/2, fol. 73v.

It is now generally acknowledged by everyone that the life of animals consists in the continuous generation and flow of subtle spirits. It is evident that these spirits of the heart are generated either by heat or fermentation by means of a previous digestion of ingested substances in the stomach, the intestines, the mesentery, and other workshops.⁷³

It is the next stage of the process that brings us to the Helmontian theory of salts.

animal life turns upon this hinge, that a continuous and constant supply of animal spirit be produced, that is, that the parts of the blood be exalted into a subtle and volatile material.⁷⁴

This 'subtle and volatile material' is diffused throughout the body and when it has 'played its role'

these mature effluvia of the blood finally transpire and fly off into the breeze, thus furnishing a place for the spirits following behind them. In this way, by repeated circuits through the heart and lungs the mass of blood furnishes material to the vital flame, and finally the whole mass of blood, having been made volatile (leaving no residue behind) and transmuted into the nature of spirits, is breathed out and vanishes through sweat; this could never be done without the air's fellowship.⁷⁵

What is the solvent in the air that brings enables it to 'agitate, subtilize, volatilize, and finally kindle' the body? Following Robert Hooke, Locke speculates that

It would seem to be a certain highly volatile nitrous spirit, <for> some have not unaptly observed that saltpeter is the proper menstruum for sulphureous and inflammable bodies. Especially since it is well known that the volatile salts of animals (for example, of blood and of urine) produce niter when cofermented with earth exposed to solar rays⁷⁶

This is, in fact, the widely held Helmontian account of the role of the volatilisation of blood venous blood in respiration. Locke even deploys the corpuscular terminology so characteristic of Van Helmont:

it is probable that it is air which consumes bodies and makes them burn, not fire, which seems to be nothing other than the greatest agitation of the minute parts, while the air loosens their texture and shatters them.⁷⁷

The point here is not that Locke was a thorough-going Helmontian, but that these were the tropes, the turns of phrase, the theoretical framework that Locke had at hand to work with. To be sure, in his *obiter dicta* concerning respiration and air he is more circumspect and less flowery, but even there the stamp of Helmontian chymistry and physiological theory are everywhere apparent.⁷⁸

⁷³ Ibid.

⁷⁴ Ibid.

⁷⁵ NA PRO 30/24/47/2, fol. 73v-72r.

⁷⁶ NA PRO 30/24/47/2, fol. 72r.

⁷⁷ Ibid.

⁷⁸ See, for example, British Library Add. MS 32554, pp. 91 and 93; BL MS Locke f. 19, p. 158 (adapted from BL MS Locke f. 27, pp. 3-4 (rear)).

Conclusion

Let us turn again to the question with which this paper began: What kind of physician was Locke? It seems undeniable that he was a chymical physician, a mercurialist and an Helmontian. Locke was almost certainly inducted into the chymical arcana by Robert Boyle at least by early 1660 when he had access to Boyle's chymical papers and laboratory. It is little wonder then that Locke was one of three physicians to whom Locke entrusted his chymical papers on his death and that it is through Locke's copies of some of them that one of the keys to unlocking Boyle's own quest for the Sophic Mercury was discovered. It is somehow so appropriate that Locke should be a key to the chymical Boyle because so much of Locke's own development as a chymical physician was inspired by Boyle.

Four things are worth noting before in conclusion. First, while Locke was a mercurialist and was tantalised by the prospect of securing the Sophic Mercury, there is, to my knowledge, no evidence of Locke as a crypto-chrysopoeian. Unlike Boyle, who secretly pursued transmutation and was even duped by unscrupulous pretenders, such as Georges Pierre, Locke remained first and foremost one who sought to apply mercurialist and Helmontian chymistry in physic. Locke was not an adept.

Second, note the absence of Thomas Sydenham from this study. Many have and do hold that the seminal influence on Locke's formation as a physician, both methodologically and practically was Sydenham. Yet Sydenham was not, in spite of the efforts of Daniel Coxe,⁷⁹ attracted to chymistry, and before he met Locke, he seems to have had little if anything in common with the physicians within Locke's ambit. It was, I believe, Locke who influenced Sydenham in the matter of methodology, while Locke learnt from him much about the treatment and classification of fevers.⁸⁰ More importantly, however, what I hope that this study shows is that the distinctive character of Locke as a physician was set before Locke met Sydenham.

Third, Locke was not uncritical of his sources, teachers and those whom he read. He would have had no truck with the pretensions to revelation of the likes of Starkey and Van Helmont himself. This, for Locke, would smack of enthusiasm, though, to my knowledge, there is no record of his response to the revelatory claims of the chymists. And this brings us finally to the historiography underlying so much Lockean interpretation. How are we to square Locke's commitment to seminal principles and the teleological substructure of mercurialist matter theory with a commitment to the sparse ontology of a corpuscular matter theory and the primary and secondary quality distinction? It may be that in the final analysis there are two levels of explanation here, one corpuscular and another chymical, and that the latter is not reducible to the former. This seems to be the case with Boyle's notion of seminal principles.⁸¹

⁷⁹ Daniel Coxe to Boyle, 14 October 1666, *Correspondence of Robert Boyle*, 3, p. 249.

⁸⁰ See Anstey and Burrows 2009.

⁸¹ See Clericuzio 1990 and Anstey 2002b.

It should be noted, however, that there is a natural fit between Locke and van Helmont. Van Helmont was a serious experimenter who contributed significantly to experimental method in chymistry. In this he was a significant source for the experimental philosophy. His gravimetric techniques were deployed by Boyle who also performed some of his experiments, most famously the willow tree experiment. Now from the early drafts of the *Essay* composed in 1671 we know that Locke was deeply concerned with standards of measure and that he conceived of natural philosophy in terms of a corpuscular metrics.⁸² The corpuscular matter theory of Boyle was conducive both to Locke's ideal for a fully quantified natural philosophy and at the same time was part and parcel of the Boylean application of Helmontian ideas. If we add to this the iatrochymical focus of Helmontian's writings, it is clear that the whole package fits nicely with Locke's natural philosophical and medical outlook. Observation, experiment, measurement and cure were the hallmarks of this approach to medicine and these were central to the experimental philosophy.

Note too that Locke's appropriation of Helmontian medicine dovetails nicely with his other natural philosophical interests and methodological views. A life-long interest in botany fed into Locke's training and practice as a physician, as did his involvement in Boyle's researches into the air. All of this was subsumed under the Baconian rubric of the need to assemble natural histories, and the classification of plants, the classification of diseases as well as the assembling of meteorological readings, and even his foray into environmental medicine, form parts of an integrated whole that preoccupied Locke for four decades.

Locke left no legacy in chymistry or in physic, but his philosophical legacy is unchallenged. And it is possible when reading the *Essay concerning Human Understanding* to in blissful ignorance of Locke's involvement in chymistry and medicine. However, apprised as we now are of his mercurialist inclinations is it any wonder that the most common illustrations in Book Three are chymical ones; gold, antimony and vitriol. Perhaps there is an autobiographical element in Locke's claim that

That we find many of the Individuals that are ranked into one Sort, called by one common Name, and so received as being of one *Species*, have yet Qualities, depending on their real Constitutions, as far different one from another as from others, from which they are accounted to differ *specifically*. This, as it is easy to be observed by all, who have to do with natural Bodies; so Chymists especially are often, by sad Experience, convinced of it, when they, sometimes in vain, seek for the same Qualities in one parcel of Sulphur, Antimony, or Vitriol, which they have found in others.⁸³

⁸² See Anstey forthcoming.

⁸³ *Essay* III. vi. 8.

References

Anstey, Peter R. (2002a) 'Locke, Bacon and natural history', *Early Science and Medicine*, 7 (1), pp. 65–92. Reprinted in *John Locke: Critical Assessments*, 4 vols, (ed.) Peter Anstey, Abingdon Oxon.: Routledge, 2006, vol. 4, pp. 299–324.

-- (2002b) 'Boyle on seminal principles', *Studies in History and Philosophy of Biological and Biomedical Sciences*, 33, pp. 597–630.

-- (2005) 'Experimental versus speculative natural philosophy' in (eds) Peter R. Anstey and John A. Schuster, *The Science of Nature in the Seventeenth Century: Patterns of Change in Early Modern Natural Philosophy*, Dordrecht: Springer, 2005, pp. 215–42.

-- (forthcoming) *Locke and Natural Philosophy*.

Anstey, Peter R. and Burrows, John (2009) 'John Locke, Thomas Sydenham, and the authorship of two medical essays', forthcoming in *electronic British Library Journal*.

Anstey, Peter R. and Harris, Stephen A. (2006) 'Locke and botany' (with Stephen Harris), *Studies in History and Philosophy of Biological and Biomedical Sciences*, 37, pp. 151–71.

Boyle, Robert (1999–2000) *The Works of Robert Boyle*, 14 vols, eds Michael Hunter and E. B. Davis, London: Pickering and Chatto.

-- (2001) *The Correspondence of Robert Boyle*, 6 vols, eds Michael Hunter, Antonio Clericuzio and Lawrence M. Principe, London: Pickering and Chatto.

Clericuzio, Antonio (1990) 'A redefinition of Boyle's chemistry: and Corpuscular Philosophy', *Annals of Science*, 47, pp. 561–89.

-- (1993) 'From van Helmont to Boyle: a study of the transmission of Helmontian chemical and medical theories in seventeenth-century England', *British Journal for the History of Science*, 26, pp. 303–34.

Cook, Harold J. (1986) *The Decline of the Old Medical Regime in Stuart England*, Ithaca: Cornell.

-- (1987) 'The Society of Chemical Physicians, the new philosophy, and the Restoration court', *Bulletin of the History of Medicine*, 61, pp. 61–77.

Debus, Allen G. (1990) 'Chemistry and the universities in the seventeenth century', *Estudos Avançados*, 4, pp. 173–96.

-- (2002) *The Chemical Philosophy, Paracelsian Science and Medicine in the Sixteenth and Seventeenth Centuries*, Mineola, NY: Dover (1st edition 1977).

Dewhurst, Kenneth (1963a) *John Locke (1632–1704): Physician and Philosopher*, London: Wellcome.

-- (1963b) 'Prince Rupert as a scientist', *British Journal for the History of Science*, 1, pp. 365–73.

Frank, Robert G. Jr (1980) *Harvey and the Oxford Physiologists: A Study of Scientific Ideas*, Berkeley: University of California Press.

Haley, K. D. H. (1968) *The First Earl of Shaftesbury*, Oxford: Clarendon Press.

Hirai, Hiro (2005) *Le concept de semence dans les théories de la matière à la Renaissance: de Marsile Ficin à Pierre Gassendi*, Turnhout: Brepols.

Hunter, Michael (2000) 'Boyle versus the Galenists: a suppressed critique of seventeenth-century medical practice and its significance' in *Robert Boyle (1627–1691): Scrupulosity and Science*, Woodbridge: Boydell Press, pp. 157–201.

Keele, Kenneth D. (1974) 'The Sydenham-Boyle theory of morbid particles', *Medical History*, 18, pp. 240–8.

Locke, John (1975) *An Essay concerning Human Understanding*, ed. Peter H. Nidditch, Oxford: Clarendon Press (4th edition 1700).

Newman, William R. (2003) *Gehennical Fire: The Lives of George Starkey An American in the Scientific Revolution*, Chicago: University of Chicago Press (first published in 1994, Harvard: Harvard University Press).

Newman, William R. and Principe, Lawrence M. (2002) *Alchemy Tried in the Fire: Starkey, Boyle, and the Fate of Helmontian Chymistry*, Chicago: University of Chicago Press.

-- eds (2004) *George Starkey: Alchemical Laboratory Notebooks and Correspondence*, Chicago: University of Chicago Press.

Nutton, Vivian (1990) 'The reception of Fracastoro's theory of contagion: the seed that fell among thorns', *Osiris*, 2nd series, 6, pp. 196–234.

O'Dowde, Thomas (1665) *The Poor Man's Physician*, 3rd edition, London.

Pagel, Walter (1982) *Joan Baptista Van Helmont: Reformer of Science and Medicine*, Cambridge: Cambridge University Press.

Porto, Paolo A (2002) 'Summus atque felicissimus salium: the medical relevance of the Liquor Alkahest', *Bulliten of the History of Medicine*, 76, pp. 1–29.

Principe, Lawrence M. (1998) *The Aspiring Adept: Robert Boyle and his Alchemical Quest*, Princeton: Princeton University Press.

Roos, Anna Marie (2007) *The Salt of the Earth: Natural Philosophy, Medicine, and Chymistry in England 1650–1750*, Leiden: Brill.

Shackleford, Jole (2004) *A Philosophical Path for Paracelsian Medicine: The Ideas, Intellectual Context, and Influence of Petrus Severinus*, Copenhagen: Museum Tusulanum Press.

Starkey George (1657) *Nature's Explication*, London.

Thomas, Sir Henry (1953) 'The Society of Chymical Physicians: an echo of the great plague of London, 1665', in ed. E Ashworth Underwood, *Science, Medicine and History*, 2 vols, London: Oxford University Press, 2, pp. 56–71.

Thomson, George (1666) *Anatomizing the Pest*, London.

Walmsley, C. J. and Milton, J. R. (1999) 'Locke's Notebook "Adversaria 4"', *The Locke Newsletter*, 30, pp. 85–101.

Wood, Anthony (1891–1900) *The Life and Times of Anthony Wood*, 5 vols, ed. Andrew Clark, Oxford.