John Locke's Natural Philosophy (1632-1671)

Thesis submitted for the degree of Doctor of Philosophy

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Abstract

The thesis concentrates upon John Locke's early development in the field of natural philosophy. This can be divided up into several distinct stages. Locke's first serious engagement with natural philosophy was in 1658 to 1664 when he embarked upon an extensive programme of medical reading. In this period he became acquainted with many notable figures, including Robert Boyle. Boyle introduced Locke to the mechanical philosophy and the work of Descartes. From 1664 to 1667 Locke became interested in formulating his own views on medical topics, writing short essays on disease and respiration, in addition to his continued study of medical texts. Through a very detailed analysis of these early medical writings it is shown that Locke was not committed to the mechanical philosophy at this point.

In 1667, Locke moved to London and met Thomas Sydenham. This encounter had a huge impact on Locke's thinking. Locke collaborated with Sydenham and came to share his mentor's methodological precepts. There is manuscript evidence of this collaboration, which is carefully examined. As a consequence of their working together, Locke eschewed all theorising about aetiology and chose instead to rely upon clinical experience. Locke and Sydenham worked in concert until at least 1671.

In 1671 Locke began work on the *Essay*. In the earliest Draft we can see that Locke was still under the influence of Sydenham, and repeated their shared assumptions. He was not a committed mechanist. Rather, he was agnostic on the question of how nature operates at the unobservable level. In the second Draft of the *Essay*, however, Locke provided his own variations on Sydenham's themes. It was at this point that Locke became a mechanical philosopher.

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Bibliography

for Mum and Dad, of course

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Notes on Sources

All of the references in this thesis are included in the measure of the text. To save on space, the titles of a number of books have been abbreviated to their initials. An explanatory list is included below, just in case there are any difficulties:

BW:	*The Works of the Honourable Robert Boyle* Robert Boyle (ed. T. Birch) (London 1772)
CHLMP:	*The Cambridge History of Later Medieval Philosophy* N. Kretzmann A. Kenny and J. Pinborg (eds.) (Cambridge 1982)
CJL:	*The Correspondence of John Locke* John Locke (ed. E.S. de Beer) (Oxford 1978-88)
CSM:	*The Philosophical Writings of Descartes* Rene Descartes (ed. J. Cottingham, R. Stoothoff and D. Murdoch) (Cambridge 1984-91)
CTMPT:	*The Cambridge Translations of Medieval Philosophical Texts Volume I: Logic and the Philosophy of Language* N. Kretzmann, and E. Stump (eds.) (Cambridge 1988)
ELN:	*Essays on the law of nature* John Locke (ed. W. von Leyden) (Oxford 1954)
H&L:	*The Library of John Locke* John Harrison and Peter Laslett (Oxford 1971)
HOP:	*Harvey and the Oxford Physiologists* Robert G. Frank (Berkeley 1980)
HW:	*The English Works of Thomas Hobbes* Thomas Hobbes (ed. W. Molesworth) (London 1839-45)
IM:	*Insitutionum Medicinae The Institutions or Fundamentals of the whole Art, both of Physick and Chirurgery, divided into five books* Daniel Sennert (London 1656)
JLMN:	"John Locke's Medical Notebooks" John Milton in *The Locke Newsletter* 28 (1997) pp.135-156
JLPP:	*John Locke: Physician and Philosopher* Kenneth Dewhurst (London 1963)
LA:	"Locke's Adversaria" John Milton in *The Locke Newsletter* 18 (1987) pp.63-74
LAO:	"Locke at Oxford" John Milton in *Locke's Philosophy: Content and Context* G.A.J. Rogers (ed.) (Oxford 1994) pp.29-47
MCF:	*Methodus curandi febres, propriis observationibus superstructura* Thomas Sydenham (ed. G.G. Meynell) (Folkestone 1987)

NEPM: *New Experiments Physico-Mechanicall, touching the Spring of the Air, and its effects* Robert Boyle (Oxford 1660)

OFQ: *The Origine of Formes and Qualities, according to the Corpuscular Philosophy* Robert Boyle (Oxford 1666)

OM: *Ortus medicinae* J.B. van Helmont (Amsterdam 1652)

OPR: *Oriatrike, or Physick Refined* J.B. van Helmont (London 1662)

TLN: *The Locke Newsletter* ed. Roland Hall 1- (York 1970-)

TPP: *The Practice of Physick* Lazar Riverius (London 1665)

TSC: *The Sceptical Chymist* Robert Boyle (London 1661)

TT: *Two Treatises of Government* John Locke (ed. P. Laslett) (Cambridge 1988)

UEP: *Some Considerations touching the Usefulnesse of Experimental Naturall Philosophy* Robert Boyle (Oxford 1663)

References will give both book-title and page number (All the relevant editions are listed in the bibliography). In cases where an edition has multiple volumes, the relevant volume will be indicted by a Roman numeral between the book title and page number, thus (CSM I p.1).

References to the main text of the *Essay* will be in standard form, thus (I.i.1). References to other parts of this book will give the title and page number of the 1975 Nidditch critical edition, thus (*Essay* p.1). References to the first two Drafts of the *Essay* will contain the name of the Draft, Section number and page number of the 1990 Nidditch and Rogers critical edition, thus (Draft A, §1, p.1) (Draft B, §1, p.101). Draft C has the same general structure as the completed *Essay*, so the same form of referencing will be used, but always prefixed by a reference to this Draft, thus (Draft C, I.i.1). References to the *Two Treatises of Government* will give Book, Chapter and Section number, thus (TT I.i.1). References to Locke's *Correspondence* will indicate the letter number only, thus (CJL 1). References to individual items in Locke's personal library will cite the Harrison and Laslett Catalogue and the book number only, thus (H&L 1).

Reference is made to Manuscript sources. Once more, abbreviations are required for brevity's sake:

BL: Bodleian Library

BM: British Library

MS:	Manuscript
PRO:	Public Record Office
RCP:	Royal College of Physicians

The body of the thesis contains a number of transcriptions of Locke MSS. For the most part these will only reflect a corrected final version of Locke's text. However occasion will arise when an MS will be transcribed so as to include all of Locke's corrections and alterations. In these cases the transcriptions will follow the rules set out below:

italics	=	Interlineal/Marginal insertion in the text
[word]	=	Deletion from text
[...]	=	Indecipherable deletion
⟨word⟩	=	Editorial insertion
{...}	=	Unreadable word or part of word
w[ei]*o*rd	=	"ei" was written first, but was overwritten by "o"
[this [silly] word]	=	"silly" was deleted individually before the rest of the text was deleted

Locke's marginal headings are indicated by an italicised first word or phrase in the measure. Locke's round brackets (…) and his underlining are his own. Locke's emphatic writing style is rendered as bold, thus **word**. Thanks to his system of common-placing, Locke's entries often start on one page, but end several pages later. In these cases an ampersand "&" will be used to indicate that the entry which appears on these separate pages is linked in Locke's system. So, an entry that begins on the verso of folio one and ends on the verso of folio eight, will be recorded thus: (BM Add MS 32554 ff.1v&8v). References made to Locke's MSS that begin on one page and end several pages later, but include all the intervening pages, will be recorded with a dash, thus: (BL MS Locke d.9 pp.329-389). Many of the notes from Locke's earliest reading and writing are in Latin. In the case of short notes, these will be given in the original language, with a translation in the footnotes. However, in the case of longer, or more important points, a translation will be given in the body of the text, and the Latin original will appear in the footnotes. These conventions will be used throughout the thesis text, so ⟨…⟩ will only indicate editorial insertions of any kind and […] only deletions in an MS text. Several

transcriptions are given in Appendix I. A modified set of rules for the transcriptions in Appendix I are given in the introduction to this part of the thesis.

so impossible it is for us to enlarge our very Guesses, beyond the Ideas *received from our own Sensation and* Reflection

(II.xiii.13).

Introduction

John Locke's *Essay Concerning Human Understanding* is a monumental work. Composed of four books, and several hundred pages long, it positively heaves with philosophical arguments and assertions. But, as with any great text, there are often disputes as to what Locke's beliefs actually are. This is due to the fact that the views presented are in many ways quite opaque. The book is by turns insightful, instructive and infuriating. It exasperates and intrigues in equal measure.

The *Essay* cannot be described as easily readable: it took some nineteen years to write and was subject to many revisions and alterations. Points are repeated at various places in the text, and arguments are spread across several different chapters. Locke even admitted to these failings himself. In the "Epistle to the Reader" of the *Essay*, Locke said that the book was "written by incoherent parcels; and after long intervals of neglect, resumed again, as my Humour or Occasions permitted" (*Essay* p.7). It was this that led to many of the stylistic difficulties. Locke indicated that

> Parts of it might be contracted: the way it has been writ in, by catches, and many long intervals of Interruption, being apt to cause some Repetitions. But to confess the Truth, I am now too lazie, or too busie to make it shorter (*Essay* p.8).

The laboured re-writing of the text produced almost unreadable sentences which were tortured by multiple clauses.

All this notwithstanding, the intimidating prose style and imposing bulk are the least of the many deterrents to the modern reader of the *Essay*. One very serious drawback exhibited by the work is that different parts of it appear to be in direct conflict. Locke is often described as the most careless of the great modern philosophers and has been accused of many inconsistencies and equivocations. Most of these imputations are merely the products of the reader's prejudice, and can be accounted for by a careful re-reading of the text. Nonetheless, central problems remain. Some of the most difficult and divisive problems in recent scholarship regard Locke's natural philosophy. This is because the two main natural philosophical theses that Locke affirmed seem to be inconsistent. Firstly, in the *Essay* Locke was a committed corpuscularian. He believed that natural phenomena were to be explained by referring solely to the mechanical interactions that bodies undergo in motion and impact. One of the consequences of his corpuscularian philosophy was the primary and secondary quality distinction. Yet on the

other hand, Locke consistently maintained that we have no knowledge of the internal structure of nature. He held that such information was beyond our reach given the impoverished state that we find ourselves in. So, we could only claim to know about the observable features of bodies, and must confine our investigations of nature to the compilation of natural histories dealing solely with manifest qualities. The inconsistency between these two positions is not difficult to detect. Locke cannot maintain on the one hand that we have no knowledge of nature's processes, and yet insist that these processes are of this or that particular nature.

Responses to this apparent incongruity fall into two main categories, both of which are predicated upon Locke's relations with Robert Boyle. The two men became acquainted *circa* 1660, and Boyle, a noted scientist and writer, was resident in Oxford whilst Locke was teaching there. Boyle was a strong advocate of corpuscular theory and defended this view against its rivals in a number of publications. The most famous of these tracts was Boyle's *The Origine of Formes and Qualities, according to the Corpuscular Philosophy* (Oxford 1666). There are many parallels between the natural philosophy presented in this book and that put forward by Locke some twenty three years later. It has been widely assumed by Locke scholars that Boyle's views, acquaintance and influence were responsible for the doctrine later found in the *Essay*. Boyle is generally understood to be the main source of Locke's views regarding natural philosophy. Richard Aaron, for example, in his now somewhat outdated work first published in 1937, looked to *The Origine of Formes and Qualities* to understand Locke's position. Aaron said that "Boyle published this work when the co-operation between him and Locke was at its height" (*John Locke* p.122), and that 1666 was "when the co-operation between the two men was at its closest" (*op cit.* p.13). He affirmed this, though he did not provide any textual evidence for his claim. Some commentators go even further. Peter Alexander, for example, was quite sure that the relationship between Locke and Boyle was of the first importance when coming to understand Locke's natural philosophy. Regarding the primary and secondary quality distinction, he wrote:

> My main thesis is that Locke was not attempting to *make* the primary/secondary quality distinction, but was accepting it, ready made from Boyle as an essential part of the corpuscular hypothesis.[1]

[1] "Locke and Boyle and Primary and Secondary Qualities" in *Locke on Human Understanding* ed. I.C.Tipton (Oxford 1977) pp.62-76 cf. *Ideas, Qualities and Corpuscles* (Cambridge 1975).

This was asserted on the grounds of the similarity in doctrine between Locke's *Essay* and Boyle's works. Alexander did not produce evidence that Locke and Boyle collaborated in the writing of any piece of text. Arguments of this sort are adduced even in the most recent Locke scholarship. For example, in the *Cambridge Companion to Locke* (Cambridge 1994), Edwin McCann cited Boyle's work to explain Locke's views on primary and secondary qualities:

> In respect of the content of the distinction and the basis for drawing it, Locke is simply following Boyle (*The Cambridge Companion to Locke* p.60).

This thesis, that Locke owes a great debt to Boyle, is one that has been in place for decades, if not centuries.

Once this main interpretative plank is in place, scholars look to the text of the *Essay* to adduce support for their particular resolution of the apparent contradiction. There are subtle variations in position, but the responses for the most part depend upon whether or not one asserts that Locke really was sceptical about our ability to pry into nature's workings. Some writers, emphasising Locke's adherence to the corpuscular theory, declare that Locke simply must have thought that we can gain knowledge of nature's causes. The sceptical passages in the *Essay* were either misunderstood, misguided or mistaken. Such writers trawl the *Essay* looking for texts which, suitably mangled, hint at an ability to understand nature at its most basic level. Other commentators take Locke's scepticism at face value, and look to Boyle's influence as the explanation for Locke's commitment to the corpuscularian theory. Put simply, such commentators think that Locke uncritically accepted Boyle's theory: Locke's official position as a philosopher was that we can have no knowledge of nature, but when it came to this or that scientific theory, he deferred to his mentor, Boyle.

Of course, the positions I have outlined are somewhat caricatured but they do serve to highlight the common assumption upon which most Locke scholarship in this area is based. The customary way to examine Locke's natural philosophy is to assume that it was derived from Boyle's work and then find various passages from the *Essay* that exhibit the author's preferred attitude regarding Locke's scepticism about our ability to fully understand nature. At the core of this analysis is a straightforward historical assertion: that Locke was greatly influenced by Boyle's work and used it to develop his own position. This is a claim about a matter of fact, and evidence can be produced either for or against it. Unfortunately, the textual evidence that is at the heart of this claim is based upon a direct comparison of Boyle's work from 1666 and Locke's from 1689.

That is a gap of over twenty years. Very little attention is paid to any of the material that Locke wrote prior to the *Essay's* publication. This is somewhat surprising considering the abundance of notebooks and manuscripts that Locke left and which are still available to scholars. There are three extant Drafts of the *Essay*, two from 1671 – some of the first work that Locke undertook upon the topic of Human Understanding. There are also a number of essays that Locke wrote which expressed his natural philosophical position at different times. Additionally there are a large number of common-place books in which Locke made many thousands of notes upon natural philosophical topics. A great deal of this material dates back to the 1660s when Locke and Boyle were first acquainted, and when the great collaboration between these two men was supposed to have taken place.

It is quite remarkable that so little investigation has been made into these early works. Indeed, in the case of the *Essay*, it is extraordinary that so little attention has been paid to the Drafts. Many scholars of Locke's natural philosophy seem to assume that since all of the *Essay* was composed after this meeting with Boyle, Locke's views were the same throughout his subsequent career. The writing of the *Essay* then, was less an evolution than an expansion – Locke had his basic position in mind and merely elaborated upon it in the later writings. There is little need to scrutinise the Drafts in any systematic way for evidence of the association between Locke and Boyle: the question has already been decided and the search is redundant. The material that Locke produced before starting to write the *Essay* does not fare any better. Since, it is supposed, Locke was a Boylean for the entirety of his career, such an investigation will only confirm what we already know. Thus a great part of Locke's early work on natural philosophy has been more or less ignored. Much of the history of Locke's natural philosophy has not really been investigated at all. The common route to an understanding of Locke's relationship to natural philosophy is via a quick comparison of the *Essay* with Boyle's work. Had commentators actually examined the many writings that Locke left behind they would realise what grave errors they have been making.

I will take the road less travelled, and will chart the meandering path Locke actually took in coming to reach his final destination. The thesis will be an in-depth examination of John Locke's natural philosophy from its earliest beginnings up until the second extant Draft of the *Essay*. A detailed exposition of Locke's early work will be provided and placed in its historical context. By paying careful attention to what Locke actually said, as opposed to what we think he should have, a highly complex development with several crucial changes of opinion will emerge. I will attempt (as far as

is possible in any interpretation) to let Locke speak for himself, and consequently the text is peppered liberally with quotations from his writings. By examining what Locke was reading and writing we will be able to gauge the importance that he attached to this or that particular position at any particular time. A number of Locke's earliest natural philosophical writings, when read without prejudice, present views diametrically opposed to those he later expounded. The customary error is to read history backwards: the few scholars who look at Locke's earlier views always do so with his later positions in mind. They prejudge the case, and search only for early indications of later opinions. Inconsistent or incongruous remarks are, for the most part, quietly ignored. It is distressing to note that many of those studying the histories of philosophers don't appreciate that philosophers have histories.

Several of the early pieces that Locke wrote which will be used in this thesis have not formerly seen the light of day. Additionally, in several cases the texts of Locke manuscripts that have previously been published are quite inadequate. New transcripts of these texts have been produced. In the case of short notes, these will be included in the body of the thesis. However, some pieces are much too long to be recorded in such a manner and so are appended to the thesis proper. Parts of these manuscripts will be quoted in the body of the text, but I feel that full transcripts should be included to allow the reader to form their own opinion of the work. This will provide an independent check upon the interpretation of Locke's views presented here.

This thesis will not be a point by point refutation of this or that Locke scholar. Such an enterprise would be tedious for both reader and author. It will be constructive rather than critical. Nonetheless, we will see that the points habitually made by all manner of historians of philosophy entirely miss the point of Locke's arguments. By attempting to fully understand all the complex influences that affected Locke's thinking and by examining the reasoning that he employed to arrive at his conclusions, new light will be shed on the arguments in the *Essay*. Thus, for the first time we will be able to appreciate fully some of the reasoning advanced in one of the greatest philosophical works ever written. Let us turn, then, to what John Locke said regarding natural philosophy.

Early Medical Thought

Locke's Medical Training

John Locke was interested in medicine. A very early notebook survives (BL MS Locke e.4) that Locke may have begun even prior to his admission to Oxford. It contains notes on cures for various illnesses and indispositions (JLMN pp.148-150).[1] These notes, probably given to Locke by his parents and Somerset neighbours, do not have any theoretical underpinning. Rather, they are simply old country recipes. For example, under the heading of "*Somnus*", Locke noted a cure "ffor speakeing in sleep":

> Drink the joyce of Sotherne wood in wine & sweeten it wth hony at your going to bed to stay the Virtigo & swiming in the head & to prevent speakeing in sleep (BL MS Locke e.4 p.23).

Such notes cannot show that Locke was planning a career as a physician, but they do betray at least a passing interest in the subject.

In May of 1652 Locke finished his studies at Westminster School and was elected to a Studentship at Christ Church, Oxford.[2] If Locke had a strong interest in medicine at this time, it was presumably submerged under the morass of scholastic education he was subjected to. At University, he most likely studied Logic, Rhetoric, Moral Philosophy, Hebrew, Greek and the Bible, along with a smattering of Geometry, Metaphysics and some Natural Philosophy.[3] A large amount of the curriculum was Aristotelean in origin, and medieval in presentation. On the 14th of February 1656 Locke received a Bachelor of Arts, and on the 29th of June 1658, he obtained his Master of Arts.[4]

Locke's tenure of the Studentship was life-long, dependent upon certain conditions. If he married, if he failed to take a degree when qualified to do so, or if he failed to take orders when of sufficient seniority, then his association with the college would come to an end.[5] However, there was a possible way to extricate himself from the requirement of becoming a priest and still hold a studentship. Four Studentships were

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[1] A very useful description and dating of Locke's medical notebooks can be found in John Milton's "John Locke's Medical Notebooks" in *The Locke Newsletter* 28 (1997) pp.135-156. This discussion also contains an excellent description of the various methods of common-placing that Locke developed, and a chronological ordering of these methods. A further discussion of Locke's common-placing can be found in Guy Meynell's "John Locke's Method of Common-placing, as seen in his Medical Notebooks, Bodleian MSS Locke d.9, f.21 and f.23" in *The Seventeenth Century* 8 (1993) pp.245-267.

[2] A very good description of the Westminster Studentships at Christ Church can be found in E.G.W. Bill's *Education at Christ Church Oxford 1660-1800* pp.91-107.

[3] For greater detail see Bill: *Education at Christ Church Oxford 1660-1800* pp.195-196 and pp.263-326.

[4] *Alumni Oxonienses* III p.932.

[5] The tenure of the Studentships is discussed by Bill: *Education at Christ Church Oxford 1660-1800* pp.138-165.

known as Faculty Studentships and their holders were exempt from ecclesiastical obligations. These Faculty Studentships were equally divided between Law and Medicine. Holders of these positions would not become *theologi*: the students of rank sufficient to require the taking of orders.[6] Once Locke had his M.A. he was free to pursue whatever line of study he chose, and medicine might have provided a way to retain his position at college without having to become a clergyman.[7] Whatever the particular motivation, there can be no doubt that in the next few years, Locke became deeply immersed in the medical world and its controversies at the time.

Locke returned to his first medical notebook, and made some more serious notes after the juvenile beginnings. A number of these come from works published in the late 1650s. He took notes from a wide variety of sources; some of them, to the modern eye, quite outlandish. For example, Locke took notes (pp.25-26) from Marin Cureau de la Chambre's *A discourse on the principles of cheiromancy* (London 1658), a work that detailed the sympathies between regions of the body and parts of the hand:

> The Leprosy hath its source & principle seat in y^{e} Liver & y^{e} first signe whereby tis knowne appears in y^{e} fore finger for when all y^{e} muscles of y^{e} hand, & even all y^{e} body are full & jucy those y^{t} serve for y^{e} motion of y^{t} finger are dry & witherd chiefly y^{t} betweene it & y^{e} thumb wherein all y^{t} is fleshy wasts its self & noething remayns but y^{e} skin & fibres w^{c} ly flatted to y^{e} bones (BL MS Locke e.4 p.25).

Such writing can hardly be considered representative of the work being done in physic at the time. Nonetheless, it is indicative of the state of seventeenth century medicine that a well-educated scholar should consider such things noteworthy. Locke also began another notebook (BL MS Locke f.20). Here, he took notes (pp.1-5) from Harvey on physiology,[8] and also noted the curative powers of various herbs according to Fuchs (pp.5-37).[9] Progress was at last being made in medicine, such as Harvey's discovery of the circulation of the blood, and Locke was aware of such advances. At around this time, Locke recorded his own confirmation of Harvey's general result:

> *Circulatio Sanguinis* Take a frog & strip it you may see y^{e} circulation of bloud if you hold him up ag^{t} y^{e} sun (BL MS Locke e.4 p.111).

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[6] The Faculty Studentships at Christ Church are discussed by Bill: *Education at Christ Church Oxford 1660-1800* pp.131-138.

[7] The structure of the Studentships at Christ Church have also been discussed by John Milton (LAO pp.30-31).

[8] Harvey's *Exercitationes de generatione animalium* (London 1651). The first notes in Locke's book come from Harvey, and Locke bought this in 1658 (H&L 1398 cf. Appendix III p.287). Some extracts from this book also appear on BL MS Locke f.14 p.1. A discussion of this notebook appears in John Milton's "The Date and Significance of Two of Locke's Early Manuscripts" TLN 19 (1988) pp.47-89.

This particular discovery later had a significant impact on the development of Locke's thought. At the time, however, Locke merely noted this experimental outcome and added nothing to it.

On the 17th of August 1659, Locke took a leave of absence from college, and spent the rest of the year in Somerset (JLMN p.143), once more taking notes and writing down recipes based on the testimony of his friends and neighbours in a new notebook (BL MS Locke f.18). The jottings in the earliest entries were still non-structured and without firm foundation. For example, one of the first entries, on "*Cancer*", gave this cure for the disease:

> ⟨Take the⟩ Juice of Woodbine leaves & hony. ana: half a small saucerfull, let it boile a quarter of an hower & while it is boileing adde to it y^{e} quantity of a small nutmegge of alume, & fine flower QSF. Elect: a little of this given at a time cures the cancer in y^{e} mouth L: Mrs Hopkins. (BL MS Locke f.18 p.1).

Such recipes were, quite literally, old wives tales. So far, Locke was not really systematic or selective in his approach to the study of physic. However, the notebook soon switched from these folk remedies to a more serious and sustained attempt to grapple with academic medicine. The orthodoxy in academia at this time was largely Galenic in origin. One of Locke's first encounters with Galenism was in the writings of Francis Glisson, and his book *De Rachitide* (London 1655), which Locke read *circa* 1659 (BL MS Locke e.4 pp.73-76). More importantly, Locke also became aware of the work of Daniel Sennert. The notebook he began in his leave of absence (BL MS Locke f.18) soon became filled with notes from this author. Discounting the early pages of this notebook, devoted to country remedies, over 80 percent of the pages have at least one reference to the Sennert's work. In some cases, pages have nothing but references to Sennert; pages 64-65 having 11 separate entries from this physician. It is clear that Locke made an extensive and systematic study of Sennert's thought. It is in order, therefore, to make some remarks about the structure of the Galenic system, as presented by Sennert, before looking at the details of Locke's engagement with his work.

Sennert's system, as expounded in his work *Institutionum Medicinae*,[10] like that of his ancient predecessors, was built out of the four elements, earth, air, fire and water, and the four primary qualities; hot, cold, wet and dry. Whilst this sufficed for a general

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[9] Fuchs' *Institutionum medicinae libri quinque* (Basel 1605).

[10] Sennert's *Institutionum Medicinae* was first published in 1611, but Locke read it as a part of Sennert's *Opera Omnia* (Lyon 1656). In the quotations I will give expounding Sennert's system I will use the first English translation of the *Institutionum* (London 1656).

ontology, in human physiology, a finer detail was required. This was expressed in the categorisation of the human body into different types.

The solid parts of the body fell into two main types, dependant upon the function and composition of the body part in question. Firstly there were the "similar" parts of the body which were homogeneous and uniform. The other parts of the body were the "dissimilar" parts, or organs. The parts of the organs were not uniform and had widely differing functions. Sennert made the distinction thus:

> Similar parts … are alike to the whole and one-another; and indeed, some are truly and exactly such, wherein no difference can be found, neither by accurate sense, nor by reason ... Dissimilar, are such as are compounded of more which are also called for the most part organic (IM B.I Ch.III pp.4-5).

In order for the similar parts to subsist, all they needed to do was feed themselves on the nutriment provided by the blood. Each of the organs, however, had a public function in the body which depended upon the suitable configuration of its parts. Consequently, each organ had its own properties, that is to say, each organ had certain features which were a product of what the organ essentially was, and the role it had to play.[11] Sennert said:

> The natural constitution of organical parts, consists in a composition fit to perform actions; namely in number, magnitude, conformation, composition or situation (IM B.I Ch.III p.5).

For example, in the case of the heart, it had the property of having various veins and arteries attached, the property of creating the vital spirits, and the property of being divided into two chambers. All of these properties flowed from the essence of the heart, as its differentia from other organs was that it distributed the arterial blood and vital spirits around the body. This function required these properties.

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[11] "Properties" are a part of the formal structure of scientific explanation in the Aristotelian system known as the predicables. This system was first set out by Aristotle in Chapters 4, 5 and 6 of Book I of the *Topics*. Taking the classic case, we can ask what sort of a thing a "man" is. In the system of the predicables this is to ask what "species" man is. This is found out by asking what "genus" "man" belongs to, a genus being a larger grouping of different, but related species. Man will be placed in the genus "animal" and its differentia in regard to all other species of this genus will be its rationality. The scientific definition of "man", then, will be that man is a "rational animal". This definition of the species, the genus plus differentia, will constitute the essence of that species, so man is essentially a rational animal. "Properties" in this scheme are the things that flow from the differentia, part of the essence, as a natural consequence. So, the power of speech or the ability to use mathematics will be considered properties of man, as they flow from man's rationality. In addition to this there are accidents that can pertain to an individual man, like a man's being short or tall, naked or clothed, etc. These accidents are not given a scientific explanation, as it is only the essence and its consequent properties that are accounted for in this system. A discussion of this system, and its relations to the categories can be found in "Predicables and Categories" (CHLMP

In all cases each part of the body had to be able to fulfil its proper function. "Similar" parts had to support the requisite level of nutrition. This depended upon the four primary qualities:

> the constitution of similar parts, even as of those which consist of Elements, and other mixt bodies, consists in a lawful mixture of the four primary qualities (IM B.I Ch.III p.5).

This meant that humans also had "temperaments" which expressed the proportions of the primary qualities found in the similar parts of the body at any one time. The primary qualities were either balanced, or unequal. The situation basic to the Galenic model was that where none of the primary qualities was predominant, and all were in a "due" proportion. Sennert expressed the notion thus:

> if there be that proportion of qualities, that they wholly concur in equal length, such a Temperament is said to be simply and absolutely such, and such a Temperament is commonly called a Temperament *ad pondus*, or according to weight … But if there be a certain inequality of qualities in relation to their strength, it is called a Temperament to Justice (IM B.I Ch.III p.6).

The situation where none preponderated was health; any dominance of one or more primary qualities was disease:

> the proper Diseases of the similar parts are Diseases of Intemperature, when the due proportion of the primary qualities is not observed, but when one doth excell the other three, or two overrule the other two contrary to nature. (IM B.II Ch.II p.33).

The dissimilar parts of the body each had their differing roles to play, which were fulfilled by their particular properties. If these properties were all maintained, then the organ could fulfil its function, and was accounted healthy. However, if some of the properties were affected, and the organ was not able to fulfil its function, then the organ was accounted as diseased. So, for example, if the liver had a connection with the stomach via six tubes and one of these connections was severed, the liver was indisposed:

> there are so many signes of Organick Diseases as we have said, ⟨as⟩ are requisite for the composition and constitution of an organ; namely four, Diseases of Confirmation, of Number, Magnitude and Composition (Ibid.).

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pp.128-142). A medieval description of the system can be found in Peter of Spain's *Tractatus* (CTMPT pp.80-88).

The only way to rectify any disease of the dissimilar parts was to return that organ to its natural state, where all its properties were normal.

The non-solid parts of the body, the four humours, were derived from food and produced in the liver. The blood was used to provide nutrition for the solid parts of the body. Excess yellow bile was stored in the gall bladder, where it was intermittently used to stimulate the intestine in the digestion of food. Excess black bile was stored in the spleen, and was used in the stomach to aid the digestion of food. Finally, the excess phlegm collected near the brain as it rose upwards and was condensed by the coolness of that organ.

Another important part of human physiology were the "spirits". These played a central role in Galenic thought and were the natural, vital and animal spirits, produced in the liver, heart and brain, respectively. These spirits aided the soul in the government of the body. The soul, the form of the body, was the active agent in all living things. For Sennert, there were three main faculties of the soul. The first was the natural faculty, whereby the body is fed, grows and generates other bodies. This work was done in the blood by the natural spirits:

> The use of the Natural Spirits are to strengthen the Innate Spirit in all its parts, that it may supply the Vital Spirits with matter, and may serve for the more convenient distribution of blood through the veins (IM B.I Ch.VI p.13).

The liver, being the seat of this vital faculty, distributed the nutritive blood throughout the body via the veins. Chyle was passed to the liver from the stomach where it was there converted into venous blood for its dispersal around the rest of the body. It was the system of veins that provided nutrition for all bodily parts.

The second faculty was the vital. This was concerned with the heart, the lungs, respiration and the pulse:

> The Vital Spirit is generated in the heart, of the thinnest and purest blood, or the natural Spirit, commonly so called, and by aer, by the help of respiration drawn, and by dilation of the Arteries in the left Ventricle of the heart, and being there freed from all fuliginious vapours, is distributed through the Arteries into all parts of the body ... Now this spirit with its innate heat in the heart, is not onely the chief instrument of the action of the heart, but is distributed through the Arteries into the whole body, and stirreth up, cherisheth, and strengthen the innate heat in all the parts (Ibid.).

These spirits were made from a combination of blood and air from the lungs. Air, then, had many roles to fulfil. It had to provide the material for the creation of the vital spirits, as well as having to cool the supposed native heat of the heart and then expel the warm waste products produced in the making of the vital spirits. This latter function was

accomplished by the expulsion from the lungs of the warm vapours created in the heart during production of vital spirits:

> by expiration the Lungs and Brest being contracted, the hotter air and fuliginous vapours are sent forth at the mouth and nostrils (IM B.I. Ch.XI p.25).

The vital spirits were carried to all parts of the body by the arteries. Thus, the veins and the arteries were conceived to be, for the most part, independent of each other; the one serving the natural faculty, the other, the vital. The only point of contact between the two systems was at the heart, where venous blood was supposed to pass directly from the right to the left ventricle, so that blood was available for the creation of the vital spirits in tandem with the air.

The final category of spirit was the animal spirit which was responsible for the material part of the cognitive process. These were produced in the brain and were responsible for consciousness:

> The Animal Spirit serves for the use of living creatures, namely to perform internal and external senses; as also, it serves for motion in Animals, and its presence occasioneth the faculty of the soul, actually to perform the operations of the internal and external senses, and it perfecteth animal motion (IM B.I Ch.VI p.13).

It was the continuous supply of these spirits that regulated movement and awareness. The nerves were responsible for the dispersal of the animal spirits around the body. Each of the three faculties, natural, vital and animal had its own origin, effector vessels and active spirit. The virtue of the Galenism was its systematic nature.[12]

Theoretically, to cure a disease in the Galenic model was simple. If illness was due to some imposition of an undue temperament, this could be easily countered. It was taken as a commonplace truth by the ancients and their subsequent disciples, that to return things to normal, the application of opposing qualities was in order. This was summed up in the notion that "contraries may be cured and resisted by their contraries" (IM B.II Ch.III p.34). So to give a rather simplified example, if the patient was overly cool in some respect, they needed to be heated to restore health.

Aside from these types of cure, however, there were more peculiar restoratives which had to be accounted for. For example, quinine could be used to treat malaria.

[12] Harvey's discovery of the circulation of the blood had a hugely damaging impact on the Galenic system, as it destroyed any belief in the supposed separation of the vital and natural systems, as executed by the arteries and veins: These were not autonomous systems, but were part of a single complex. This presented many new research problems concerning the function of the heart, lungs, blood and respiration.

There was no obvious fit between the categories of disease, and the cure effected by the drug. The medication was attributed an "occult" quality:

> besides that temperature of the primary qualities, other qualities are also in ⟨bodies⟩ which are more occult, arising from their forms, which parts all of them possesse, as is manifest by their sympathy and antipathy with other natural bodies, and by several actions, and kinds and manners of actions, which are beyond the force of Elements (IM B.I Ch.III p.5).

Sennert simply attributed the ameliorative effects to some mysterious quality of the drug that was somehow super-added to it, because there was no suitable Aristotelean explanation. These "specific" or "occult" qualities were simply a way of dealing with these anomalous events in a rather ad hoc manner.

There was much more to the *Insititutionum Medicinae* and Sennert's other works than I have just outlined[13] and Locke made a large number of notes on more practical matters. Nonetheless, Locke also felt that it was appropriate to note down some of the basic conceptions of the Galenic system.[14] For example, Locke copied down the following notes:[15]

> *Frigus* Frigida intemperiei causa. Sennert Inst. l2. p.2. c10 p.379[16] (BL MS Locke f.18 p.99).
>
> *Humiditas* Humidae intemperiei causa Sennert Inst: l.2. p 2. c10 p380.[17] (BL MS Locke f.18 p.101).

Locke recorded these Galenic commonplaces without apparent unease.[18] We cannot infer from this any adherence to such a theory of disease, but Locke evidently felt that these points were of interest. Thus, when Glisson wrote, and Locke noted that

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[13] I do not here mean to imply that Sennert was a typical Aristotelean in all respects; this is far from the case. He engaged in chemical experimentation and even postulated tiny bodies as constituent parts of larger objects. However, this postulation of tiny parts of bodies was not a sort of mechanism that we recognise in Boyle or Descartes. Sennert held that each corpuscle was a compound of matter and form, and that the causal powers of the corpuscle were dependent on this form. Moreover, all the corpuscles in a body were arranged according to an overall form that structured the macroscopic body. He may have believed in the existence of tiny parts of bodies, but he was in no sense a mechanist. In addition, Sennert did not come to formulate this hybrid view until the second edition of his *Epitome Naturalis Scientiae* of 1633. Prior to this he had been a relatively orthodox Aristotelean pluralist. Since the great majority of the references to Sennert's work by Locke came from works published prior to this period, there is no need to assume that Locke saw Sennert as anything more than an orthodox figure in the Galenic mode. For an excellent discussion of Sennert's thought on these points see Emily Hunter's "Daniel Sennert on Matter and Form at the Juncture of Old and New" in *Early Science and Medicine* II (1997) pp.272-299.

[14] A very useful discussion of Galenic physiology has been written by Robert G. Frank (HOP pp.2-9).

[15] Locke's page references are to Sennert's *Opera Omnia* (Lyon 1656).

[16] "Cold causes distemper".

[17] "Moisture causes distemper".

[18] Locke also recorded similar assertions by Sennert regarding "*Siccae*" and "*Calor*" (BL MS Locke f.18 p.100 and p.104 respectively).

> Morbus hic consistit in frigida & humida intemperie. cu⟨m⟩ defectu & torpore spirituu⟨m⟩ insitoru⟨m⟩ in constitutione insita partium 1° affectoru⟨m⟩[19] (BL MS Locke e.4 p.73).

we cannot but assume that Locke was genuinely interested – interested, moreover, to the point where he wanted to outline the overall structure of the Galenic system. Amongst Locke's medical papers at the Bodleian is a volume of miscellaneous medical papers, one of which (BL MS Locke c.29 ff.7r-8r) was an in depth analysis of the structure of Galenic medicine, under the three heads "Antecedentia", "Comitantia" and "Consequentia sive Symptomata". Considering the latter category only, Locke made a further division into two parts: "laesa actio facultatis"[20] (BL MS Locke c.29 f.7r), as opposed to "Qualitates sensibiles ie habitus colour odor. magnitudo figure &c"[21] (BL MS Locke c.29 f.7v). The former of these, "laesa actio facultatis", was then divided into the traditional Galenic triumvirate: "Naturalis", "Vitalis" and "Animalis" (BL MS Locke c.29 f.7). The illnesses under the natural faculty were, for example, "Nausea", "Dysenteria" and "Diabetes". Those under the vital faculty were a "Palpitatio cordis", "Respiratio laesa" and "Asthma". The indispositions in the animal faculty Locke further sub-divided into "sensus", "sensus internus", "motus" and "plurium actionium animaliu⟨m⟩" So, for example, diseases under "sensus" were, unsurprisingly, "Visus", "Auditus", "Gustus", "Oflactus" and "Tactus" (BL MS Locke c.29 f.7v).

The system that Locke noted here was strikingly conservative. Locke obviously spent some time and effort in compiling this table, so it cannot be doubted that he was very much interested in Galenic medicine. This was no mere passing interest, nor was it a dismissive attack. These scholarly encounters with Glisson and Sennert were far from isolated incidents. For example, he read Jean Fernel's *Universa Medicina* (Utrecht 1656) (BL MS Locke f.20 pp.43-44). Fernel was a major Galenic figure, and has the distinction of being credited with inventing the study of physiology. Locke also read Moebius' *Fundamenta medicinae physiologica* (Jena 1661) (BL MS Locke d.11 ff.287r-286v *rev*). Locke took Galenic medicine in general, and Daniel Sennert in particular, very seriously indeed.

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[19] "Disease here consists in a cold and moist distemper with a defect and stupefaction of the inherent spirits in the inherent constitution of the parts primarily affected". This is most probably a reference to Glisson's statement that "compositum hunc esse morbum judicamus, primamque ac radicalem ejus essentiam consistere asserimus in frigida ac humida intemperie cum defectu & torpore spirituum insitorum in constitutione insita partium primo affectorum concurrentibus" (*De Rachitide*, p.35). Which translates as: "We judge this to be a compound disease, and we assert that the prime and radical essence of it to consist in a cold and moist distemper, with a defect and stupefaction of the inherent spirits, concurring in the inherent constitution of the parts primarily affected."

[20] "hurting the action of the faculties"

Early in 1660, Locke met Robert Boyle.[22] The first indication of this comes in a letter to Locke from a country friend, Dr Ivie, dated the 20th of May that year. Dr Ivie was clearly impressed with this new acquaintance of Locke's, and urged Locke to make the most of it, for both their benefits:

> I hope sir, you will lett slippe noe occasion whereby you may better yourselfe, and soe me, by your acquaintance with Mr Boyle (CJL 97).

Locke certainly did better himself by his association with Boyle: Boyle gave Locke an introduction to the mechanical philosophy. Locke had begun a new common-place book on the 25th of February that year (BM Add MS 32554) and its earliest entries were still rather Galenic in tone, a lot of the first entries coming from Glisson's *De Rachitide*[23] and Moebius' *Fundamenta*.[24] However with these entries came references to Boyle's latest work, the *New Experiments Physico-Mechanical touching the Spring of Air* (Oxford 1660). Locke read this work carefully and many made notes upon it. The character of these, it should be noted, was generally of a factual kind. Locke did not spend much time noting matters of overall theory, rather he recorded various interesting phenomena. For example:

> *Aer* A cylinder of this free air not exceeding 3 inches in diameter is able to raise & carry up a weight about 100 pound: Boyl: Ex. 33. p.256. (BM Add MS 32554 f.9r).

> *Aqua* The surface of water in pipes is concave being depresd in y^e^ middle & higher on every side. In Quic silver on the contrary, not only y^e^ surface is wont to be very convex, but if you dip the end of a very slender pipe in it, y^e^ surface of y^e^ mercury will be lower within the pipe then without. Boyle: Ex:35. p.271 (BM Add MS 32554 f.20r).

Locke appears to have read Boyle's works as they were published, and so continued with *Certain Physiological Essays* (London 1661), *The Style of the Scriptures* (London 1661) and *The Usefulness of Experimental Natural Philosophy* (Oxford 1663). An exception to this rule was *The Sceptical Chymist* (London 1661), which was published in 1661, but was not read by Locke until *circa* 1664-5 (LAO p.37).[25]

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[21] "Sensible qualities i.e. place, colour, odour, magnitude, figure etc."

[22] A useful discussion of Locke's relationship with Boyle can be found in M.A. Stewart's "Locke's Professional Contacts with Robert Boyle" TLN 12 (1981) pp.19-44. This catalogues a great deal of the information detailing the personal contacts between the two men. However, it does not present a systematic survey of the notes in Locke's common-place books that Locke took from Boyle's works, or those that Locke had from personal acquaintance with Boyle.

[23] In Locke's mature system of common-placing, entries are ordered according to their first letter and the first subsequent vowel, each heading having its own set of chronologically ordered entries. So, under "M", Locke had five different sets of headings, under the individual heads of "Ma", "Me", "Mi", "Mo" and "Mu". The first note under the head "Mo", "*Morbus*" is from Glisson (BM Add MS 32554 f.43v).

[24] The first note under the head "Te", "*Temperamentum*" is from Moebius (BM Add MS 32554 f.54v).

[25] This pattern of reading is discernible in a number of Locke's MSS, however, the most obvious examples occur in BL MS Locke f.14. See pp.22-23 where entries from the NEPM are closely followed by those

Boyle was not fully resident in Oxford until 1664,[26] so contact between the two men was infrequent. It cannot be said that the two men were particularly close at this point, and there is no evidence to suggest that they undertook any collaborative work. But it is clear that Boyle did introduce Locke to the mechanical world view, and it is also clear that Boyle introduced Locke to the writings of Descartes.

From 1660 to 1662, Locke pursued a systematic and thorough examination of the Cartesian system.[27] He started first with the *Principles of Philosophy*, then read the *Discourse on Method*, next was the *Dioptrics* and *Meteors*, the *Meditations*, some of the *Objections and Replies* and finally in this period, the *Passions of the Soul* (LAO pp.37-38).[28] Again, the material that Locke noted was really rather mundane. Locke did not spend time labouring over the parts of Descartes' works that contemporary philosophers worry about. Instead he concentrated upon Descartes' explanations of particular natural phenomena. So, for example, when making notes on the *Principles*, Locke made few notes on the first two parts and concentrated mostly upon parts III and IV.[29] Locke does not seem to have been so interested in the metaphysical foundations of the Cartesian system, but concerned himself with the concrete explanations that could be derived from these. So, we find Locke making notes on such subjects as "*Liquor*", "*Aqua*", "*Ventus*", "*Motus*" and "*Magnes*" (BM Add MS 32554 ff.11v, 20r, 89r and 43v and BL MS Locke d.11 f.51v, respectively). It is interesting to note that these topics were concerned with general natural philosophical subject matter. Locke was gaining an interest in natural philosophy that went beyond the confines of medicine. This was possibly due to the influence of Boyle, who was interested in all areas of natural phenomena.

There was one area of Descartes' work in which Locke took something of a more philosophical interest, namely in the Cartesian account of body. Locke made a number of notes on this from the *Principles*, for example, on weight:

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from the *Physiological Essays*, and p.28, where entries from the NEPM are followed by those from UEP. See also Milton's "Date and Significance" TLN 19 (1988) pp.47-89. Evidence can also be found in BL MS Locke d.11 ff.2v, 4v, 9v, 11v, 30v, 73v and BM Add MS 32554 ff.9r, 20r, 49r, 52v, 99r 111v and 114v.

[26] R.E.W. Maddison, *The Life of the Honourable Robert Boyle* (London 1969) pp.112-113.

[27] Locke read a copy of Descartes' *Opera Philosophica* (Amsterdam 1656).

[28] Once more, the evidence for this claim is based upon a number of sources. The most important of these is BM Add MS 32554 ff.9r, 11r, 13v, 19r, 20r, 20v, 27r, 37v, 40v, 41r, 43v, 45v, 46r, 47v, 54v, 66v, 70v, 77v&78r, 82r&96v, 83v&84r, 89r, 90v&91r, 93v, 94v and 95v. Important entries can be found in BL MS Locke f.14 pp.25, 64, 79 and 92. See also BL MS Locke d.11 ff.29v, 30v, 51v, 73v&74r, 77v, 80v, 88v and 89v.

[29] Contemporary philosophers are so contemptuous of this as to omit most of it from the standard English edition of Descartes' philosophical works (CSM I pp.248-291).

> *Gravitas* A particulis primi & 2di elementi partes terrestres versus medium propellentibus. Cartes: prin:phil: p.4. n.20. p155.[30] (BM Add MS 32554 f.13v).

Locke also took notes upon the Cartesian conception of Solidity (BM Add MS 32554 ff.83v&84r). This interest was also shown in the single quote that we have which Locke took from the *Meditations*. We can see that Locke avoided all the complex epistemological questions in the book, and instead documented Descartes description of body:

> Per corpus intelligo illud omne, q⟨uo⟩d apte est figura aliqua terminari, loco circumscribi, spatio sic replere ut ex eo omne aliud corpus excludat; tactu, visu, auditu gustu, vel odoratu percipi, nec non moveri pluribus modis non quidem a seipso, sed ab alio quopiam a quo tanguntur. namque habere vim seipsum movendi, item sentiendi vel cogitandi, nullo pacto ad natura⟨m⟩ corporis pertinere judicabam; quinimo mirabar potius, tales facultates in quibusda⟨m⟩ corporibus reperiri. Cartes. Medi: 2. p11.[31] (BM Add MS 32554 f.91r).

One of the most interesting feature of Descartes' views on natural philosophy concerned the question of the vacuum: Descartes thought he could prove *a priori* that there was no such thing. In the *Principles of Philosophy* Part II Article 4, Descartes said: "*The nature of body consists not in weight, hardness, colour, and the like, but simply in extension*" (*Principles* II.iv. CSM I p.224). This was demonstrated by a method of exclusion: we can remove weight from our conception of body, and still the body will remain, we can remove colour, and still the body will remain, but if we remove extension, no body remains. From his assertion about the nature or essence of body, Descartes drew some conclusions regarding the constitution of the physical world. Firstly he asserted that space and body were, in fact, identical:

> For in reality the extension in length, breadth and depth which constitutes a space is exactly the same as that which constitutes a body. The difference arises as follows: in the case of a body, we regard the extension as something particular, and thus think of it as changing whenever there is a new body; but in the case of a space we attribute to the extension only a generic unity (*Principles* II.x. CSM I p.227).

Taking the example of a stone, we can ask what we can remove from the concept of body, and yet still have the body remain:

> After all this, we will see that nothing remains in the idea of the stone except that it is something extended in length, breadth and depth. Yet this is just what is comprised in

[30] "By particles of the first and second elements the parts of the earth are driven towards the middle".

[31] "By body I understand whatever has a determinable shape and a definable location and can occupy a space in such a way as to exclude any other body, it can be perceived by touch, sight, hearing, taste or smell, and can be moved in various ways, not by itself, but by whatever else comes into contact with it. For, according to my judgement, the power of self movement, like the source of sensation or of thought, was quite foreign to the nature of body; indeed it is a source of wonder to me that certain bodies were found to contain faculties of this kind".

> the idea of a space - not merely a space which is full of bodies, but even a space that is called "empty" (*Principles* II.xi. CSM I pp.227-228).

According to this definition of space and body it is inconceivable for there to be a vacuum "in which there is no substance whatsoever" (*Principles* II.xvi. CSM I p.229). Descartes regarded such a supposition to be an "impossibility" (Ibid.):

> For a body's being extended in length, breadth and depth in itself warrants the conclusion that it is a substance, since it is a complete contradiction that a particular extension should belong to nothing; and the same conclusion must be drawn with respect to a space that us supposed to be a vacuum, namely that since there is extension in it, there must necessarily be a substance in it as well (*Principles* II.xvi. CSM I p.230).

Locke was clearly very interested in the Cartesian conception of body, and he wrote a short note on just this issue. This was the first commentary that Locke ever made where he explicitly referred to the work of Descartes:

> *Vacuum* Since according to Descartes, the nature of a solid body consists in this one thing alone, that surfaces touch each other, and that the firmness of bodies would be nothing but the state of rest of parts amongst themselves, which touch each other with the greater part of their surface and are not very firm, it follows that if there were no vacuum at all, not even one that is "disseminated", all particles of matter are touched on all parts of their surface by another body; from this it follows that if contact were the cause of firmness, then according to this principle either no body will be a fluid, or there is some vacuum, or something else is required for the firmness of bodies besides mere naked contact. JL [Since, if not perhaps]. However, I guess that motion should be taken into consideration as well, not only because the formal cause of a fluid consists in motion, and because motion can separate the firm parts of a body; but even if there is a way of contact for all, yet a continuous motion that is already there can hinder parts from coalescing into a firm and stable body JL and thus subtle matter does not stiffen together with the other bodies that it touches, because of its very swift motion JL[32] (BM Add MS 32554 ff.75r&95r).

Locke was attempting to conceptually grasp the Cartesian notion of solidity and, initially, he was unhappy with it. He thought that this definition of solidity was not something that accounted for everyday objects, such as liquids. This, thought Locke, made the definition absurd: If contact was all that was required for solidity then without a vacuum,

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[32] *Vacuum* Cum secundum Cartesium, corporis solidi na⟨tur⟩a in eo solum consistit, quod superficies se mutuo tangunt, et corporum stabilitas sit nil nisi partium inter se quies, quaeque majore parte suae superficiei se mutuo tangunt sunt maxime consistentes. sequitur si nullum detur omnino vacuum ne disseminatum quidem, quod quaevis ma⟨teri⟩ae particula [materia] in omni parte suae superficiei ab alio corpore tangitur; unde sequentur, si contactus sit causa stabilitatis, quod secundum haec principia, aut nullum corpus [in] omnino erit fluidum vel datur aliquod vacuum. [JL] vel aliquid aliud requiritur ad corporum firmitatem praeter merum et nudem contactum. JL [Cum nisi forte d]. Conjicio autem quod motus etiam in considerationem venire debit, non solum quod formalis ratio fluidi consistit in motu, nec quod motus partes corporis firmi seperare potest, sed licet detur contactus omni modus, tamen motus continuus *qui iam est* impedire potest ne in firmum et stabile corpus partes coalescant JL & ideo materia subtilis non concrescit cum corporibus aliis quae tangit, ob velociss⟨imum⟩ suum motum JL (BM Add MS 32554 ff.75r&95r) ⟨The English translation is the work of Paul Schuurman⟩.

all bodies would have to be part of one continuous solid bulk. This part of the note was appended with the initials "JL" indicating that Locke had finished his piece. However, he was not yet satisfied with his work. In the second half, Locke was more inclined to reconcile himself to Descartes, by admitting that motion might play a part in differentiating one solid body from another: even if the parts were in continuous contact, the fact that they were moving past one another stops their being part of the same body. This was not a particularly satisfactory resolution of the issue, as it does not deal with how motion was possible in a plenum: how can something move, if there was no space to move into? Nonetheless, in this brief discussion we can clearly see an interest in the notion of body and vacuum that Descartes had presented. This was Locke's only explicit reference to the Cartesian system prior to the writing of the Drafts, and it is worth noticing its subject matter: it dealt with body and vacuum. Locke returned to this issue again and again.

Locke did not confine his interest to Boyle and Descartes alone. He read a little of Gassendi's *Syntagma*, soon after reading Descartes.[33] Locke also read Spinoza's re-construction of the Cartesian system, *Renati des Cartes principorum philosophiae pars I. and II., more geometrico demostratae [par B. de Spinoza]* (Amsterdam 1663) in 1664 (BL MS Locke f.27 p.166 *rev*). The pattern of Locke's interest seems to have been unvarying: he was taking notes on natural philosophical matters. He did not seem concerned with what we would call epistemology or metaphysics.

What can we make of these notes? It does not seem, on the evidence that we have available to us, that Locke was not particularly interested in the problems that vex contemporary philosophers at this point in this career. There were no notes on scepticism or the mind-body problem. This, though, is entirely consistent with the knowledge that we have of Locke at this time. It would perhaps be more surprising if things were the other way around – why should a man concerned with curing patients or performing experiments worry about whether he was being deceived by an evil demon? Such speculations would be of no use to a budding scientist and medical man.

[33] See, for example, BM Add MS 32554 f.93v where a Cartesian note on "*Locus*" from the *Principles* is followed immediately by one on the same subject from Gassendi. See also f.52v where a quote from Gassendi comes directly after a note from Boyle's NEPM, both on the topic of "*Suctio*". Further evidence can be found in BL MS Locke f.14 pp. 28, 60, 62, 64, 82 and 84. Locke's read Gassendi *circa* 1660-1. There is no textual evidence to suggest that Locke had anything more than a passing interest in Gassendi. Indeed, all of Locke's notes from the *Syntagma* come from a very narrow range of pages: pp.182-205. This conclusion has been argued for by John Milton in "Locke and Gassendi", in *Studies in Seventeenth Century Philosophy* (Oxford forthcoming).

At this point, it seems that Locke was only concerned with Descartes the *natural* philosopher. Moreover, it is groundless to assume that Locke underwent a profound conversion after his acquaintance with the Cartesian philosophy. There is no evidence in the pattern of Locke's reading or note-taking that he came to reject the competing theories and adopt mechanism. On the contrary, there were number of occasions where notes from these authors were followed by extracts from the works of Sennert.[34] Locke continued to have a very broad programme of reading that was not confined to writers who espoused mechanical explanations for natural phenomena.

This was most evident in Locke's interest in the Paracelsian or Helmontian tradition in medicine. These "Chymists"[35] rejected the matter and form of the scholastics, as the mechanists did. However, the chymists put in its place a much more organic system of explanation. The paradigm case for mechanical philosophers was that of *clockwork* with its regular external movements being caused by complex but understandable processes behind the scenes. For the chymists the paradigm case was that of *fermentation*. Here, organic phenomena such as the spontaneous generation of heat from straw-piles, or the creation of alcohol from hops and yeast were seen as pointers to an underlying *modus operandi* in nature. Such transformations were not readily explainable in terms of bits of matter bumping into one another by chance. This dissenting tradition found its first expression in the works of Paracelsus, who gained a considerable following in medical circles, despite his intimidating prose style. At the time of Locke's study, though, the major writer in this field was Joan Baptista van Helmont. Locke took a keen interest in this writer and read his major work, *Ortus Medicinae* at least twice - the 1648 edition *circa* 1660-1 (BL Add MS 32554 f.42r) and the 1652 edition at points between 1665 and 1667 (BL MS Locke f.22 p.109), using the book itself to make notes (H&L 1417 Appendix IIC p.282). Since Locke was evidently interested in this man's thought, and since, as we shall see, it had an influence on his medical work, it is worth giving a brief outline of the Helmontian system.

As an experimentalist of some experience and renown, Helmont had a wide-ranging knowledge that was not easily reconciled to the Galenic system.[36] Using some

[34] See, for example, BM Add MS 32554 f.9r and BL MS Locke d.11 f.3v and f.88v.
[35] I will use the word "chymist" to denominate the followers of Paracelsus and Helmont throughout the rest of this thesis, so as to distinguish their particular ontology from the practice of chemical experimentation, which authors from all sides of the debate engaged in.
[36] All the references in this brief exposition are to the first English edition of *Ortus Medicinae*, entitled *Oriatrike, or Physick Refined* (London 1662).

rather dubious religious reasoning, Helmont attached a special significance to water. Water, in his mind, was a fundamental element. God,

> created the Firmament, which should separate the inferior Waters from the waters that were above itself, and named that, Heaven. Therefore it is hence plainly to be seen, that before the first day, the waters were already created from the beginning, being partakers of a certain heavenly disposition, because they were hidden under the Etymologie of the Word, Heaven (OPR p.48).

Water, not having been created, was part of heaven itself before creation. Helmont also thought that there was another basic part of the universe, namely Air:

> the Eternal would have the Heaven to contain Waters above it, and as yet something more (by reason whereof it is called Heaven) that which we call that Air, the Skie, or vitall Air, for that, both of them the Etymologie of the Word, Heaven, did include (Ibid.).

Air too was fundamental, but it was not used to create anything else: it could not be altered. Water, on the other hand was the source of all other substances in the universe. Water, for Helmont, was everywhere.

The second central concept was that there was a dynamic process at work in the universe: fermentation. These reactions were, he thought, a basic type of life with all the dynamism this involved. This gave Helmont the conceptual apparatus to move from the undifferentiated world of "water" to the physical world we see around us. Water was impregnated with "ferments", "ferments" which made "seeds" that altered the water into new and various substances:

> there are two chief or first beginnings of Bodies, and corporeal causes, and no more, to wit, the Element of Water, or the beginning of which, and the Ferment or Leaven, or seminal beginning, by which that is to be disposed of, whence straightway the Seed is produced in the matter (OPR p.31).

One "seed" would turn water into iron, another into gold. Helmont put it thus:

> the matter doth follow the properties of the seed. Therefore the liberty of nature is perpetuall, of its own accord, to cause and to suffer pressings together of a watery body, and will not undergoe those by any guidance of an Artificer ... Therefore there shall be sixteen parts of water pressed together in the room of one part, where Gold is framed of water (OPR p.67).

Not that this made the end-product any less water itself. Just as ice was water in a different state, so too were the other elements. Helmont's great experience in chemical experimentation had given him insight into physical processes, so when experiments yielded water as a result, this lent support to his basic intuitions. Helmont also altered the

traditional system of the Aristotelean elements, rejecting earth, air, fire and water, and replacing them with the principles of salt, sulphur and mercury.

The concept of the "seed" played a vital role in Helmont's system as it brought with it certain connotations that contrasted sharply with the Aristotelean system. Whereas in the latter system the form was impressed upon the matter from the outside here, the "seed" gave a sense of the internally generated power of things: "The whole efficient cause in Nature is after another manner, it is inward and essential" (OPR p.29). For example, two different seeds could be externally indistinguishable, yet, when germinated, they could produce plants of widely differing qualities. It should be emphasised here, though, that the physical seed which we plant in the ground was conceived of solely as the shell of the true active principle that was contained in this shell, which principle was responsible for the creation of the plant: "the visible seed is onely the husk of ... the seminal likeness" (OPR p.35). This was the case also with more basic elements: it was the "seed" in these that determined their essence.

Helmont elaborated upon this basic system of "water" and "seed" in order to account for chemical elements and, more importantly, life itself. The central concept here was that of the "Archeus". To give a rather simplistic characterisation we might describe it as an active spiritual principle that guided and shaped that actions of material things. For Helmont, "The **Archeus** or chief Workman is the efficient cause" (OPR p.35). When anything was created out of water, "they inclose in themselves an Air, which before generation, representeth the inward future generation to the Seed ... which is called the *Archeus*" (Ibid.). It was this that directed the creation of things:

> since every corporeal act is limited unto a Body, hence it comes to passe, that the *Archeus*, the Workman and Govenour of generation, doth cloath himself presently with a bodily cloathing: For in things soulified, he walketh thorow all the Dens and retiring places of his Seed, and begins to transfer the matter, according to the perfect act of his own Image. For here he placeth the heart, but there he appoints the brain, and he everywhere limiteth an unmoveable chief dweller, out of his whole Monarchy, according to the bounds of requirance, of the parts, and of appointments (Ibid.).

It was the Archeus that animated living things. It had a purpose to its actions and served as a sort of continuity in the flux of the material - it was the same Archeus that animated a body, even if the parts of the body changed over time. Helmont postulated multiple Archei correspondent to the many and varied vital functions of the body.

In disease, the concepts of the Archei, ferments and seeds again played a central role. Health was defined as the proper functioning of the Archeus, actively directing the matter of the body in an uninterrupted way. Disease, however, occurred when an agent

attempted to direct the matter of the body in some way other than that planned by the Archeus. So, some ferment, or "seminal principle" could attack the body and attempt to re-direct the body's functioning. Disease was the state of the body as the Archeus attempted to regain its control of body functioning:

> A Disease therefore is a certain being, bred, after that a hurtful strange power hath violated the vital Beginning, and hath pierced the faculty hereof, and by piercing hath stirred up the Archeus unto Indignation, Fury, Fear, &c. To wit, the anguish and troubles of which perturbations it by imagining, stir up an Idea no-like that unto themselves, and a due Image. Indeed that Image is readily stamped, expressed, and sealed in the Archeus, and being cloathed with him, a Disease doth presently enter on to the stage, being indeed composed of an Archeal Body, and an efficient Idea (OPR p.552).

For example, in the case of a rabid dog's bite there was the imposition upon the body of some rabid ferment. This impressed itself upon the body's Archei, after its own design, to produce hydrophobic and rabid behaviour. For Helmont, disease was the introduction of some external ferment which had to be expelled by the resident Archei. Locke's reading of Helmont's work once more illustrates the fact that he was not restrictive in his medical interests after his exposure to mechanism.

Helmont was a very important writer in the chymical tradition, but he was not the only person striving to make Paracelsus' works more intelligible. In England, the chemical experimentation that had inspired the initial revolt against Galenism also had an influence, though it produced a more measured response from English thinkers. One of the most important of these was Thomas Willis, Sedleian Professor of Natural Philosophy at Oxford. Some of Locke's earliest medical notes after the acquisition of his M.A. come from Willis's work. Locke made a set of notes "*De ffermentatione*" (BL MS Locke e.4 pp.97-104) based on Willis's thoughts on this subject. These possibly came from personal contact with Willis himself, as it is likely that Locke could have made this man's acquaintance if he had so desired, or they could have come from Willis's *Diatribe duae medico-philosophicae* (London 1659): The first half of this book was entitled "*De fermentatione*". Locke also attended the lectures that Willis was required to give as a part of his professorship at Oxford. These were given *circa* 1662 and were on a variety of medical topics.[37] In Willis's view, macroscopic objects were made up of tiny parts. However, each of these particles has its own separate chemical identity, over and above its purely mechanical properties. There were five different types of body in Willis's

[37] These lecture notes from Locke (BL MS Locke f.19 pp.1-6, 8-22, 24-6, 28-30, 32-40, 42-50, 52-74, 76-80, 82-9, 91, 93, 95, 97, 99-104, 106-119, 130-151 and 156) have been edited and published by Kenneth Dewhurst in *Thomas Willis's Oxford Lectures* (Oxford 1980).

opinion: spirit, sulphur, salt, water and earth. So a particle of spirit, irrespective of its size and shape, would always be very active and volatile, while one of earth would be inert and unreactive. On this view, change occurred in natural bodies when particles of one type were joined to particles of another. This process of particular re-arrangement due to these chymical properties, Willis called a "fermentation".[38]

This theory, though it eschewed the more abstruse spiritual aspects of Helmont's view, was still non-mechanical; the five principles were thought to act outside the scope of possible mechanical interactions. This system posited the existence of tiny parts of bodies, but it was not the sort of view that Descartes would subscribe to. The postulation of tiny parts of bodies in no way made Willis a mechanist. Sennert came to believe in the existence of corpuscles, but he remained an Aristotelean. Willis posited these particles, but followed the teaching of Paracelsus. It is not the postulation of these tiny parts that makes you a mechanical philosopher. Rather, it is the assertion that only the mechanical affectations of a body are responsible for that body's causal properties. Both Willis and Sennert denied this, and so are not to be thought of as mechanists.

Locke studied Willis's work with care, and on more than one occasion. Indeed, he continued to read other texts from the same school, for example, Kerger's *De fermentatione* (Wittenberg 1663) (BL MS Locke f.19 passim) and Schookius' *De fermento et fermentatione* (Groningen 1662) (Ibid.). Locke was clearly interested in this strain of medical thought. A great number of the notes made from these authors came after he had first read Boyle and Descartes.

In 1661, Locke took a more practical interest in botany. He started his own Herbarium (BL MS Locke c.41 and b.7), using Jacob Bobart's Physic Garden as his main inspiration.[39] Over a period of 11 years Locke eventually accumulated 970 specimens, and used his copy of the *Catalogus Horti botanici Oxoniensis* (Oxford 1656; BL MS Locke f.49) as an inventory of the plants acquired. Many of those collected were not entered in the *Catalogus* and so Locke added notes on them in his copy of the book. A good

[38] Willis's views are presented more fully by Robert G. Frank (HOP pp.165-169).

[39] A description of the contents of these documents can be found in J.W. Gough's "John Locke's Herbarium" *Bodleian Library Record* 7 (1962-1967) pp.42-46. Information about the student's exercises that Locke used to mount his specimens can be found in P. Long's "The Mellon donation of additional Manuscripts of John Locke from the Lovelace collection" in *Bodleian Library Record* 7 (1962-1967) pp.185-193. This lists the names of all the students that wrote an exercise included as a mounting in the Herbarium. However, as John Milton has pointed out "Henry Cleaton" and "Henry Clayton" are the same person. See "Locke's Pupils" TLN 26 (1995) p.96 n.5.

knowledge of botany was essential to a medical man. Herbal remedies were the mainstay of the general populace, as well as being common to Galenic practice.[40]

Locke also seems to have been especially interested in the clash between the chymists and the Aristoteleans. Whilst working through Moebius' *Fundamenta medicinae physiologica* (Jena 1661) in the early part of 1661, Locke noted the opinion of the author regarding such clashes:

> *Chimia Sennertus* Galenicor⟨um⟩ & Chimicor⟨um⟩ conciliationem & consensu⟨m⟩ elegantisse deliniavit Sennertus: Moeb: c.7. n.27[41] (BM Add MS 32554 f.46v).

Locke studied Sennert's "reconciliation" of the two traditions by reading his *De Consensu et Dissensu Galenicorum et Peripateticorum cum Chymicis* in Sennert's *Opera Omnia*.[42] Sennert's general position was that the chymists were attempting to pass off old doctrines under a new guise. The three principles of salt, sulphur and mercury were acceptable, but merely as products of the four elements and the four qualities. Regarding the more animistic elements of the Helmontian system, Sennert was direct, and Locke felt that this was worthy of note:

> *Archaeus* Spiritus naturalis Senn: Cons: Chym. c5 p.193. (BL MS Locke f.18 p.41).

For Sennert the so-called Archeus was nothing other than the Galenic natural spirit. Sennert's plan in the book was to show that the chymists either said things that were outright wrong, or, in those cases where they say something useful, it was only because they repeated the ancients. Locke was interested in this dispute, and he clearly respected Sennert's opinion on the subject. Locke also used this defence of orthodoxy as an opportunity to note some of the key Galenic notions, and their supporters:

> *Contraria* Contrariis curari a multi probatque quere nomina & locus. vid Sennert: Con: & Diss: c.18. p.271[43] (BL MS Locke f.18 p.61).

Sennert's "reconciliation" was really a reduction. Locke recorded this with interest.

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[40] Dewhurst cited BL MSS Locke f.7 and d.9 as Locke's Herbarium (JLPP pp.9 n.1). This is in spite of the fact that he elsewhere noted that the former is one of Locke's Journals (JLPP p.51 n.1), the volume in question being the Journal for 1683. Dewhurst also recorded the latter as being one of Locke's medical common-place books (JLPP p.19 n.4). Here, as so often elsewhere, Dewhurst is quite unreliable.

[41] "The consensus and reconciliation of the Galenists and Chymists has been elegantly outlined by Sennert".

[42] The book was originally published under the title *De Chymicorum Cum Aristotelicis et Galenicics Consensu et Dissensu* (Wittenberg 1619). It should be noted that this was in Sennert's non-corpuscular period. The first English translation was published in 1662 under the title: *Chymistry Made Easie and Useful, or the Agreement and Disagreement of the Chymists and Galenists* (London 1662).

[43] "That contraries cure contraries is approved of by many and to seek names and places see Sennert".

It is in the period from 1658 to 1662 that Locke was engaged in his most extensive research of the contemporary medical literature. However, he soon gained new responsibilities, and other interests. At the end of 1660 Locke was made a lecturer in Greek at Christ Church and in May of the same year was appointed a tutor by the Dean, John Fell. Locke seems to have perpetuated the scholastic education that he was given in the teaching of his students. He recommended peripatetic authors to them (BL MS Locke f.11 ff.8-57) and set traditional exercises and themes for them to work on (BL MS Locke c.41 and b.7 passim).[44]

1663 saw Locke progress in his academic career, by his appointment as Praelector Rhetoricus at his College. This period also saw his burgeoning interest in the preparation of chemical remedies find a new, more practical outlet. On the 23rd of April that year Locke embarked on a course of public lectures given by Peter Stahl. Stahl was the first person to publicly instruct on chemistry at Oxford.[45] He had been brought to England by Boyle in 1659.[46] Anthony Wood recorded this impression of the young Locke's contributions to the classes:

> This John Lock was a man of turbulent spirit, clamorous and never contented. The club wrot and took notes from the mouth of their master, who sate at the upper end of a table, but the said J. Lock scorned to do it; so that while every man besides of the club were writing, he would be prating and troblesome.[47]

The course ended on the 30th of May.[48] Locke made notes upon this course in a new notebook (BL MS Locke f.25).[49] Locke's attendance would seem to indicate at least a respect for the remedies recommended by the chymists, although this can imply no strict adherence to their doctrine. After all, Boyle was happy to recommend the experimental works of chymical writers, as Locke noted,[50] but this can in no way be taken to imply a non-mechanistic approach in Boyle. Locke's attendance at this course might also indicate

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[44] John Milton presents an account of Locke's tutees in "Locke's Pupils" TLN 26 (1995) pp.95-118. A general description of the exercises that students undertook is given by Bill: *Education at Christ Church Oxford 1660-1800* pp.245-263.

[45] A summary of the available biographical material relating to Stahl can be found in G.H. Turnbull's "Peter Stahl, the first public teacher of Chemistry at Oxford" in *Annals of Science* 9 (1953) pp.265-270. Further information about the structure of the course taught is provided by Guy Meynell in "Locke, Boyle and Peter Stahl", *Notes and Records of the Royal Society of London* 49 (1995) pp.185 and n.13.

[46] R.E.W. Maddison, *The Life of the Honourable Robert Boyle* p.98 cf. *The Life and Times of Anthony Wood, Antiquary, of Oxford, 1632-1695, described by Himself. Collected from his Diaries and other Papers* (Oxford 1891)Vol. I p.472.

[47] *The Life and Times of Anthony Wood* Vol. I p.472.

[48] *The Life and Times of Anthony Wood* Vol. I p.475.

[49] See Appendix II.

[50] "*Cymicus* that great & candid chymist. Basilus Valentinus. Boyle Phys: Ess: p48. That experiencd Chymist van Helmont ib p.57 great chymist ib" (BL MS Locke d.11 f.13v). Locke read a number of works by Basil Valentinus, though he did not take many notes (BL MS Locke d.11 ff.267r-265v *rev*).

a more practical outlook to Locke's medical and natural philosophical work: up until now Locke's research had been carried out exclusively in libraries. Despite his "prating and troblesome" comments, Locke was now beginning to get his hands at least a little dirty in laboratory work.

However, Locke's freedom to choose his course of study was possibly about to be curtailed. He was rising in seniority amongst the students of Christ Church and was in serious danger of having to take orders, and so embark upon a religious career. Late in 1663, Locke wrote to his friend John Strachey for advice. Strachey was quite forthright in his recommendations:

> as to your studies (I hope I may speake without flattery) I believe you and your parts such, that you may wel bee said to bee homo versatilis ingenii, and fitted for whatever you shall undertake, but to deale freely I have alwaies lookt on you as one of a higher head then to take covert under a Cottage, and in my opinion the best Country Parsonnage is no more, and although our Holy Mother makes better provision for some of her children and bestows titles and preferments upon them, yett the expectation is soe tedious, and the observance soe base besides the uncertainty, that it will tire the pateince of an ingenious spiritt to waiht on such a doting Grandame, not to meddle with your owne Genius and inclination which is as bad as Helmont's Archeus if once thwarted and one would as good hang as contradict it (CJL 163).

Locke seems to have been unsure what to do and, despite his medical education, did not yet take the degree requisite to obtain the Faculty Studentship of Medicine.

1664 saw Locke continue to progress academically. He was made the Censor for Moral Philosophy, the senior disciplinarian in the college, under the Dean. As well as his disciplinary duties, this post saw Locke give lectures on the subject of natural law.[51] In 1664 Boyle moved permanently to Oxford, and a number of notes began to appear in Locke's commonplace books which were received directly from Boyle.[52] At about this time Locke also became very interested in the subject of respiration. A great deal of experimental work in this area was being undertaken at this time in Oxford, by a variety of different individuals, and Locke now became one of them.[53] Locke's school friend Richard Lower was carrying out research on this subject and many notes began to appear in Locke's notes detailing various physiological and chemical problems. Locke's work on this topic is of great interest and will therefore be carefully examined subsequently.

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[51] BL MS Locke f.31 and e.6. These essays have been edited, translated and discussed by W. von Leyden in *Essays on the Laws of Nature* (Oxford 1954).

[52] Most of these entries marked "Mr Boyle" from around this period can be found in BL MS Locke f.19 pp.51, 201, 250, 264, 267, 268, 276, 286, 294-295, 286, 298, 321, 324 and 377, and BL MS Locke f.25 pp.15, 43, 45, 49a, 50, 63, 73, 76, 105, 148, 164, 210, 234, 236, 264, 265, 273, 301, 314, 315, 317a, 317b, 318, 322, 344, 350 and 365. There are sporadic entries in BL MSS Locke d.9, f.23, f.27 and f.28, and in BM Add MS 32554.

In 1665 Locke was promoted to the ranks of the *theologi* within the college and he was now obliged to take orders, or face losing his studentship. Locke managed to retain his position in spite of his failing to switch to a medical studentship. He did not take orders as he was required to do, and this suggests that he was very highly esteemed by the Dean.[54] 1665 also provides us with the only evidence we have of Locke's reading Bacon in the early part of his career. Curiously, there is little documentation from this early period to show a serious interest on Locke's part in Bacon's works. There are references to only one of Bacon's books, *Sylva sylvarum* (London 1664) (BL MSS Locke f.22 and f.19). Locke was aware of Bacon's *Novum Organon*, as this note from taken Glisson *circa* 1660, shows:

> *Calor* Caloris essentiam consistere in motu expansivo et rarefactivo non nihil cohibito clare demonstrat. Verulamius in novo suo Organo: Gliss: Rac: c.12. p.116[55] (BM Add MS 32554 f.21v).

Locke does not appear to have spent any more time on Bacon's influential work.[56]

Having resigned the post of censor in December 1664, Locke was free from the necessity of attending college. So, when the opportunity arose for him to go abroad for the first time, Locke seized it. He accompanied Sir Walter Vane from November 1665 to

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[53] The definitive account of the work being done on respiration in Oxford at this time is provided by Robert G. Frank in *Harvey and the Oxford Physiologists* (Berkeley 1980).

[54] In fact, Locke later removed himself from this anomalous situation in a rather undignified fashion. He did not get around to taking the medical degrees that he needed to exempt him from the conditions of the Studentship. So, in November 1666, in a shameless attempt at string-pulling, Locke got the Chancellor of the University to write to the Medical Faculty, describing Locke as "in all respects qualified for the degree of Doctor in that Faculty" (PRO 30/24/47/8A). In spite of the fact that this must have appeared as a formidable edict, it was ignored. Doubtless this was because even in those days, when medicine was far from a perfected art, no serious academic would licence the practice of medicine on the advice of a layman. Locke, however, was undeterred and made sure that the next person pulling the strings on his behalf had the requisite influence. On the 14th of November 1666 the Dean of Christ Church was greeted by a letter from the King, requiring them to "suffer him, the said John Locke, to hold and enjoy his Student's place in Christ Church, together with all rights, profits and emoluments thereunto belonging, without taking holy orders" (PRO 30/24/47/22 f.9). Locke knew what to expect from this royal communication, having drafted the piece himself (BL MS Locke c.25 f.11).

[55] "Heat essentially consists in expansive motion and rarefaction somewhat interrupted as Verulam clearly demonstrates in his Novum Organon".

[56] This is all the more peculiar given a note that Locke copied from Boyle *circa* 1661. It read thus: "*Bacon* Nor would I be thought to disallow such writings of very learned men, as though they may bare very generall titles, yet are not published by their authors as complete bodys or systems of physiologie, but rather of generall principles (almost like ye hypothesis of astronomers) to assist men to explicate the already knowne phenomena of nature. & yt you may know wt kinde of writings I meane I shall name to you the Learned Gassendus his little syntagma of Epicurus philosophy & that most ingenious gent Mr Des Cartes his principles of philosophy. excellent though disagreeing books. & S Francis Bacons novum Organum excellent books Boyle: Phys: Ess p6 That great & candid philosopher ib p.98 That profound naturalist ib p.115" (BL MS Locke f.14 p.92). It seems odd that Locke should have taken up the first two of these recommendations, yet did not take up the third. Nonetheless, there is no evidence that he did.

February 1666 on a diplomatic mission to Cleves. Locke wrote home about a disputation he witnessed during his stay:

> I was had to a fodering of chopped hay or Logick forsooth, poore materia prima was canvassed cruelly, stripped of all the gay dresse of her formes and shewne naked too us, though I must confesse I had not eys good enough to see her, however the dispute was good sport and would have made a horse laugh, and I truly was like to have broke my bridle … our disputeing here in Oxford comes as short of it, as the Rhetorick of Carfax does that of Belings gate. But it behoves the Moncks to cherish this art of wrangleing in its declineing age, which they first nursed and sent abroad into the world to give it a troublesome idle imployment (CJL 182).

It is clear that Locke was far from approving of these academic exercises, and was no advocate of hylemorphism.[57] On this mission Locke met a Doctor Johann Schard, a physician who shared Locke's interest in the preparation of chymical remedies. In later correspondence Schard supplied new prescriptions for Locke and to try out.[58] After his return home in 1666, Locke began a new set of chemical experiments with Lister Blount[59] and David Thomas, which are recorded in his old notebook from Stahl's class (BL MS Locke f.25).[60]

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[57] Evidence of Locke's engagement with Aristotle's philosophy and its medieval derivatives is rather scanty. There are two quotations from Aristotle's *Nichomacean Ethics* in the *Essays on the Law of Nature* (ELN pp.35 and 112-113), but these explicit references are a rarity. There is rather more evidence of Locke's acquaintance with the scholastic philosophy derived from the ancients. This is summarised in John Milton's "The Scholastic Background to Locke's Thought" TLN 15 (1984) pp.25-34. Milton concludes that most of Locke's study of scholastic philosophy concerned works that were published in Locke's relatively recent past. Locke did not appear to have studied at first hand any of the works of the great scholastic philosophers; Aquinas, Duns Scotus or Ockham, for example. (In the *Essays on the Law of Nature* Locke does give a reference from Aquinas, but as von Leyden points out, this is most likely taken from a footnote of Hooker's (ELN pp.116-117).) Milton also asserts that much of the work that Locke was exposed to was of a very low quality. Nonetheless, some scholastic authors do appear to have had an influence upon some of Locke's thought. Robert Sanderson, for example, was the source for some of the material that Locke used in his work on the Law of Nature (ELN pp.30-34). Locke owned Sanderson's textbook on Aristotelian Logic, *Logicae Artis Compendium* (Oxford 1615) (H&L 2548a) and may have been personally acquainted with the man (ELN pp.33-34). Locke did not list his copy of Sanderson's *Compendium* in his 1681 book catalogue, suggesting that it was acquired at a later date. This indicates some respect for Sanderson's work even after Locke's scholastic education was complete.

[58] See, CJL 198, 204 and 237, and the notes referring to Schard in BL MS Locke f.25 pp.17, 21, 29, 34, 64, 120, 181, 184, 186, 188, 194, 205, 226, 264, 277, 301, 307, 309, 310, 313, and 360, BL MS Locke f.27 pp.65, 67, 68, 69, 70, 73, 74, 77, 79, 80, 81, 82b and 83c, and BL MS Locke d.9 pp.2, 8, 12, 13, 18, 22, 48, 53, 78, 80, 82, 86, 124, 200 and 218.

[59] The name of Locke and Thomas's partner in these experiments has been the source of some dispute. He is mentioned only infrequently in the MS sources: He is referred to as "Mr Blunt" in one of Locke's account books (BL MS Locke f.12, p.9), "Mr Blunt" in a memorandum book (BL MS Film 79, p.10) and "Dr Blunt" in a letter from Thomas to Locke, dated 11 December 1693 (CJL 1681). Cranston (*John Locke A Biography* (London 1957) p.91 n.1) suggested that the man was probably "Thomas Blount of ⟨Brasenose College⟩ (matriculated 1650), son of Colonel Thomas Blount, F.R.S.". Dewhurst followed Cranston (JLPP p.20) and described this man as a "doctor". De Beer thought that the person in question was most likely one "Lister Blount, D.M 1644" (CJL 1681 n.2). Cranston's identification appears to rest on nothing more than the fact that Thomas Blount's father was connected with the Royal Society and that the son was more or less contemporary with Locke and Thomas. However, Thomas Blount did not even graduate, let alone acquire an M.D. (*Alumni Oxonienses* I p.141) and there is no reason to suppose that he shared his father's interest in natural philosophy. Lister Blount on the other hand, certainly was a medical man having taken

1666 also saw the publication of Boyle's *The Origine of Formes and Qualities*. This was Boyle's attempt to establish comprehensively the corpuscular world-view as the only tenable natural philosophy: he wanted to show that the scholastic theories were groundless and obscure, and that corpuscularianism was a much more palatable alternative. This book is cited by modern commentators as *the* major influence on John Locke's natural philosophy. It is surely worth noting then, that at a time when Locke had just finished reading a good deal in the chymical tradition, and was once more embarked upon the preparation of chemical remedies, in all Locke's surviving common-place books there is only one note from this text (BL MS Locke f.25 p.313). There is a great discrepancy between the importance attached to this book by conjectural historians, and the textual evidence we have of the attention Locke gave to it. I do not here mean to imply that there was no interaction between these two men. Nor do I mean to assert that Locke was uninterested in the contents of this book. It will be shown that this is not the case. There is a great deal of evidence that there was collaboration between Locke and Boyle on some scientific matters. We have already indicated the notes that Locke took from Boyle on minor medical subjects. Locke attempted to perform some few experiments on Boyle's behalf. In 1666 Locke started a weather register which he would keep, intermittently, for the rest of his life (BL MS Locke d.9 pp.329-389 and 394), part of which would later re-appear in Boyle's *The General History of the Air* (London 1692) (pp.104-132). A letter (CJL 197) that Locke wrote to Boyle was also included (*op cit.* pp.137-141). There is evidence to suggest that Boyle informed Locke of a plan to research about the blood and Locke may have supplied some of his results to Boyle (BL

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the relevant exams (Ibid.). He may have been somewhat older than Locke and Thomas, but this is no bar to their having been acquainted through the medical circles in Oxford. Indeed, Willis was known to Locke and Lower, and he had obtained his B.Med. and licence to practice in 1646 (*Alumni Oxonienses* IV p.1650). Lister Blount, therefore, seems the most likely candidate as Locke and Thomas's partner in chemical experimentation.

[60] Guy Meynell argues ("Locke, Boyle and Peter Stahl" in *Notes and Records of the Royal Society of London* 49 (1995) pp.185-192) that the last experimental entry is dated July 1667, though he gives no reference (*op cit.* p.188 cf. n.18). If he is referring to the date on p.322, his argument is unconvincing. This date of 2 July comes immediately after entries dated by Locke as in May and June 1666. It is most likely that the date in July refers to 1666 too. Locke left his glassware packed up in Oxford when he left the town (BL MSS Locke c.1 p.422, f.12 p.8 and BL MS Film 79 p.7), and there is no evidence to suggest that it was sent on after him to London. On the June 22nd 1667, Thomas wrote to Locke on this date to tell him that "I had forgot in my last, to tell you that I have taken all the remainder of that materialls to Sarum, but as have yet not opened any thing I brought hither; as thinkeing this is not a time for Chymists" (CJL 227). The materials referred to almost certainly included the concoctions that Thomas and Locke made up together and may possibly also have referred to the glassware that Locke had left at Oxford. All this points to the conclusion that Locke did not perform chemical experimentation after the 2nd of April 1667. Locke later wrote to Boyle on this subject in a letter headed "Exeter-house, Nov.12, 1667", saying: "The place I am at present in … ⟨has⟩ kept me from attempting any further experiments in chemistry, though I find my fingers still itch to be at it" (CJL 228).

MS f.19 pp.272-273&302-303).[61] This suggests a collaboration on rather mundane empirical matters, but there is no evidence suggesting a great philosophical alliance between the two men. That Locke took few notes from *The Origine of Formes and Qualities*, is entirely consistent with this conclusion.

In April 1667 Locke left Oxford for London, and the character of his medical work was to change dramatically. His academic training was over. In the previous years he had undertaken an enormous project of medical scholarship. His first studies were eclectic, but he soon began to carefully investigate the Galenic medical tradition. Later, when acquainted with Boyle, he studied the mechanical philosophy, and the works of Descartes. However, he still continued to study orthodox medicine.[62] Locke also looked at the chymical tradition, and tried his hand at chemical experimentation.

There cannot have been many people who had better acquainted themselves with the competing medical theories of the day. Nonetheless, in all these notes on authors, recipes for cures and notes on experiments, there is no evidence that Locke ever found himself in the position of having to cure a gravely ill patient. Locke was much more an academic than a practising physician.

[61] Nonetheless, there is no evidence to suggest that they ever carried out practical work together. Boyle did recognise Locke's contribution to research into the nature of the blood, giving Locke two very favourable mentions in his *Memoirs for the Natural History of Humane Blood* (London 1684). The Preface of this last mentioned work is addressed "*To the very Ingenious and Learned Doctor J.L.*" (*op cit.* p.A2r) Additionally, the fourth part of the book, "Containing the History of the Spirit of Humane Blood" takes the form of "an Epistolary Discourse to the very Learned Doctor. JL" (*op cit.* p.94). The evidence of these collaborative efforts has been summarised by Dewhurst in "Locke's contribution to Boyle's Researches on the Air and Human Blood" in *Notes and Records of the Royal Society of London* 17 (1962) pp.198-206.

[62] See, for example, the many references to Lazar Riverius' *Praxis Medica* (The Hague 1658) *circa* 1665 (BL MS Locke f.22 passim).

Respirationis Usus

John Locke and Richard Lower were at school together. Lower came to Oxford in 1649, three years before Locke, and acquired a Studentship at Christ Church, as Locke would three years later. Lower was a lecturer in Greek from 1656 to 1657 and was a Censor in Natural Philosophy from 1657 to 1660. He rose in seniority within the college until, in 1663, he reached the level of *theologi*. However, unlike Locke, Lower did not manage to retain his Studentship when he failed to take orders. But he did keep his rooms in college and so could live and work in Oxford. As this brief academic biography illustrates, Locke was following in Lower's footsteps during his career at Oxford.[63] The two had a great many common interests. Lower was drawn to medicine and worked closely with Thomas Willis. Indeed, the two shared a medical practice *circa* 1662-4 (HOP pp.180). Lower was also acquainted with Boyle and the two corresponded on a number of natural philosophical issues. Locke even recorded some of this interaction. After copying out a prescription for "*Febris intermittens*", Locke noted:

> This is Riverius cure of 4^{an} agues w^{c} he mentions in his observation, w^{c} Mr Lower had from Mr Boyle (BM Add MS 32554 f.119v).

Locke took many notes from Lower in the period from 1660 to 1666, as the two old school-friends collaborated on a wide range of medical topics. Lower was well versed in the skills of vivisection and his speciality was the study of anatomy. This latter ability was put to use in a collaboration with Willis on the structure of the brain. We have already noted the fact that Willis gave lectures as a part of the requirement of tenure as Sedleian Professor of Natural Philosophy. Locke had attended these, as had Lower. Indeed, Lower is the likely source of at least one of the sets of notes that Locke made.[64] In these lectures Willis worked on many topics, but was unhappy with his teaching on the brain.[65] So, he resolved to undertake further study on this question and set Lower to work on the project. They studied many corpses, killed various animals and, with the help of Wren, who provided the illustrations, created a book that superseded all previous work on the subject: *Cerebri Anatome* (London 1664). Locke read this and made many notes on it (BL

[63] Lower's biographical details are taken from Robert G. Frank (HOP pp.179-180).
[64] At the end of one set of lecture notes Locke wrote "Willis praelectio a RL accepta." (BL MS Locke f.19 p.48). Lower sent a set of these notes to Boyle (Boyle Papers at the Royal Society (Vol 19 ff.1-35)).
[65] Locke recorded Willis's lectures and gave them the headings "Cerebrum" (BL MS Locke f.19 pp.130-142) and "Cerebellum" (BL MS Locke f.19 pp.142-151).

MS Locke d.11 ff.275r-273v *rev*). This research over with, Lower was free to pursue other interests, one of which he related to Boyle. Lower wanted to examine

> the reasons of the different colour of the blood of the veins and arteries; the one being florid and purple red, the other dark and blackish.[66]

Lower worked closely with Locke in this period, and Locke often recorded Lower's experimental results, as well as adding his own speculations about Lower's work. It was this work on blood and physiology that eventually led Locke to think about respiration, and to write his first significant piece on a natural philosophical subject.

As we have seen, Locke was acquainted with Harvey's discovery of the circulation of the blood. He had also read Boyle's work on respiration as presented in the *New Experiments Physico-Mechanical.* All this as well as reading a wide range of medical texts, many of which referred to this topic. It is not surprising then, given Lower's interest in the problem of blood and its role in respiration, that Locke should have made his own notes on this question. One of the first of these was a quite general statement of theory that owed more to Locke's reading than Lower's experimental work. Since this note has not been previously published, I will here transcribe it in full:

> *Respiratio* One use of respiration seems to be for y^e^ carrying away those vaparous excrement of y^e^ bloud w^c^ are usually cald fuliginos, w^ch^ findeing a fit receptacle in y^e^ pores of y^e^ aire drawne into y^e^ lungs insinuate them selves & soe are cast out in expiration & y^e^ bloud ventilatd, but if the pores of y^e^ aire be allready fild with [such or] steams soe as not to be able to receive those effluvia it is not fit for respiration & hence it probably comes y^t^ in crowds people swoune, adde to this what Dr Power in his Experimental Philosophy *p.174* <u>*64*</u> observes of Damps in Cole mines, y^t^ y^e^ effluvium y^t^ comes out of their owne bodys espetially when they sweat will cause them & put out their candles, w^ch^ will burne longer neare y^e^ floore then roofe of those lanes, y^e^ dampe runing along y^e^ roofe. JL. Another use of respiration seems to be to mixe some particles of aier with y^e^ bloud & soe to volatize it, since it appears y^t^ vegitable substances neither ferment nor yield any volatile salt without a communication with y^e^ open aier, for noe vegitable distild in close vessels affords any volatile salt but, [atmosphere] vegitables burnt in y^e^ open aier, & soe mixing its volatile parts with those of y^e^ aire is turnd into soot w^ch^ being distild in close vessels yields a volatile salt very little differing from y^t^ of Bloud or Harts horne. JL. & hence possibly is y^e^ reason why charcoale kept in a glasse exactly stopd will never calcine to ashes in the greatest fire because no aire comes to mix with it & make any of y^e^ parts volatile .v. Boyle. Scept. Chym. p.62 . <u>61</u>
> Cut a hole in each side of a dog (BM Add MS 32554 ff.48r&49r).

The last sentence of the note "Cut a hole in each side of a dog" seems to have been copied from an early note in one of Locke's memorandum books. This book (BL MS Locke f.27), used by Locke from 1664 to 1666, contained a short-hand note:

[66] Lower to Boyle 24 June 1664. BW VI pp.472-473.

> *Respiratio* Open a hole in each side of a dog and cut off the nerves that go to the diaphragm, the dog will die immediately. But if you cut off the eight pair that go to the lungs he will live two or three days. Bloud will be congealed in the vessells JL Mr Lower (BL MS Locke f.27 p.13a).

It looks as if Locke was copying this into his common-place book, possibly with regard to some further theory but perhaps he was interrupted at the time of writing, or changed his mind about his idea. Nonetheless, the fragment suffices to date the piece to 1664. There is no change of ink or interruption of the flow of previous writing, nor is there a line to indicate a break in the text. Independent dating evidence comes from the fact that Locke was quoting Henry Power's *Experimental Philosophy* (London 1664) which he read soon after its publication.[67] This note in the common-place book also shows that Locke and Lower were working together on the problem of respiration. This piece details Locke's views as to the use of respiration and seems to have two main parts.

Firstly, Locke believed that air has a use in the expulsion of "vaparous excrement". This excrement was fitted on to the "pores of y^e aire drawne into y^e lungs" and was then expelled from the body through exhalation. This theory Locke illustrated in two ways, first through the collapsing of people in crowded rooms, and second through the fainting of miners. The posited explanation was that in both these cases, the air became filled up with this excrement and was saturated with it. This meant that no more excrement could be expelled from our body, resulting in the observed effect. This theory was appended with the initials, "JL" to indicate its authorship. Presumably the initials also indicated that he had finished the note on this particular subject.

Evidently, though, Locke felt that this was not a fully comprehensive explanation of the purpose of breathing, so another use was assigned to this bodily activity. Locke supposed that parts of the air mixed with the blood, which volatized it, and made it chemically more reactive. This theory Locke supported with the differing results of burning vegetables in various vessels supplied with, or deprived of, air. This theory spurred Locke on to attempt to account for a phenomenon noted by Boyle. Boyle recorded the experimental result that heating charcoal in a closed vessel would not turn that body into ash, whereas it would do so in the open air (TSC pp.62-63). Locke took the reason for this to be that in this closed vessel, the parts of the air that volatize things cannot reach the charcoal, and so cannot reduce it to ash. This second conjecture by Locke is interesting in as much as it was one rejected by Boyle.

[67] These two points also serve to date Locke's reading of Boyle's *The Sceptical Chymist* to 1664.

In the *New Experiments*, Boyle had conducted just the sorts of experiments that Locke was referring to. For example, in Experiment 10 (NEPM pp.74-78) Boyle had shown that when placing a candle in the air-pump, and evacuating the air, "within little more then half a minute after the Flame went out" (NEPM p.74). Experiment 11 (NEPM pp.78-82) showed that burning hot coals were affected in the same way. Boyle "observ'd that upon the first exsuction of the Air ... the Fire in the Coals began to grow very dim" (NEPM p.79). Experiment 12 (NEPM pp.82-83) showed that fire, when extinguished by a vacuum, was "as it were refresh'd by the new Air" (NEPM p.83) when the vessel was opened. All this demonstrated a close relationship between fire and air, as did the experiment referred to by Locke from *The Sceptical Chymist*.

Another set of experiments Boyle carried out concerned the relationship of air to the conservation of life. Experiment 41 (NEPM pp.328-334) examined the effects of the air pump on animals. Boyle first took a lark, and placed it in the closed vessel, from which the air was then evacuated:

> the Bird for a while appear'd lively enough, but upon a great Exsuction of the Air she began manifestly to droop and appear sick and very soon after was taken with as violent and irregular Convulsions, as are wont to be observ'd in Poultry, when their heads are wrung off: For the Bird threw her self over and over two or three times, and dyed (NEPM p.328).

Similar experiments were carried out on a sparrow (NEPM p.329) and a mouse (NEPM pp.330-331). There seemed to be a close relationship between air, fire and life. Locke was aware of Boyle's work, noting its relevance to respiration:

> *Respiratio* ejus causa et finis. Ent: p.96. Boyl. op: ex: 40.41. [68] (BL MS Locke d.11 f.73v).

These results led Boyle to assert that the animals had died "from the want of Air" (NEPM p.332). The question was why the lack of air had this effect. The Galenic explanation for this phenomenon, Boyle dismissed (NEPM pp.347-350). Since Locke discussed this at a later date, we shall leave our consideration of the Galenic theory until then. Boyle gave two other possible explanations of the use of air in respiration. The first of these was that

> the Air does not onely, as a Receptackle admit into its Pores the Excrementious vapours of the Blood, when they are expelled through the Wind-Pipe, but also does convey them out of the lungs, in regard that the inspired air reaching to all ends of the *Aspera Arteria*, does there associate itself with the Exhalations of the circulating Blood, and when 'tis exploded, carrys them away with its self (NEPM pp.351-352).

[68] "*Respiration* of its cause and end".

Boyle found this theory "congruous enough" to his observations, and added to these comments another regarding the fainting of miners where "the Air too much thicken'd (and as it were clogg'd) with Steams, is unfit for Respiration" (NEPM p.353). In short, Boyle seemed happy enough to take this as the correct explanation of the use of breathing. In so far as Locke, in the first half of his early note, used the same example, and adhered to the explanation, he agreed with Boyle's account. Boyle also presented a second possible use of respiration, which he did not subscribe to:

> *Paracelsus* indeed tells us, *That ... the lungs consume part of the Air, and proscribes the rest.* So that according to our Hermetical Philosopher ... it seems that we may suppose, that there is in the Air, a little vital Quintessence ... which serves to the refreshment and restauration of our vital Spirits, for which use the grosser and incomparably the greater part of the Air being unserviciable, it need not seem strange that an Animal stands in need of almost incessantly drawing fresh Air (NEPM p.362).

The theory that the air was used in the production of vital spirits was expressed in both the Galenic and Paracelsian traditions. Indeed, even Helmont thought that it had something akin to a catalytic role in the production of vital spirits. He maintained that "The air is drawn inward for a peculiar end, that it may cause the blood of the veins … to be plainly volatile"[69] (OPR p.184). Despite all this argumentation, at the time of writing his experimental results for the *New Experiments*, Boyle was evidently not impressed:

> this Opinion is not ... absur'd, yet besides that, it should not be barely asserted, but explicated and prov'd; and besides that, some Objections may be framed against it, out of what has been already been argu'd against the Transmutation of Air into vital Spirits: Besides these things, it seems not probable, that the bare want of the Generation of the wonted quantity of vital Spirits, for less then one minute, should within that time, be able to kill a lively Animal (NEPM pp.362-363).[70]

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[69] "aerem intro trahi, peculiari fine, ut cruorem venarum ... plane volatilem" (OM p.151).

[70] Boyle remained adverse to the notion that there was a volatile salt in the air. As we shall see, later theorists posited a nitrous salt in the atmosphere as responsible for the volatization of the blood. Boyle continued to be sceptical on this point. In *The General History of Air*, which Locke prepared for the press, there was hostility to the idea that these salts have an important role to play. In the Chapter entitled "*Of* Salts *in the Air*" (*op cit.* pp.39-60), Boyle wrote: "I know that divers learned Men, some Physicians, some Chymists, and some also Philosophers, speak much of a *Volatile Nitre*, that abounds in the Air, as if that were the only Salt wherewith it is impregnated. But though I agree with them, in thinking that the Air is in many Places impregnated with Corpuscles of a Nitrous Nature; yet I confess I have not been hitherto convinc'd of all that is wont to be delivered about the Plenty and Quantity of the Nitre in the Air: For I have not found, that those that build so much upon this volatile Nitre, have made out by and competent Experiment, that there is such a volatile Nitre abounding in the Air. For having often dealt with Salt-peter in the Fire, I do not find it to be easy to be raised by a gentle Heat; and when by a stronger Fire, we distil it in close Vessels, 'tis plain that what the Chymists call *Spirit of Nitre*, has quite differing Properties from crude Nitre, and from those that are ascribed to the volatile Nitre of the Air; their spirits being so far from being refreshing to the Nature of Animals, that they are exceeding corrosive" (*op cit.* pp.41-42).

In Locke's note we can see a clear disagreement with Boyle's previously published conclusions about respiration. Locke was happy to countenance the idea that there was some part of the air that was necessary for our continued life. In point of fact, he was so confident of this notion as to draw some conclusions from it in order to explain another experiment reported by Boyle in *The Sceptical Chymist*. This experiment, was not Boyle's own, rather the "Experiment is that of *Helmont*" (TSC p.62). So here, in this second section of Locke's note, we have a situation where Locke was referencing Boyle's works to lend indirect support a theory that Boyle himself did not subscribe to. In fact, in this second section of the note, the emphasis was rather more upon the Chymical explanations of the phenomenon, and the reference to Boyle was merely a means to this explanatory end.

Locke diverged from Boyle's view as expressed in the *New Experiments* because he was paying a great deal of attention to experimental results about volatility and fermentation. Often the source of these empirical observations was Boyle himself. Experimental results reported in *The Sceptical Chymist* inspired Locke to theorise about the properties of air. For example, under the head "*Sal Volatile*", Locke spent a great deal of time working out the basic nature of volatility, especially by looking at the case of fermentation:

> things fermented yeild a great deale of volatile sp^{t}, but I suppose noe oyle. & lesse alkali then otherwise they would do unfermented (BL MS Locke f.19 p.224).

Locke believed that fermentation produced volatility. He then questioned the role that air plays in the fermentation:

> what interest y^{e} aer hath in this businesse of fermentation will be worth enquiry. since noe fermentation is without a communication wth y^{e} aier, nor will soot (out of w^{ch} may be distild a volatile salt like y^{t} of animal substances) be generated in close vessels out of w^{ch} y^{e} aire is excluded JL v. Boyle. Scept: Chym. p.267. 61 (BL MS Locke f.19 p.226).

Locke had previously noted that air played a crucial role in a great number of experimental situations, without which the processes at work would be greatly altered:

> *Fulgio* Soot seems not to be generated but from things burnt in y^{e} common aire, & therefor y^{e} parts sublimated by y^{e} fire may be well supposed to unite them selves with some particles of y^{e} aer or else some salt or other matter flying about in it. from which union is generated y^{t} body we call soot. v. Boyle. Scept. Chym. p.49: 61. JL.
> Consider too y^{e} difference of fire workeing upon Sulphur in close vessells & y^{e} open aier, in one it produces only flowers in y^{e} other an acid liquor JL (BM Add MS 32554 f.108v).

Locke recognised that air played a role in chemical processes and postulated a "salt" in the air that was responsible for this. Prior to his point regarding the role of the air in fermentation, Locke had tried to pinpoint what it was in this process that was important:

> liquors without fermentation yeild noe sp^{t} or volatile salts, but animall substances doe because they are fermented in y^{e} bodys of y^{e} liveing animalls. v. Boyle Scept. Chym. p.231. & hence perhaps is y^{e} reason why fat & oleaginous substances are with soe much difficulty if at all fermented: because of y^{e} want of salt w^{ch} is y^{e} cause & a necessary ingredient of fermentation (BL MS Locke f.19 p.225).

We can see that Locke postulated a salt as a pre-requisite of any fermentation, and posited a salt in the air as a possible reason for differences the in chemical reactions when things are exposed to, or kept from, the air. Thus Locke came to believe that air had a crucial role in volatizing bodies, as it provided a salt. This would explain why "noe fermentation is without a communication wth y^{e} aier" (BL MS Locke f.19 p.226). All of these consideration led Locke to posit the second strand of his theory: There is something in the air that we take in during respiration that volatizes the blood.

However, none of this was very specific concerning the various physiological processes that took place during respiration. The blood was in some way volatized, but was this by fermentation or not? Was it in the lungs or elsewhere? It was Locke's close relationship with Lower that supplied the answers to these questions. Lower intended to work on the difference between venous and arterial blood in 1664. Notes began to appear on this subject in Locke's common-place books. The first of these detailed the main point at issue:

> *Sanguis* Bloud taken out of y^{e} veines and arteries of y^{e} same creature at y^{e} same time very much differs. y^{t} y^{t} comes out of an opend veine being y^{e} greatst part of it of a darke colour w^{c} they commonly call crassamentum nigru⟨m⟩ with a florid red about y^{e} thicknesse of half a crowne on y^{e} top. y^{t} w^{c} comes out of an opend atrerie is all of y^{t} florid colour without any Crassamentum nigrum R.Lower (BL MS Locke f.19 pp.212-213).

The general statement, however, was subject to one exception:

> *Sanguis* Bloud taken out of y^{e} artery of y^{e} lungs hath its crassamentum nigrum like y^{t} which comes out of y^{e} vains so y^{t} y^{e} red florid is made only in y^{e} left ventricle of y^{e} heart RL w^{ch} perhaps is by y^{e} mixture of y^{e} aire with it w^{ch} gives it volatilization & colour (BL MS Locke f.19 p.226).

This last passage came immediately after that which posited a link between fermentation and air. Locke erroneously noted that the blood coming from the lungs to the heart was of the same sort as venous blood. This would leave some role to be played by the heart

in the volatization of the blood. So, for Locke, it was through both the lungs and the heart that blood came to be volatized, with fermentation as part of the process. Locke also looked to other sources to support his arguments, this time turning to Martin Kerger in his *De Fermentatione*:

> *Fermentatio* ad superiorem de fermentatione opinionem facere videtur q⟨uo⟩d de acetu generatione observavit[71]
> Kerger de fermentat: s.1. c10 (BL MS Locke f.19 p.226).

Locke must have been very interested in the role played by fermentation in volatization, as this entry is entirely out of place in his system of common-placing. All the entries so far, "*Sanguis*" and "*Sal Volatile*" had an "Sa" heading. "*Fermentatio*" was quite wrong. The fact that Locke violated his own cherished rules just goes to illustrate the importance he now attached to the role of fermentation in the explanation of respiration.[72]

These speculations about the composition of the air led Locke to attempt a tentative solution to a well-known problem concerning the difficulties of respiration at altitude:

> *Respiratio*: whether y^{e} aer, as we are told by travailers on pike Tenerif & y^{e} Andes in peru & other great heights, be lesse useful to respiration, because of any extraordinary quality, or y^{t} it wants some of those salts or other materiall parts w^{ch} mixes with the bloud & helps to its fermentation, & which are found in y^{e} aer of lower regions, or else because the pressure of the aier being lessend by the height of y^{e} place, it is scarce sufficient to lift up y^{e} lungs & soe respiration is hindered (BL MS Locke f.27 168-167 *rev*).[73]

Locke looked for support for one of these conjectures, and given his previous researches into fermentation, it is not surprising which one he went for. What may be more unexpected is the support that Locke adduced; he turned to the chymical work of Helmont:

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[71] "to the above opinion on fermentation seems to belong what he has observed concerning the generation of vinegar".

[72] Locke was very particular about his common-placing, and was rather proud of the system that he had developed. He made a huge amount of notes on many topics, and was usually quite scrupulous in following the rules that he set down for himself. Indeed, a description of this system was one of the very first publications that Locke ever produced: a "Méthode nouvelle de dresser des Receuils" in *Bibliothèque universelle et historique* 2 (1686) pp.315-340. An English translation can be found in *The works of John Locke* (London 1832) III pp.331-349. A draft version of this piece is printed by Meynell in "John Locke's Method of Common-placing, as seen in his Medical Notebooks, Bodelian MSS Locke d.9, f.21 and f.23" in *The Seventeenth Century* 8 (1993) pp.258-263.

[73] This note appears also in BL MS Locke f.19 p.158, where the phrase "or other materiall parts" was replaced by "which by Mr Hooke are thought to be Niter" and the note as a whole was appended "JL". The page in the Memorandum Book (BL MS Locke f.27) is headed "64" and does not contain the reference to Hooke, suggesting that the common-place entry is a later copy. Hooke had not published any such suggestions and so this information most likely came from personal acquaintance.

> *Sal Volatile* Helmont Blas humanu⟨m⟩ n.35.p.150.52 where he says y^t y^e aire makes y^t all y^e bloud transpires & becomes volatile, but being distild leaves a ⟨caput mortum⟩ But y^t he says n45 that y^e aier volatizing y^e sulphur of any concrete, all y^e alkali will become a volatile salt. Q How y^e aier may be soe applyd as to effect this whither by expressing to it or fermenting in it. JL (BL MS Locke f.19 pp.226-227).

The typically obscure quote from Helmont from *Ortus Medicinae* that Locke cited first, read:

> This has not been known in the Schools; to wit, that the whole of the Venal bloud, that it may depart into a Gas, it hath need of two wings to fly, the aire and a ferment. Wherefore observe thou, That as oft as any thing of bloud becomes unfit, or is not by degrees disposed of, and undergoes its degrees in the outward part of the body, that it may be wholly throughout the whole be made volatile and capeable to flye away[74] (OPR p.182).

It was Helmont's opinion that the blood was made volatile by the air and a ferment (although in Locke's note the main point of interest was the role of the air in the production of volatility). The next reference Locke made, to "n45" of the same chapter contained a point on the same theme:

> If he Air (let him who can, comprehend the secret) doth in the first place, volatize the Sulphur of the composed Body, with the every way separation of its Salt, this Salt (which else in the Coal, should be fixed into an *Alkali*, by the fire) is made wholly volatile[75] (OPR p.184).

The volatility of the body was contingent upon the presence of the air. Significantly, it was this result, in this part of his work, which led Helmont to assign an overall purpose to respiration. Locke was acquainted with the piece, so it seems appropriate to note the conclusions that Helmont drew from the volatization of the blood by the air:

> This Salt is demonstrated by a Handicraft-operation; but its demonstration is known to few, although it lifteth us to make it plain. At least, it from thence appeareth, that the true use of Air in the Pulse, and breathing, was not made known to the Ancients, by reason of ignorance of the Art of *Alchymie*. Likewise from thence it is manifest, that from a continual necessity, the Air is drawn inward for a peculiar end, that it may cause the bloud of the veins … to be plainly volatile[76] (OPR p.184).

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[74] "Hoc fuit in Scholis nescitum. Nempe quod totus cruor, ut in Gas abeat, duobus alis ad volandum opus habeat, aere & fermento. Quocirca attende, quoties aliquid cruoris in externo corporis ineptum fit, aut non sensim disponitur, gradusque subit, ut totum per totum fiat volatile, & transvolabile" (OM pp.149-150).
[75] "Si aer, (arcanum capiat qui potest) imprimis volatizat sulfur concreti cum omnimoda separatione sui sales, hoc sal (quod alioquin in carbone fixaretur in alkali, per ignem) fit totum volatile" (OM p.151).
[76] "Hoc sal, per mechanicam est demonstratum; ejus autem demonstratio est paucis cognita, nos licet eam tamen palem facere. Saltem inde apparet veteribus, verum aeris usum in pulsu, & anhelitu, non enotuisse, propter Spagyricae artis ignoratum. Saltem inde constat continua necessitate, aerem intro trahi, peculiari fine, ut cruorem venarum … plane volatilem" (OM p.151).

It was the role of an aerial salt in volatization which led Helmont to the conclusion that we breath in air in order to volatize the venal blood. Locke was using theories and examples from this Chymical writer to underpin his thought that the blood was made volatile by a salt in the air. The question now was whether it did this merely by mixing with the blood, "expressing to it", or by actually reacting with it, "fermenting in it". Given Locke's previous record of Lower's opinion that the blood coming from the lungs to the heart was the same as venous blood, simply mixing with the air was not enough; some other process must be at work. However, Locke did not speculate about this straight away, preferring instead to theorise about the purpose of the volatization:

> *Sanguis* Aer probably it is y^{e} nitrous salt in y^{e} aier y^{t} gives it this tincture & volatizes it, & y^{e} volatile part in circulation being either transmuted into nourishm^{t} of y^{e} part, y^{e} remaining bloud in y^{e} vains is lesse spirituosus & both in colour & consistence comes nearer a caput mortuum, & therefor is returnd by y^{e} vains to y^{e} lungues & heart to be new volatilizd & soe by sucession is made all volatile JL. v. Helmont Blas hum. n.35. p150. 52 Destill ana of y^{e} venall & arteriall bloud of an animall & try whether they will yeild different quantitys of Salt. JL. (BL MS Locke f.19 p.227).

Locke again used Helmont's example to suggest that the true use of respiration was to provide a nitrous salt to volatize the blood, which in turn provided some sort of nourishment for body (although he did not clearly outline what form this nourishment took). Once the body consumed this volatile part of the blood, the blood was sent back to the lungs and heart to be re-volatized so that it could provide more of this "nourishment". This explained the difference between the venous and arterial blood and provided an explanation as to why the blood circulated in the first place. Locke even provided an experimental trial to determine if his result is correct. He had previously alluded to some of Hooke's personal comments as a support for his theory, but now, Locke could also cite his friend's published work: *Micrographia* (London 1665). Hooke had noted similar results to those we have seen in Locke regarding the "charring of Coals", and from this had drawn a number of conclusions, not least that

> *the dissolution* of sulphureous bodies is made by a substance inherent, and mixt with the Air; that is like, if not the very same, with that which is fixt in *Salt-peter*, which by multitudes of Experiments that may be made with *Salt-peter*, will, I think, most evidently be demonstrated (*Micrographia* p.103).

This was another result which suggested a salt in the air. Locke used this speculation of Hooke's as a further spur to his own experimental imagination:

> *Respiratio laesa* Q whether there be not something in ye aier y^{t} in respiratio⟨n⟩ ascends y^{e} bloud in y^{e} heart, after y^{e} same manner y^{t} it keeps in y^{e} flame of a candle, since we finde

> in mines & such other places where a candle will not burne a man cannot live. Q also whether it be niter as Mr Hooke intimates in his micrographia. JL. ⟨Take⟩ a glasse of such a length, & a mouth soe wide as will just let a kandle burne in it, out of ye sides of this let there be 2 or more necks, so that at them 2 or more men may let the ayer that comes out of their lungs (& soe is robd of its ascending spirits) into ye glasse where ye candle is & see whether this will lessen ye flame or make it goe quite out. JL. (BL MS Locke d.9 p.36).

Here Locke once more connected fire, air and the heat in animals, and provided another interesting experiment to test his conjecture. It is also worth recording that Locke also linked these two processes to an aerial nitre that possibly "ascends ye bloud in ye heart". It is clear that, on Locke's view, the heart was the centre of volatization. In Locke's view the blood was not volatile when it left the lungs, despite the fact that it had picked up the salt in the air. This meant that the blood had still to be volatized. Since the blood was not volatile when it entered the heart, and was volatile when it left, the heart had to be the seat of volatization.

Locke continued to work and think about this subject, and produced new sources and theories about the role of breathing. One of the last of these notes once more returned to speculations about a "nitrous salt" in the air, as that which explained its volatizing capability:

> *Sal volatile* It seems probable yt ye aier volatilizes bodys & takes away theire sulphur by some nitrous particles v. Zwelpher pharmac. p782. 53 Hookes microgr: c16 p103. 65 Helmont p151. Aer vero quanto frigidior tanto alicujus rei volatilizatione aptior videtur & Boreas Austro. Q an non ab hujusmodi aere acrior ardeat ignis & citius fomitum consumat[77] JL v. Helmont ib n56. (BL MS Locke f.19 pp.227&272).

Here Locke returned to the consideration of the nitrous salt theory that he had alluded to previously. Hooke's remark, reproduced above, was mentioned once more. Helmont provided the inspiration for the second part of this remark on respiration. This attacked the traditional notion that the air is serving to cool the blood, by showing that cooler air might actually be more use for the volatization of a substance than its hotter counterpart. Once more, Helmont's work was mentioned as a endorsement of Locke's theorising. In the passage cited by Locke, Helmont wrote:

> *But* I blame the air, which as oft as it is colder, is also nearer to its own natural quality, and a more potent seperater of the waters: And so, by how much the air is colder, it doth the more volatilise the venal bloud into a Gas[78] (OPR p.187).

[77] "It seems that the colder the air, the more suited it is for making something volatile and the northern wind, the south-western wind. Q⟨uestion⟩ does fire by this kind of air burn sharper and consume touch-wood faster" (BL MS Locke f.19 pp.227&272).

[78] "Ego vero aerem incuso. Qui quoties frigidior est, etiam est suae naturali qualitiati vincinor & separatur aquarum potior, adeoque cruorem magis in Gas volatilizat, quo aer est frigidior" (OM p.153).

This was the first time that Locke had fully engaged with traditional medicine on this point, and he was unimpressed by the use it attributed to respiration. Indeed, Locke reversed the role played by the cold: in Galenic theory, it tempered the heat of the heart, but here, it encouraged heat by making the blood more volatile. It is striking that Locke often cited Helmont's views as a justification for his own positions.

Richard Lower was putting forward roughly the same theory at this time. Lower, as we have noted, was closely associated with Thomas Willis *circa* 1664. Willis in his earlier *Diatribae* had outlined a theory of respiration which Locke was familiar with.[79] In this work Willis had adapted his theory of the five chymical principles to the processes involved in respiration. Blood was thought to be a heterogeneous liquid with parts of salt, sulphur and spirit. Willis supposed a ferment in the heart which loosened the bonds of the particles and caused an effervescence. This created heat and changed the colour of the blood which was then distributed throughout the body to heat it. This continued throughout the circulation to keep us warm and alive. Willis believed that there were some particles of air that in some way fed this *flammam vitalem*, but he did not specify how this was so, nor did he specifically identify it with the ferment in the heart.[80]

1665 saw an attack on Willis's theories by a rather reactionary physician from Bristol; Edmund Meara in his *Examen diatribae Thomae Willisii doctoris et professoris Oxoniensis de febribus* (London 1665).[81] It was immediately responded to by Lower who saw it as an attack on the whole project of research at Oxford at that time. Lower expounded his own views in a defence of Willis, entitled *Diatribae Thomae Willisii de febribus vindicatio, adversus Edmundum de Meara* (London 1665). This hastily written rejoinder detailed roughly the same theory that Locke had been moving towards. Here the blood circulated heat through the body by means of a fermentation in the heart. This heat was diminished through its circulation through the body and so had to be continually re-fermented. The role of the lungs was to impregnate the blood with a

[79] We have already noted Locke's reading of the first half of this tract *De Fermentatione* (BL MS Locke e.4 pp.97-104). Locke had also read and made notes on the second half: *De Febribus* (BL MS Locke d.11 ff.91v, 270r-269v *rev* cf. BL MS Locke c.29 ff.11v-12r, 17v-18r).

[80] This theory is discussed by R.G. Frank (HOP pp.167-169).

[81] Locke was aware of this book (BL MS Locke d.11 f.52v and BL MS Locke d.9 pp.3 and 36) and actually knew its author, as he had treated Locke's father during his final illness (CJL 110 and 111). It is also possible that Meara was the source of one of Locke's medical recipes, headed "Dr Meara" (BL MS Locke c.29 f.4r).

nitrous food for the body, an "*aeris pabulum nitrosum*", as well as remove the waste products of the continually fermenting blood.[82]

So, Locke was quite in line with the most advanced theoreticians, if not slightly ahead of them. Both Locke and Lower supposed that a part of the air was used in respiration in order to volatize the blood, and both supposed that this was necessary for the preservation of life. Lower saw this as a preservation of a *flammam vitalem*, a rather traditional notion. Locke on the other hand, had characterised it more along the lines of some sort of "food" for the body. However, he had not clearly spelt out exactly what form this nourishment took; whether it was a vital heat, or some sort of vital spirit, or a food consumed not in the blood, but directly by the rest of the body. These minor differences aside, though, the two men were working closely together and were producing remarkably similar theories. We can also see that the tradition in which Locke was working was not a mechanist one. He was moving further and further away from the theory put forward by Boyle: he was relying upon Willis's chymical principles, and was citing Helmont for support. All he had to do, was present his theory as a whole.

Respirationis Usus, is a short and somewhat cryptic piece that attempted to put together into a coherent theory all the different aspects of Locke's researches in the field of respiration. It was written in the style of a scholastic disputation, and was prefaced by some brief remarks on more general matters. The central topic of the paper takes us back to the observations Locke made about whether the air served to cool the blood. There, Locke had briefly noted phenomena contradicting the Galenic dictum about breathing: "It seems that the colder the air, the more suited it is for making something volatile"[83] (BL MS Locke f.19 pp.227&272). This was the first explicit hint that Locke was tackling Galenic theory. *Respirationis Usus* was an outright assault on this system.

At this point in the seventeenth century, there were three main theories that could account for the phenomena of respiration. The short passage that prefaces the paper (PRO 30/24/47/2 f.71v), and which sets out some of the over-arching principles that will govern the subsequent disputation, gave a large-scale treatment of the issues that Locke dealt with in the rest of the text. In this opening preface, and in the body of the text itself only the Galenic theory and the Chymical alternative were mentioned. The thesis of the prefatory remarks was given, as was usual in scholastic disputations, in the

[82] The dispute between Lower and Meara is detailed by Robert G. Frank (HOP pp.188-192).
[83] "Aer vero quanto frigidior tanto alicujus rei volatilizatione aptior videtur" (BL MS Locke f.19 pp.227&272).

form of a question: "Are the chemical remedies preferable to those of the Galenists?"[84] (PRO 30/24/47/2 f.71v). To which Locke responded "Yes".[85] This was supplemented by two other questions. The first asked whether there was a universal remedy, the second whether opposites were cured by opposites. Both of these were rejoined in the negative. However, in the first of these supplementary questions, it was not clear to whom the question was posed. The Galenic tradition did acknowledge the possibility of a universal remedy, a "panacea". However, this possibility was not widely thought to be one that was realised.[86] On the other hand, some Paracelsians did assert the existence of a cure-all, some even identifying it with the Philosopher's Stone, the mysterious material that turns base metals into gold. In giving a negative response to this question it was not clear who Locke was attempting to criticise. However, the object of criticism in the second question was not difficult to discern. The Galenists had long maintained that "opposites were cured by opposites". As Locke pointed out,

> The cure of opposites by opposites is an axiom so well known and repeated so emphatically by every author, that up to this day it has been accepted by almost the whole medical profession as the foundation, as it were, of all medical practice, approved by the ancients and attested by experience[87] (Ibid.).

Here, Locke was rejecting the method of the ancients and siding with modern theory.

Locke, in these opening remarks, was happy to embrace the Chymical approach to the treatment of medicine, and rejected its ancient counterpart. When a Chymist considered treatment, it was denied that opposites cured opposites. If the elements, which for the Chymists comprised salt, sulphur and mercury, were imbalanced this was to be treated by the same sort of substance as was causing the excess.[88] The thought here being that the cure must have something in common with that causing the disease, or else the cure, not sharing any common ground with the illness, would not be able to affect it. So, for example, if a disease was caused by a volatile salt, then the way to treat it was to administer a calming salt to render the first one inert. Clearly this was not so far from the Galenic assertion as the Chymists would have liked to have thought

[84] "An chymia remedia Galenicis Anteferenda?" (PRO 30/24/47/2 f.71v).
[85] "Aff⟨irmatur⟩" (Ibid.).
[86] Sennert argued against such a claim: "Those who think there is no such universal Medicine have sounder principles" Sennert, *Chymistry Made Easie and Useful or, the Agreement and Disagreement of the Chymists and Galenists* p.130.
[87] "contraria contrariis curari adeo notum et omnium ore iactatum axioma ut nihil notius adeo ut hactenus tanquam totius medecinae practicae fundamentum et veterum consensu et rerum usu stabilitum" (PRO 30/24/47/2 f.71v).
[88] "The modern Chymists say that like cures like" Sennert, *op cit*. p.147.

themselves, but they did, nevertheless, deny the traditional assumption. So here, Locke was following in Helmont's footsteps.

In beginning *Respirationis Usus* Locke sided with the Chymists on the question of opposites curing opposites, and went on to say that "this paper will show that this proposition was not a dogma among the early doctors nor founded on the facts of nature"[89] (Ibid.). That he succeeded in correctly demonstrating this purely historical point regarding ancient medicine, or achieved his stated aim to "describe the true method of healing"[90] (Ibid.) is open to serious question. He did, however, bring to light some serious problems concerning the Galenic account of respiration, and did this by using their pre-supposition of the curative power of opposites against them. The orthodox view at this time in medicine was that the heart had an innate heat which powered the body. The basic facts seemed clear: we breathe in cold air, and breathe out the same air warmed, so there was a loss in heat from the body due to respiration. It was supposed that there must be some reason for this transfer of heat away from the body. Given that the heart was thought to be innately hot it was supposed that the function of respiration was to cool the heart down. So, here, an opposite (the heat of the heart) was cured by an opposite (the coolness of the air). It was this basic Galenic tenet, and its application to respiration that Locke attacked when he commenced his paper:

> Is the first purpose of respiration the cooling of the heart? No[91] (PRO 30/24/47/2 f.73r).

This response Locke then justified with a variety of examples and arguments, all of which were anti-Galenic in nature. Significantly these points were also endorsements of the Chymical alternative. Locke was prepared to agree with the fundamental point, common to both viewpoints, that "Nature's aim seems to have been to foster the universal heat or fire of our life"[92] (Ibid.), but he did not think that the lungs cooled this internal flame. It would be strange if the fires that burned in us were so strong that they needed to be damped down by the cooling action of the lungs. Locke asked "would ⟨nature⟩ not be over-prodigal and remiss if she devised such great fires in us that she had

[89] "verum enim vero illud nec veteris medecinae *fuisse* dogma nec na⟨tur⟩ae institutum" (PRO 30/24/47/2 f.71v).
[90] "vera methodus medendi ex sequentibus patebit" (Ibid.).
[91] "An primarius respirationis usus sit refrigeratio cordis Neg⟨atur⟩" (PRO 30/24/47/2 f.73r).
[92] "Quia in eo maxime laborare videtur natura, ut vestalis illa vitae nostrae foveatur ignis" (Ibid.).

continually to blow through us cold air to prevent our strength burning up?"[93] (PRO 30/24/47/2 f.73r-v). Locke gave an alternative account of the use of respiration, based on this consideration:

> Hence in our bodies there are so many secret places for extracting and cooking various ferments of the intestines all of which seem to work together to produce something which can be burned so that the vital flame may have its fuel. This end seems particularly to be served by respiration. For there such a close connection between air and fire that nowhere will you find the heat of fire growing from internal principles if you have excluded air[94] (PRO 30/24/47/2 f.73v).

This brought out two points. Firstly Locke here referred to the Helmontian account of nature, in that he referred to various "ferments". This was not an isolated allusion in the text. Reference was continually made to "ferments" or "fermentation". Indeed, in a passage a little further on from the one above quoted, Locke attributed the creation of vital spirits to a "fermentation". Since Locke stated that "all are now agreed that the life of animals consists in the continual generation and flux of fine spirits"[95] (Ibid.), it is clear that Locke placed this Helmontian concept right at the centre of his account of physiology. The second point of interest here was that Locke also alluded to some of the experimental results recently published by Boyle regarding the necessity of an air supply for combustion. In his *New Experiments Physico-Mechanical Touching the Spring of Air and its Effects* and *The Sceptical Chymist*, Boyle had noted just such results, and, as we have seen, Locke took notes from these texts. In point of fact, a large part of folio 72r was spent in consideration of "what an essential function the air plays in fermentation and volatization"[96], by examining exactly the sort of results Boyle had demonstrated. For example, things will cease to burn when starved of an air supply, and fire will not catch on objects usually inflammable if no air is available. Here we can see that Locke was well aware of Boyle's work on this subject and used it to attack the Galenic viewpoint. However, his chosen theoretical alternative was that of Helmont. This was further demonstrated in the rest of the piece, where Locke attempted to construct an alternative account of the role played by respiration.

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[93] "na⟨tur⟩a male prodiga esset materfamilias si tantos in nobis extruit focos ut continuo sibi necesse foret frigida transpirare ne incenderentur aeres" (PRO 30/24/47/2 f.73r&v).

[94] "hinc fit in corpore digestionum coctionumque arlinac, hinc tam varia viscerum fermenta quae huc omnia conspirare videntur ut sit tandem aliquid q⟨uo⟩d accendi possit fomitemque habeat flamma vitalis cui usui prae omnibus respiratio inservire videtur, tanta n. aerem inter ignemque tanta intercedit necessitudo ut nullubi ignem reperias vel calorem ab internis principiis nascentem unde aerem excluseris" (PRO 30/24/47/2 f.73v).

[95] "Vita animalium in continua spirituum subtilem generatione et fluxu consistere apud omnes iam in confesse est" (Ibid.).

[96] "necessarium sit aeiris interventus ad res et fermentandas, et volatizandas" (PRO 30/24/47/2 f.72r).

Air was essential to fire, and Locke inferred that, with regard to the functions of the body, "all this apparatus is useless, and the other organs perform their functions and prepare their foods in vain, unless finally a mixture of air is added and feeds the ever-burning furnace"[97] (PRO 30/24/47/2 f.73v). The question that Locke had to ask himself, was what is it in the air that produced this combustion? His theory was that there were some volatile "salts" in the earth that are agitated by the sun, and thereby expelled into the air. It was these "salts" that we take in when we inhale. They act upon the food we eat in the body, to produce the spirits in us that are vital to our life. The role of respiration, then, was to make the blood volatile by internalising the volatile elements of the air. These salts when mixed with the blood produced the vital spirits.

> This volatization takes place by fermentation and a kind of burning in the heart, but without air no such fermentation or burning or whatever we call it takes place. We conclude therefore that the air serves rather to foster the heart's heat than to cool it[98] (PRO 30/24/47/2 f.72r).

In this way then, Locke can be seen as having refuted the Galenic assumption premised and then rejected in the prefatory remarks. The cool air served to increase the heat of the heart. The factor is not removing, but aiding its contrary. It is evident that Locke's work with Lower was a strong influence. Both heart and lungs played a role in respiration: the lungs drew the air into the blood, which was transferred to the heart, and there volatized by a "fermentation". Locke's theory in *Respirationis Usus* was closely related to that put forward in Lower's *Vindicatio* of Willis's theory. It was also similar to that put forward by Helmont. Helmont posited both the air and a ferment as necessary for the volatization of the blood. Locke followed Lower and Helmont by stating that this ferment was in the heart. Helmont said:

> Indeed in the left bosom of the heart, as it were in a stomach, doth a singular, most vitall, and light some Ferment dwell, which is a sufficient cause of the venall bloud its being transchanged into arteriall bloud, even as it is chief in the transmutation of arteriall bloud into vital spirits[99] (OPR p.179).

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[97] "inutilem prorsus esse totum hunc apparatum, et alia viscera frustra mutuas tradere operas, et alimenta elaborare, nisi ultimo accedat aeris mistura et continuo affluxu perennos nutriat focos" (PRO 30/24/47/2 f.73v).

[98] "volatizatio fit fermentatione et quasi accensione in corde, nulla autem huiusmodi fit accensio sive fermentatio sive quicquid aliud vocare libet nisi exe aeris, concludimus igitur aerem potius efficientem fomitumque esse caloris cordis potius quam refrigerium" (PRO 30/24/47/2 f.72r).

[99] "Scilicet in sinu cordis sinistro, tanquam stomacho, singulare fermentum maxime vitale & luminosum habitat, quod transmutate cruoris in sanguinem est caussa sufficiens, prout sanguinis in spiritum vitalem transmutatione praeest" (OM p.143).

The many similarities between Locke's theory and Helmont's, coupled with the references that Locke gives to this Chymist's work, strongly suggest a great influence on Locke's work. In this first substantial piece of natural philosophical writing, Locke was relying greatly on the work of Chymical authors.

Locke's conclusion was clearly a heterodox one, and this was even more apparent when Locke came to give some examples for his theory. Locke referred to miners in situations where there was no continuous supply of fresh air:

> Anyone who can go into the subterranean mines and see there the frequent faintings, swoonings and finally deaths, unless open air aids them through the openings, will know that there was not lack of coldness of air to temper the heat of the heart, but of food of life which must be breathed in with the air ... This all happens not because of an excessive burning of the heart nor because of an improper temperature of the air, since these symptoms often occur when the air below is much colder than that of the surface of the earth[100] (PRO 30/24/47/2 f.72v).

To counter this possibility the miners:

> take care that new fresh drafts of air are continuously being brought down through ducts specially pushed out through the sides of wells, whose openings are turned into the wind and pick up the air, which is driven by the blast and carried down to the workmen. If you block up the opening of this duct or even only turn it away from the wind ... the air stagnates and the circulation ceases; the diggers underground soon feel the badness of the air and at once their pulse changes, their limbs droop, their strength fails, their heart trembles, and swooning and death soon follows unless a small draught of the breath of life is immediately supplied[101] (Ibid.).

It was the freshness and continuous supply of the air that counted, not the temperature.

A point of interest that can be gleaned here, in that this example also appeared in Locke's earlier note on respiration. In the earlier work, the example had been used as an instance of the theory that the air carried off foul vapours from the lungs. If the air became over-saturated with too many vapours, then it could not carry off the vapours from us, and this would cause fainting. However, in *Respirationis Usus*, Locke thought that this example served rather to illustrate the alternative account of respiration. Locke

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[100] "Si quis in mineralium fodinas adire · velit et frequentes illic hypothymias syncopes et nisi oportune subveniatur p⟨er⟩ conclaucatos tandem exitus, sciet non frigiditatem aeris quo calor cordis temperetur defuisse operariis sed pabulum illud vitae qd una cum aere inspirari debuit … quae omnia non ex male aucto cordis incendio et in debito aeris temperamento enim constat, q⟨uo⟩d haec symptomata saepissime eveniunt ubi aer in fodinis longe frigidior sit quam qui eodem tempore in superficie terrae" (PRO 30/24/47/2 f.72v).

[101] "cavent sibi ne ut deferatur continuo novi et illibati aeris haustus p⟨er⟩ canales in puteorum lateribus ad id extruatos quorum orificia flanti vento obversa excipiunt aerem flatibus impulsum deducuntque ad operarios q⟨uo⟩d si hujus canalis foramen obtures vel modo a vento avertas … aer stagnet cessatque illius circulatio, demersi alte fossores aeris vitium allico sentiunt quorum statim immutatur pulsus labascunt artus deficiunt vires tremit cor et tandem hypothymia et mors irrepit nisi aurae vitalis novus affluxus statim suppeditetur" (Ibid.).

believed that the reason the miners become ill was that they were starved of the particles of air that were essential for life:

> When there is deficiency of air, which is the agent by which the heart retains its heat and the mass of blood ferments, then the little flame of the heart for lack of fuel gradually dies down[102] (PRO 30/24/47/2 f.72v).

This example was now seen to tell for the theory that there was some part of the air that was necessary for life, the theory that Boyle had previously discounted (NEPM pp.362-363). In point of fact, Locke turned next to the other example that he had used to illustrate his previous theory that the air carried off "vaparous excrement". In the 1664 note *Respiratio*, he had supported this contention by the example of people fainting in crowded rooms. It was because the air becomes saturated with the excrement that "it probably comes y^{t} in crowds people swoune" (BM Add MS 32554 f.48r). In *Respirationis Usus*, however, this example was used to illustrate the alternative explanation. Following on from the example of the miners, who faint when deprived of fresh air, Locke speculated as to the cause of a similar phenomenon:

> The same thing happens in meetings of men in enclosed buildings where frequently people who are weaker and of less solid make up suffer from fainting, because the ferment of the enclosed air has largely been exhausted by so many dry lungs[103] (PRO 30/24/47/2 f.72v).

Locke had switched this example form supporting the theory favoured by Boyle, to that endorsed by Helmont. Locke did refer to the theory that the air became over-saturated in *Respirationis Usus*, but it was not clear how this saturation was taking place. All he said in this regard was that in such a situation:

> a dense crowd of people shut in the same place, where there is very little entrance for the outside air, saturates the enclosed air by constant breathing so that it is less suitable for refreshing and dissolving the mass of the blood and scarcely suffices to feed the little flame of the heart[104] (PRO 30/24/47/2 f.74v).

Using this theory involving a sort of saturation implies that something is added to the air in the process of respiration, but Locke did not clearly spell out what he thought this

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[102] "quod vero pabuli aeri defectus quo calor cordis foveri et sanguinis massa fermentescere debet, cordis igniculum quasi subtracto fomite paulatim extinguit huic patet" (PRO 30/24/47/2 f.72v).
[103] "Idem saepe evenit in hominum conventibus in aedificio quovis ante conclusis, ubi non raro debiliores et rarioris texturae homines deliquium patiuntur. aeris n inclusi fermente a tot aridis pulmonibus magna ex parte exhausto" (PRO 30/24/47/2 f.72v).
[104] "confertissima hominum turba in eundem locum conclusa ubi minus liberum est cum aere externo comercium aerem inclusum frequenti anhelitu saturat, adeo ut postea exaltandae solvendae sanguinis massae minus idonea, ad accendendam cordis flammulam vix sufficiat" (PRO 30/24/47/2 f.74v).

something was. This assertion seems to be in conflict with the reason previously given, but it is not clear whether the reference to saturation was genuine or merely illustrative.

Locke did refer to the theory that the air is used to expel something, but it was only a secondary and not unequivocal reference. We breathe in air in order to volatize the blood:

> After this mixing of the blood has played its part, it departs, is breathed out and flies into the air, giving place to succeeding spirits; and thus the mass of the blood by constant circulation through the heart and lungs give rise to the vital flame and at length, become wholly volatile and leaving no dregs behind it changes into the nature of spirits and is blown away and evaporated through respiration, in which process air is essential[105] (PRO 30/24/47/2 f.73v).

It certainly seemed that something was given off in exhalation, but it was not entirely clear just what it was: the blood, the air, or the spirits? In any event, it is clear that this role is secondary to the main function of respiration which is internalising the volatile salt in the air. This was the main purpose of respiration for Locke in *Respirationis Usus*, and it was this that explained the fainting of miners and people in crowded rooms.

Locke did consider one possible objection to his theory, namely that "if the purpose of respiration is not to cool the heart, how is it that respiration increases along with internal heat?"[106] (PRO 30/24/47/2 f.74r). The thought here presumably being that the respiration had to increase in order to temper the excessive heat being generated in the heart. Locke's solution to this problem was to note that the heat of the heart only increased at those times when the blood circulated faster due to some exercise or a fever. It was this that provided the key to one part of Locke's solution:

> The blood's circular movement being thus speeded up, respiration must also become quicker, not for the purpose of cooling, but principally so that the quickened blood may have free passage through the lungs. For unless the two lungs are drawn up and exercised by the admission of air, the vessels are squeezed by the flabby lungs and hinder the flow of blood from the right to the left ventricle of the heart[107] (PRO 30/24/47/2 f.74v).

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[105] "posquam inquam scaenam suam peregerit haec sanguinis effluvia exebita tandem transpiret, et in auras evolet succedentibus. spiritibus locum praebentia et ita sanguinis massa repetitis per cor et pulmones circuitionibus flammae vitali ma⟨teri⟩am praebeat et tota tandem volatilis facta nulla relicta faece in spirituum ma⟨teri⟩am transmutata per διαπνοην difflatur et evanescat, quod nunquam fieri possit sine aeris" (PRO 30/24/47/2 f.73v).

[106] "si respirationis usus non sit cordis refrigorium, qui fit quod aucto ⟨in⟩terno calore augeatur et respiratio?" (PRO 30/24/47/2 f.74r).

[107] "Sanguinis igitur motus circularis ita auctus necesse est augeri simul respirationem non ad refrigerium, sed primo ut properanti sanguini detur liber cemmeatus et per pulmones transitus, nisi n: per repetitam aeris admissionem attollerentur dercuturque dictum pulmones, vasa flaccidis pulmonibus compressa cursum sanguinis a dextro ad sinistrum cordis ventriculum impedirent" (PRO 30/24/47/2 f.74v).

The other point Locke made against this supposed objection was closer to our modern understanding of respiration. If the blood was circulating faster around the body, and was becoming depleted of vital spirits at a faster rate, then there would be more blood without the right amount of these spirits. Locke's thought was that respiration increased

> So that, depending on the quantity of blood, no crude blood lacking in that ferment, deadly and unsuited for nourishment and life, is sent to the brain (and other centres of bodily functions)[108] (PRO 30/24/47/2 f.74v).

Here, Locke showed awareness of the role air played in the vital functions of the body.

The example of the miners also serves to date this paper as just after May 1666, as these reports are closely based upon a trip Locke had undertaken just prior to this time. Locke had carried out some experiments with a barometer in order to find out if air pressure altered with altitude. One of the ways that this might be discovered was if the barometer was taken down a mine. This Locke attempted to do, but the miners that he tried to work with in this endeavour were untrusting, and the equipment was too large to be successfully deployed, so the attempt had to be abandoned. Locke reported his failure to Boyle in a letter dated the 5th of May 1666 (CJL 197).[109] It was in this letter that Locke reported some of the points of interest gleaned from the miners. One of these points is particularly significant for our purposes:

> In deep Pits they convey down Air by the side of the Gruff, in a little Passage from the Top; and that the Air may circulate the better, they set up some Turfs on the Lee side of the Hole, to catch, and so force down the fresh Air: But if the Turfs be removed to the windy side, or laid close over the Mouth of the Hole, those below find it immediately, by want of Breath, Indisposition and Fainting (CJL 197).

It is clear that the examples used in *Respirationis Usus* were based upon this experience, and so cannot have been written before May 1666.[110] The disputational style of this paper, the last piece that Locke wrote in such a way, would seem to suggest a connection with Oxford. We have already noted Locke's desire to acquire a Faculty Studentship in

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[108] "ut pro quantitate sanguinis cor et pulmones transeuntis debita fermenti aeri suppenditantur quantitas ne cruor sine isto fermento crudus cadaverosus et ad nutritionem vitaeque parum idoneus ad cerebrum aliasque functionum officinas demitteretur" (PRO 30/24/47/2 f.74v).

[109] It was this letter that was re-printed in Boyle's *The General History of the Air* pp.137-141.

[110] This experience was also the source of a note in Locke's own notebooks which detailed the same happenings as were related to Boyle: "*Aer* In the gruffs of Minedeep if by damps they swound, they draw them up dig a hole in y^{e} earth & lay in their faces & soe cover them with the turfs as close as they can & this recovers them. In deepe gruffs they cannot well breath unlesse fresh ayre be conveyed downe in a trunke by y^{e} side of the gruff & turfs set up on y^{e} lee side of y^{e} hole to convey in the aire, w^{ch} turfs if turned on the other side or laid downe flat they below begin presently to faint & want breath, & if they have carried downe a nosegay with them y^{e} flowers that but now smelt sweet, will stinke like carrion immediately. They finde it dangerous to goe downe into a gruf that hath beene lately burnd if there be any remaines of the fire left in the cranys Mr Buckland." (BM Add MS 32554 f.113r).

Medicine by obtaining a medical degree. Given the fact that such a degree would require the submission of a medical disputation, it is plausible that the paper was written as a draft of just such a piece. We know that by November 1666, Locke had given up hope of obtaining an MB by conventional means. This would imply that *Respirationis Usus* was written at some point before this. Given these two considerations, we can date the paper as coming from May to November 1666.

With all this in mind we can draw some conclusions from the consideration of Locke's paper. Firstly, it rejected the medical orthodoxy of the time. This should occasion little wonder, as many of Locke's contemporaries and friends were engaged in exactly the same sort of enterprise. What may elicit more surprise, however, was that Locke did not move from Galen to Boyle, rather, he preferred Willis and Helmont, as can be seen in his constant use of their theoretical terms. Locke was aware of the mechanical philosophy; indeed, his close association with Boyle provided the occasion for some of the main examples in this paper. Despite this, however, he did not simply accept the opinions of his friend. Indeed, if anything, in comparing this paper with the earlier note on respiration, Locke was moving further and further away from his associate's views on this topic. There is a very strong case for asserting that Locke was an adherent of a Chymical theory of physiology.

It is possible to object to this assertion on the ground that this hypothesis relies upon the fact that Locke used words like "ferment" and "fermentation". This usage need not imply an exclusive commitment to the theories of the Chymists. As we shall see, Boyle used similar terms himself, but took them to refer to purely mechanical agents and processes. May it not also be the case that Locke used the terms in this way in this early medical thought? It seems to me that this interpretation is excessively charitable. Locke made no specification in his paper that these terms were to be used in a non-standard way. As we shall see, whenever Boyle used these terms, he always pointed out that his meaning was restricted to the corpuscular philosophy. Since the common usage was in terms of non-mechanical processes, and Locke made no effort to disabuse the reader of this association, and since, moreover, no reference was made to a purely mechanical explanation, we can only infer that Locke was using these terms in the generally accepted way. We can infer this even ignoring Locke's close association with workers in the Chymical tradition, and the documented influence of Helmont on his deliberations. Yet, this is not the only evidence we have that Locke's early natural philosophy had a strongly

non-mechanistic bias. Indisputable proof can be found in a careful consideration of another early medical essay, *Morbus*.

Morbus

This piece was an exposition of what were presumably Locke's own views as to the causes of disease. The opening remarks gave the central thesis of his argument.

> I suppose another & more rationall theory of deseases might be establishd upon other principles, then those either of y^e^ Galenests or Paracelsians, for Considering y^t^ in y^e^ greate world some things are produced by seminall principles, & some other by bare mistion of y^e^ parts, to w^ch^ might be added the circumstantiall assistances of heat and cold &c. (BM Add MS 32554 f.118v).

As with the prefatory remarks of *Respirationis Usus*, Locke was addressing himself to the conflicts in recent medical thinking, and these opening lines are informative as much in regard of what they omit, as what they include. There was no mention of the mechanical philosophy at this point: the main conflict in Locke's mind was that between the two antagonists of *Respirationis Usus*. Even when there was mention of areas not concerned with "seminall principles", i.e., where there was a "bare mistion of y^e^ parts", there was no allusion to a purely mechanical explanation. Locke was aware at this time that Boyle's corpuscular philosophy could account for inorganic phenomena such as these, yet he chose not to endorse it as a possible explanation. Yet again, the conflict in Locke's mind featured only two combatants. Locke's aim was to produce principles and theories that reconciled the rifts between the Galenists and Paracelsians. However, he immediately referred to "seminal principles" and later referred to "humours". We may suppose, therefore, that his intention was not to start from scratch in this endeavour, but rather to fit each theoretical concept to its relevant area of applicability. Locke took it as obvious that there were some phenomena that were due to the effects of "seminal principles", and other areas where such an explanation was inappropriate. The aim of the paper, seen in this light, was to divide the world into "seminal" and "non-seminal" parts, and then see where the concepts of humours applied.

That Locke was not invoking the mechanical hypothesis in positing "seminall principles" was clearly shown when he spelt out precisely what he meant when he used this technical term:

> by seminall principles or ferments I meane some small & subtile parcelles of matter w^ch^ are apt to transmute far greater portions of matter into a new nature & new qualitys, w^ch^ change could not be brought about by any other knowne means, soe y^t^ this change seems wholy to depend upon y^e^ operation or activity of this seminall principle, & not upon y^e^ difference of y^e^ matter its self y^t^ is changd (BM Add MS 32554 f.118v).

At first sight this might seem to have a close association with corpuscular theory, given the talk of "small & subtile parcelles of matter". This inference, however, would be misleading. The point here was not that these "ferments" acted by the use of matter, but that the mechanical affectations of matter were not responsible for the changes that were wrought upon other bodies. The central claim of the mechanical philosophy was that the only causally efficacious factors in interactions between bodies were the bare differences between pieces of matter, i.e. their shape, size, motion, etc. Locke was denying this. He asserted that the "ferment" acted in such a way that the changes it effects "could not be brought about by any knowne means". Motion, size and shape, etc. were perfectly well known means, so the "ferment" could not be acting along these lines. The activity depended solely upon the ferment itself, and "not upon y^{e} difference of y^{e} matter its self y^{t} changd". The account was one that was emphatically not mechanical: there was something more to these "ferments" than mere mechanism. Locke himself was perfectly prepared to admit that this was the case:

> How these small & insensible ferments, this portent Archeus works I confesse I cannot satisfactorily comprehend, though y^{e} effects are evident (BM Add MS 32554 f.121r).

This statement is unequivocal in its adherence to an Helmontian ontology: Locke even used the central term of this theory, the "Archeus". Now that Locke had spelt out what it was that he meant by these terms it is clear that he was not attempting to re-define such concepts along corpuscularian lines, but was accepting and using them in the sense given by Helmont. We can also see that, at this stage in his intellectual development, Locke was prepared to admit the existence of agents which he conceded he could not comprehend. The reason he gave for this was the evidence of the effects of these "ferments".

Perhaps unsurprisingly, when it came to giving an account of the reasons behind his acceptance of the Helmontian ontology, Locke used the example that provided a paradigm for the rest of the theory, namely, the "seed":

> soe severall seeds set in the same plot of earth, change y^{e} moisture of y^{e} earth w^{ch} is y^{e} common nourishm^{t} of them all into far different plants which, differ both in qualitys & effects (BM Add MS 32554 f.118v&119r).

Locke's point was the usual Chymical one that, even though the seeds can be indistinguishable, radically differing plants can be produced. The hypothesis had then to be made that this was not due to any material difference in the seeds, but was in fact

caused by this mysterious, immaterial "seminall principle", which the physical seeds had within them. This was all the more likely, Locke thought, because the purely mechanical explanations for such phenomena were so woefully inadequate. This power of creating different plants from qualitatively indistinguishable seeds

> is not donne by bare streineing y^{e} nourishm^{t} through their pores w^{ch} in different plants are of different shapes & sizes, for then it would be hard to conceive how such very destinct parts of y^{e} same plant, w^{ch} sufficiently shew their difference both in shape size taste small &c as in y^{e} fruit leaves knots flowers seeds pith bark &c of plants. w^{ch} can hardly be supposd to be made by parts y^{t} had noe other difference then what proceeded from y^{e} pores of y^{e} root & stake. & therefor could hardly be various enough (BM Add MS 32554 f.119r).

This passage was a clear allusion to the Cartesian theory as laid out in the *Treatise on Man* and the *Discourse on Method*. In these works Descartes supposed that "straining" through holes of different sizes was responsible for a very large part of the processes necessary to sustain life, including motion and growth. Applying this sort of explanation to all living creatures implied that individual plants are the way they are due to the various strainers that were in the seeds from which they grew. This supposition Locke clearly thought absurd:

> y^{e} conversion of y^{e} same water into divers plants of different kindes as mint & marjorame &c, cannot be effectd by barely streineing it through y^{e} different pores of those plants, but must be wrought by some more powerfull way, then bare streineing is able to produce in soe simple & homogeneous a body, & I beleive all the streineing in y^{e} world would scarce make y^{e} parts of water produce y^{e} smell of either of those plants (BM Add MS 32554 f.119r).

Nor was the production of the odour of plants from water the only phenomena beyond the reach of a purely mechanical explanation. In the growth of plants some solid parts seem to be produced purely from water:

> there are in branches of mint put into a bottle of water some parts generatd out of y^{e} water & nourishd by it w^{ch} cannot possibly be donne by streineing such as are the little roots, y^{t} sprout out at y^{e} bottom (Ibid.).

Locke clearly believed that the production of these roots could not be accounted for by a mechanical explanation. Locke felt that there had to be something else at work that could change "soe simple & homogeneous a body" as water into different plants. The Cartesian explanation, then, was roundly rejected. What, though, of Boyle?

In actual fact, we have already seen Locke deal with Boyle's thought on these matters in the examples just cited. Descartes' theory was the only really serious attempt to give mechanical explanations for phenomena such as these at this time. So, anyone

who posited a purely mechanical world could be accused of subscribing to such accounts as these. Significantly, Boyle did make just such assertions. In his book *Some Considerations touching the Usefulnesse of Experimental Philosophy*, Boyle explained the powers of "specific" medicines by reference to the abilities of some cures to affect the "strainers" in our bodies:

> The Motion, Size, or Shape, of the Medicinal Corpuscles in the Blood, though not by sense distinguishable from the rest of the Liquor they help to compose, may be so conveniently qualify'd, as to shape, bulk, and motion, as to restore the Strainers to their right Tone or Texture, as well as the Blood to its free and Natural course, by resolving and carrying away with them such Tenacious matter, as stuff'd, or choak'd up the slender passages of the Strainer, or at least Straitened its pores, or vitiated their Figure; And the same Sanative Corpuscles may perchance be also fitted to stick to, and thereby to strengthen such Fibres of the Strainers, or such other firmer parts of the Body, as may need congruous Corpuscles to fill up their litle unsupply'd Cavities (UEP Part II, Chapter XIX, p.283).

In attacking the positing of "Strainers", Locke was attacking Boyle as much as Descartes. This was not the only assault on Boyle's position.

In *The Sceptical Chymist*, Boyle was concerned to refute the Paracelsian account of the elements. One way of doing this was to show that supposedly elemental bodies could be created anew. This he illustrated by the growth of plants, where the sole nourishment was water:

> I took a top of Spearmint, about an Inch long and put it into a Good Vial full of Spring Water, so as the upper part of the Mint was above the neck of the Glass, and the lower part Immers'd in the Water; within a few Days this Mint began to shoot forth Roots into the Water, and to display its Leaves, and aspire upwards; and in a short time it had numerous Roots and Leaves, and these were very strong and fragrant of the Odour of Mint (TSC pp.110-111).

Nor was this Boyle's only experiment:

> The like I try'd with sweet Marjoram, and I found the Experiment succeed also (TCS p.111).

It is highly likely that Locke's use of these two plants as examples ("mint & marjoramme" BM Add MS 32554 f.119r) was most likely due to Boyle's having used them previously. If this is not assumed then we are left facing an extremely fortuitous coincidence. In *Morbus*, Locke was using Boyle's examples to highlight what he took to be the poverty of the mechanical hypothesis. Locke went out of his way in order to criticise the theories of Boyle. Nor was this Locke's final attempt in *Morbus*.

Boyle's *Origine of Formes and Qualities* was partly composed of a large theoretical part dealing with the content of corpuscular philosophy and its merits. Boyle also gave

an exposition of certain experimental results that he hoped would lend support to a corpuscularian programme. These were the "Considerations and Experiments Touching the Origine of Qualities and Formes" (OFQ p.105). Here Boyle employed some everyday observations and explained them in the light of his theory: "The Observations I shall begin with shall be fetched from what happens in the Hatching of a Egge" (OFQ p.109). Boyle noted the general circumstances of the phenomenon where

> the Nutrative Liquor of an Egg, which is in itself a Body so very soft ... being brooded on by the Hen, will within two or three weeks be transmuted into a Chick, furnished with the Organical parts, as Eyes, Ears, Wings, Legs, &c. of a very differing Fabrick, and with a good number of Similar ones, as Bones, Cartilages, Ligaments, Tendons, Membranes &c. which differ very much in Texture from one another (OFQ pp.113-114).

This change of the transparent and runny substance into the chick was brought about, for Boyle "by the new and various Contrivement of the small parts it consisted of" (OFQ p.114). Here, as elsewhere, Boyle was of the opinion that the change was brought about merely by the alterations in the arrangement of the matter, through the action of local motion. However, he was aware that, despite his insistence upon this explanation, there may be some who were apt to attribute this startling transformation to something other than purely mechanical change.

> I very well forsee it may be objected, that the Chick with all its parts is not a Mechanically contrived Engine, but fashion'd out of Matter by the Soul of the Bird ... which by its Plastick powers fashions the obsequious Matter, and becomes the Architect of its own Mansion (OFQ p.116).

Boyle rejected this possibility and, excepting man and his rational soul, stated that no animal or plant was any more than a "Curious Engine" (Ibid.). This was because whatever was happening in the formation of the chick, it could only be making the changes in the substances involved by altering the matter of the egg:

> For let the Plastick Principle be what it will, yet still, being a Physical Agent, it must act after a Physical manner, and having no other Matter to work on but the White of the Egg, it can work upon that Matter but as a Physical Agent, and consequently can but divide the Matter into minute parts of several Sizes and Shapes, and by local Motion variously context them (OFQ pp.116-117).

Boyle denied that any non-mechanical action was taking place in the formation of the chick. Still, such an argumentative strategy was open to criticism, as all that Boyle said in this passage was that if there were some "Plastick Principle" all it could do would be to act on the matter available. He did not specify how this action would take place. The

strictly mechanical account would say that the only changes that take place were due to the mechanical affectations of the matter according to strictly exceptionless mechanical laws. Boyle's admonition applied only to the fact that the "Plastick Principle" had to act upon the matter to produce the chick. Boyle did not explicitly say that this had to be according to purely mechanical laws. He did not, in this case at least, rule out the possibility of there being some non-mechanical interaction taking place.

This can be seen later on in the same treatment of this problem. Boyle was sure that the local motion provided by the hen acted on the matter so as to produce the chick, and so concluded that any "Plastick Principle" could do no more than guide this production:

> that the Formative Power (whatever that be) doth any more than guide these Motions, and thereby associate the fitted Particles of Matter, after the manner requisite to constitute a Chick, is that which I think will not be easily evinced (OFQ p.119).

Boyle clearly wanted to identify this formative power with some basic mechanical laws but did not explicitly do so. In saying only that this "Plastick Power" guides the formation of the chick, but not specifying that it "guides" only in the sense of being a mechanical device, Boyle left open the possibility that there was some other guiding factor at work here. Clearly Helmont would want to specify this "Plastick Principle" as some "seminall principle". Perhaps Boyle thought that in making this claim that the "Plastick Principle" had to act on the matter, meant that it was thereby constrained to act by mechanical laws. However, this was exactly what his opponents, both Chymist and Galenist, were at pains to deny. Since he appeared unable to explain clearly what was a quite remarkable transformation, given his position, he could offer no better argument.

Boyle also turned his attention to the grafting plants. Here the sap of one plant was altered by the bud grafted on to the plant and was "so far chang'd and overrul'd as to constitute a Fruit quite otherwise qualify'd, then that which is the Genuine production of the Tree" (OFQ pp.131-132). This could be done in various ways

> by the help of some peculiar type of Strainer, or by the Operation of some powerful Ferment lodged in it, or by both these, or some other cause (OFQ p.131).

Boyle did not spell out further which of these options he wanted us to adopt. He did, though, take this observation to prove that "common water, may, by being variously contexted by the Buds of Trees, be transmuted into Bodies endow'd with new ... Qualities manifest and Occult" (OFQ p.134). That is to say, it was merely a change of

texture that is being wrought upon the water, and Boyle was keen to keep his explanation of this as mechanical as possible:

> If it be said, that these Qualities are productions of the Plastick Power residing in prolifick Buds ... I shall return the same Objection, when 'twas propos'd in the First Observation (OFQ p.134).

Again, his retort was that the power that makes this change can only act on the matter there available. But he failed to add the qualification that the agents involved had to act in an exclusively mechanical fashion. Boyle hoped that his arguments would rule out non-mechanical explanations, but it is far from clear that he succeeded in doing this.

Locke's piece, *Morbus*, dealt with the same examples as Boyle and presented them in the same order as Boyle did in *The Origine of Formes and Qualities*.[111] We know what Locke thought of the "Strainer" theory of Descartes, and attributed plant growth to "seminall principles". We are now also in a position to consider what he thought occurred in the hatching of eggs, and the grafting of plants:

> By this seminall ferment y^e^ liquid parts of an egge are turnd into a chicke, w^ch^ how it can be donne by streineing where hard & consistend parts are producd out of a soft & liquid I cannot conceive, Soe grafs of severall kinds grafted on y^e^ same stocke by their seminall ferments, turne y^e^ common juice of y^e^ crab into fruits of far differing sorts (BM Add MS 32554 f.121r).

We can see in this passage that Locke directly responded to Boyle's thought on these points. Locke fully exploited the logical gap that Boyle left open in dealing with these problems. Locke's "ferments" are "parcelles of matter" that act on other bodies, but in non-mechanical ways. Locke, then, denied a universal mechanism, and so specifically rebutted Boyle's assertion that all nature was purely a "Mechanically contrived Engine" (OFQ p.116). Where Boyle took these examples to give credence to the mechanical philosophy, Locke saw no such support, and in this doubt he had reason: it did not seem obvious that there was merely a re-arrangement of bare matter here. The physical seed got bigger and its extra bulk was not just water, but plant material. It appeared that some transformation was effected upon the water to turn it into the new body of the plant. Locke was right to doubt Boyle's assertion, especially given the chymical account, which

[111] This indicates that Locke was acquainted with the book when he wrote *Morbus* and was dealing with the themes raised there. Locke read *The Origine of Formes and Qualities* in late 1666, and this piece was unlikely to have been written after Locke went to London, so *Morbus* can be dated late 1666/early 1667. Patrick Romanell first noticed the parallels between *Morbus* and Boyle's *Origine of Formes and Qualities* (*John Locke and Medicine* (Buffalo N.Y. 1984) pp.54-61). The argument presented here, whilst based upon this initial discovery, expands greatly upon it.

seemed to deal with just such phenomena. Locke was well aware of Boyle's thought on these points and rejected it. Instead, he chose the vitalistic alternative open to him.

Locke re-introduced the concept of "humours" as a factor in "seminall" disease. Not, however, as the cause of disease when the qualities are imbalanced, but rather as the factor of susceptibility to the agency of various ferments. In just the same way as the soil in which you sow your seeds affects the development of the plant, so the constitution of your body will make you more or less likely to catch this or that particular disease:

> soe sanguine complexions are observd most easily to admit y^{e} seminall principles of y^{e} plague easily melancholy more difficultly. & in all these seminall deseases y^{e} fault seems noe otherwise to be in y^{e} bloud & humours then as they are more or lesse disposd to receive & nourish this seminall principle, w^{ch} did it not insinuate into them & corrupt them by its heterogenious & hostile ferment, the body would continue still in its ordinary health (BM Add MS 32554 f.126r).

Locke was not prepared to accept the Galenic assumption that a general imbalance of the body was entirely responsible for ill health. Disease was often localised and so could not be attributed to a factor that was general in its nature, like an imbalance of the temperament. The localisation of disease only made sense if there was some "seminall principle" that corrupted the body in only one place, and did not act in any other part.

With this Galenic concept assimilated into his neo-Helmontian theory, Locke then moved on to the discussion of non-seminal diseases, those maladies caused by a "bare mistion of parts":

> Other deseases I suppose may probably be conceivd to be producd by a bare mistion of two unfitt ingredient, as when acid & volatile salts are mixd, there presently is producd an ebullition, & then y^{e} two differing salts coagulate into a 3^{d} substance far enough different from either of y^{e} ingredients (BM Add MS 32554 f.127r).

Even in the most basic of inorganic interactions, Locke neglected to describe it in terms of the differing textures of the material parts, despite the fact that this was the best case Boyle had for a strong mechanical explanation. If Locke was talking in corpuscularian terms, he did not go out of his way to say so. Helmontian theory also accommodated inorganic interactions in its theory. Indeed, the followers of Paracelsus were called "Chymists" because of their strong interest in chemical experimentation, and the preparation of remedies by purely chemical means. Even in this part of Locke's discussion, which might charitably be construed as corpuscularian, there was an equally high probability that it could be based upon a Helmontian perspective. Indeed, as we have noted, even some Aristoteleans were prepared to posit tiny particles in bodies. The

point that differentiates mechanism from other theories is not just the thesis that bodies are made of smaller parts, but that these parts only act in mechanical ways. Locke made no comment on this point. So the passage cannot be construed as anything other than neutral as regards adherence to the corpuscular hypothesis.

We may now draw together some of the strands of evidence that we have discovered in these early medical writings. First, it is transparent that there is no evidence of Locke, in the period of 1664 to 1666, being an adherent or champion of the corpuscular theory. He was acquainted with Boyle, and even took the time to criticise his writings, but he did not agree with his illustrious associate. Indeed, if anything, Locke moved further away from some of Boyle's opinions in this period. It is equally obvious that Locke's acquaintance with Boyle occasioned many of Locke's thoughts and produced many useful examples in his arguments. The relationship, however, did not extend so far as to induce Locke to accept his friend's chosen theory. The strengths of the corpuscular theory were in explaining inorganic phenomena, when it came to biological matters, problems were numerous. Boyle struggled unsuccessfully to present the corpuscular theory in a favourable light when dealing with these difficulties. Locke, on the other hand, made physiology and medicine his prime interests, and had these areas at the heart of his thinking in this period. It is unsurprising, therefore, that Locke's natural philosophy at this point was one firmly based in the organic realm. It is far from astounding that he was dismissive of the dry physics of Descartes, and the implausible mechanical explanations given for biological phenomena. It is also unremarkable that Locke dealt swiftly with the phenomena of incubation and grafting that Boyle laboured over. Boyle seems unsure of himself in the passages; he insisted that all was mechanical, but left a wide gap in his argument. Locke was direct in his treatment of these issues.

It can also be seen that the major problems in Locke's mind around this time were those concerning the disputes between the Galenists and the Paracelsians. Both *Morbus* and *Respirationis Usus* commenced with the problem of how to resolve the dispute between these two camps. In *Respirationis Usus* a mechanical alternative was not even considered. In *Morbus,* it was quickly dismissed as inadequate. Corpuscularianism was not an option for Locke at this point. By the end of 1666, Locke had known Boyle for at least six years, had corresponded with him and had read many of his books, including the landmark *Origine of Formes and Qualities*. As far as theoretical commitments were concerned, it is evident that Locke was not greatly influenced by this association: Locke was a Helmontian, positing the "Archeus" and "ferments" as factors in disease. All this

in spite of the fact that Locke could not conceive how these agents worked. In terms of natural philosophy, Locke in 1666 was nothing like the Locke of the *Essay*.

Locke and Sydenham

Methodus Curandi Febres

On the 9th of July 1666, David Thomas wrote to Locke to ask him to run an errand:

> I must request one favour of you, which is to send mee word by the next opportunity, whether you can procure 12 bottles of water for my Lord Ashley to drinke in Oxford sunday and munday morening; if you can possibly doe it, you will very much oblidge him and mee (CJL 203).

Locke's inability to meet this small request was to have a significant impact upon the course of his medical thinking. Locke had to meet Ashley to explain why it was that the requested waters were delayed. The future Earl of Shaftesbury received Locke amicably and was impressed by this medical student. Lady Masham later gave this account of the first encounter between Locke and Lord Ashley:

> My Lord Ashley, designing to spend some days with his son at Oxford, had resolved at the same time to drink Astrop medicinal waters there, and had accordingly written to Dr. Thomas, a physician in Oxford, to provide them against his coming. The Doctor, being obliged to go out of town, could not do this himself, and requested of his friend Mr. Locke to take care of getting the waters against my Lords' coming. Mr. Locke was no way wanting in this care, but so it fell out that through some fault or misfortune of the messenger employed by him to this purpose my Lord came to town, and the waters were not ready for his drinking them the next day, as he had designed to do. Mr. Locke much vexed at such a disappointment, and to excuse from the blame of it Dr. Thomas, who had entrusted him herein, found himself obliged to wait upon my Lord Ashley (whom he had never before seen) to acquaint him how this had happened. My Lord, in his wonted manner, received him very civilly, accepted his excuses with great easiness; and when Mr. Locke would have taken leave of him, would needs have him stay sup with him, being much pleased (as it soon appeared) with his conversation (JLPP pp.23-24).

The politician was taken with Locke, and subsequently spent a long time encouraging the Oxford don to leave academia behind, and come to London.[1] This encouragement notwithstanding, Locke took a long time to make up his mind. But, by the 24th of March the following year, Locke was writing to Boyle informing him that the two correspondents would soon be meeting in London:

> I intend to go between this and Easter into Sommersetshire, where if I can do you any special service about Mendipp, or any other way, you will oblige me with employment ... After some little stay in the country, I hope to kiss your hands in London (CJL 224).

[1] Indeed, it was most likely Ashley's influence that secured Locke's place at Christ Church. There is no evidence to suggest that Locke himself could have persuaded the Chancellor of the University or the King to speak up on his behalf. Ashley, on the other hand, had many powerful friends. Having secured Locke's Studentship at Christ Church, and freed him from the need of further study, Ashley could enjoin his friend to come to London without having to fear any detriment to his position.

Locke still had a little unfinished business to attend to, and spent some of his last days in Oxford sorting out his chemical experiments and apparatus. In early April he recorded his last result in the experimental notebook, detailing the results of a trial commenced the previous June (BL MS Locke f.25 p.136). He also settled up his lab expenses with his friends Blount and Thomas:

Laboratory	Apr.1 accounts	
	Mr Thomas .	22-5-5
	Mr Blunt ————	5-15-11
	JL ————————	4-13-5 (BL MS Film 79 p.10).

Locke left Oxford the next day. By the 29th of April 1667, Locke had made his way to Somerset (BL MS Locke f.12 p.12), as he had informed Boyle he would. By the 5th of June, his journey was complete, and he was finally resident in London under the patronage of Lord Ashley (BL MS Film 79 p.5), for whom he was running various errands. In addition to his duties to his new patron, Locke was also continuing to pursue his medical interests. It was at this point in his medical education that his outlook, methods, and theories would all undergo a complete sea-change. He would reject his previous bookish adherence to a study of medical systems and theories, and replace it with the position that would come to be described as characteristically "Lockean". He was to do all this thanks to the influence of Thomas Sydenham.

As we have seen, during his work at Oxford, Locke concerned himself with the clash between the three main strands of medical thought prevalent at the time. He attempted to reconcile these factions, but in doing so betrayed a strong bias towards Helmontian thought. In early 1666, Thomas Sydenham, a controversial physician from London and a friend of Boyle's, published a book: *Methodus Curandi Febres* (Amsterdam 1666).[2] It is not clear exactly when Locke read this work, but it is clear that when he did read it, it had a massive impact on his thinking about medical matters - so much so, in fact, that Locke came to disavow his previous work on the subject. Locke made many notes on Sydenham's work (BL MS Locke d.11 ff.79v and 268r-267v *rev*). In order to examine the impact of the book, the subsequent change in Locke's thought and the collaboration between the two men, it is necessary to look closely at the text of the first edition of the book, and compare it to that of the second.

The full title of Sydenham's first book was *Methodus Curandi Febres Propriis Observationibus Superstructura*. Freely translated this means "Thomas Sydenham's method

for curing fevers based upon his own observations". The title was highly indicative of the content. The book was a straightforward exposition of the practical methods to be employed in order to cure various diseases. It had only a minimal theoretical structure, and did not engage in *a priori* exercises as to the nature or constitution of the body or disease. In this respect it differed from virtually all the literature that preceded it in the medical sphere. The ideas that lay behind this enterprise are easily enumerated. In order to cure disease, we must first determine what type of fever it is that is afflicting a patient, and then find out what method of cure is best suited to removing this fever. The content of Sydenham's book was mostly just the product of this exercise, which was executed by careful observation of patients and the effectiveness of the treatment. Sydenham was adamant that this was the only way that progress would be made in the treatment of illness:

> To some it may appear that the method which I adopt is based upon insecure foundations. I am, however, on my part, fully convinced, and I truly affirm, that it ⟨is⟩ altogether proved by a manifest experience (MCF p.9).

Experience was cited again and again as the reason for the adoption of this or that method of treatment. Sydenham rested his whole case in support of his methods upon the fact that he had seen such treatments being effective in a large number of cases:

> To bring the discussion to an end at last, I allow myself to add that the general method already described embraces the treatment of all kinds of fevers as far as I have been able to make out by careful observation (MCF pp.63-65).

In fact, even the minimal theoretical framework that Sydenham did lay down to explain disease, was closely linked to the observable level. It was asserted that in a fever the body attempts to expel "some heterogenous matter" (MCF p.17). This was merely a generalisation of the various symptoms of fever – sweating, vomiting, abscesses, etc. All were attempts to expel something from the body. In this way we can see Sydenham taking a rather different tack from that pursued by the majority of his contemporaries. For most physicians of the period, theoretical concerns were paramount when it came to determining the methods for treating illness. Sydenham's aim was to turn this attitude around, and make the practical art of restoring people to health the top priority in medicine.

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[2] All the references given in the following text are to the English translations in the 1987 edition of the book, edited by G.G. Meynell.

Sydenham was far from impressed with the state of medicine as he found it, and was dismissive of the disputes that it engendered. In point of fact, he went out of his way to divest the terms that he used of any theoretical connotations that they might have, in order not to get drawn into fruitless controversies. Locke in *Morbus* had adopted a two-fold aetiology. On the one hand, he looked at the "fermentation" of Helmont, and on the other, he used the notion of an "ebullition", which was just a "bare mistion of parts". Both of these terms had places in philosophical systems, and could carry with them a great deal of theoretical baggage. Sydenham wanted no part of any abstract dispute and made it clear that whenever he was talking of a motion in the blood, he was not making any such implications:

> With this in view, I prefer the broad and general term *commotion*, to either *fermentation* or *ebullition*. I so cut off the occasion of a mere dispute about words, against which the use of the two other two terms, although admitting a fair explanation, would not sufficiently ensure me. To some they might appear harsh, to others inappropriate (MCF p.17).

Sydenham was not at all concerned to engage in the sorts of disputes and arguments that were symptomatic of the state of medicine at the time: he said as much himself:

> I have no desire to mix myself up with such controversies as these. Be the matter what it may, I shall, now and then, use the words *fermentation* and *ebullition*, inasmuch as they have been currently adopted by medical men of late years; provided only that, from what has been said upon the subject, it is now clear to the reader that the terms are used in the present treatise solely for the sake of illustration (MCF p.19).

Sydenham's reluctance to be drawn on these issues was not due only to his respect for practical measures, but also to a strong conviction that there was really no way for people to penetrate into the causes of illness. Such causes, thought Sydenham, are hidden from us. He was clear that some things in disease are obvious to us, and are attested by experience. He was adamant, for example, that diseases fall into different and distinct types: that there are "species of fever" (MCF p.55), which fevers act in a constant and systematic way:

> Nature here {regarding aetiology}, as elsewhere, moves in a regular and orderly manner (MCF p.103).

These facts could be established by a careful observation. When it came to discourse upon the essence of the species, though, Sydenham would not be drawn and indeed washed his hands of the whole matter. When discussing the different species of fever it

can be asked why one fever acts and another in a different way - what was the underlying cause of the differences?

> if any one, I say, requires an answer upon all these points, I am ready to confess my ignorance. No one, that I know of, has hitherto gone far enough in such matters to flatter himself for having solved these problems of Nature. For my own part, I am not ambitious of the name of a Philosopher, and those who think themselves so, may, perhaps, consider me blameable on the score of my not having attempted to pierce these mysteries (MCF p.101).

This was a recurring theme in the first edition of the *Methodus*: we simply cannot pry into the unobservable causes of observable effects. The causes of disease "cannot be laid down" (MCF p.59), and "In such cases, we must confess our ignorance, and admit only a blind, inexplicable and malignant ⟨cause⟩" (MCF p.59). In short, it appears that Sydenham was strongly pessimistic about our ability to know that causes of disease. Indeed, in one of the cases in which he did put forward a speculation as to the cause of continued fevers, he was so unsure of his ideas, as to merely state it as a possibility, and then return to what he knew best: the art of healing, based on experience:

> Whether this theory be the right one, or whether something more abstruse must be substituted for it, I leave to the decision of those who have the time, taste and temper for the necessary speculations. Meanwhile after an honest and fair induction from many observations, I pronounce this as an undoubted truth, and a thing most certain ... (MCF p.69).

Sydenham continued by spelling out the effectiveness of various drugs in different stages of a disease. He summed up this attitude to the causes of illness clearly and concisely: nature acts "secretly", and has a "power of hidden working" (MCF pp.231-232). Consequently,

> Aetiology is a difficult, and, perhaps, an inexplicable affair; and I choose to keep my hands clear of it (MCF p.103).

It is no surprise, then, that Sydenham chose not to engage in the disputes of his contemporaries. It seemed clear to him that such disputes were never capable of conclusive resolution, not least because of the impenetrability of the subject matter involved. In conclusion, we can draw out three inter-related strands of Sydenham's thought from this first edition of the *Methodus*. Firstly, Sydenham evidently felt that it was not possible to give a definitive account of aetiology. Simply put, such things were beyond our capabilities. Secondly, it was of no practical use to speculate about these things, or involve ourselves in disputes about them, as this will merely waste our time.

So, thirdly, the way to proceed was to rely upon experience, and only use methods that had a demonstrated practical applicability. Experience should be our guide in medicine, not abstruse speculation and learned dispute.

On this basis, Sydenham created a programme of histories of diseases, and their remedies. These were compiled by experience at the bed-side and not in the library. This compilation of the histories of fevers would be hard work:

> To reduce ⟨fevers⟩ into classes according to the variety of their phenomena, to work out their idiopathic characters, to accommodate to each in detail its proper method of cure - this is a work requiring much opportunity, a work of great difficulty, and the work for which the life of a single physician might possibly be insufficient (MCF p.55).

It would be worthwhile nonetheless.

All of this was written by 1666, and thus before Locke had met Sydenham. This was not the case as regards the second edition. On the 2nd of April 1668, exactly a year after Locke had left Oxford, Sydenham wrote to Boyle. This letter is interesting and important because it enables us to see when the second edition of the *Methodus* was completed, and printed, and also indicates the nature of the collaboration between Locke and Sydenham at this early stage. The first edition was dedicated to Robert Boyle and was published at some point before the 7th of May 1666.[3] The dedication to Boyle was brief, and laudatory, but also contained some important facts. Firstly, it stated that Boyle was the inspiration for the project which is carried out in the text. Sydenham said that "It was on ⟨Boyle's⟩ persuasion and recommendation that I undertook the subject" (MCF p.3). The dedication also pointed to Boyle's own interest in the practicalities of medicine. Boyle could give a genuine testimony on behalf of the work because he had "gone so far as to accompany ⟨Sydenham⟩ in the visiting of the sick" (MCF p.5). The work that made up the *Methodus* began in 1661, and the first edition of the book was the product of some five years of clinical experience and observation (MCF pp.61&63 cf. RCP MS 572 f.60r). The second edition had various additions to the body of the text, but did not alter the dedication at all. This letter of the 2nd of April 1668 was to thank Boyle for accepting this dedication once again:

> now that you are pleased to give yourself the pains of a thanks, which I never thought myself capable of deserving from you, I hold myself obliged to return you my humble thanks, that you take in good part my weak endeavours, and are pleased to have a concern (as you always have done) for me (BW VI p.648).

This edition must presumably have been published at some point before the 2nd of April 1668. The letter also points to, not only the date of publication, but also the completion of the manuscript. In discussing the contents of the book with Boyle, Sydenham re-affirmed his belief in the general tenets of his methodology and results, especially regarding the section on smallpox: "I find no cause, from my best observation, to repent of anything said by me in my tract *De Variolis*" (BW VI p.649). There were, nevertheless, some slight modifications of the disease that he had not been able to control fully: "I confess, some accidents there are incident to that disease, which I was never able to master, till towards the end of last summer, and which therefore could not be mentioned by me" (Ibid.). This strongly suggests that the second edition was unavailable for Sydenham to alter at the end of the summer of 1667. This unavailability was most likely due to the book's having already being sent to the press.

What, though, of Locke? He too had been busy in the pursuit of medical knowledge, as Sydenham mentioned:

> I perceive my friend Mr. Locke hath troubled you with an account of my practice, as he hath done himself in visiting with me very many of my variolous patients especially (BW VI pp.648-649).

Locke saw Sydenham's practice at first hand. He had been impressed by Sydenham's book, and had become acquainted with its author. Due to a lack of decisive evidence it is not possible to say whether Locke read the book before or after meeting Sydenham. Whatever the precise chronology, an encounter between the two men was effected. This could have been easily arranged thanks to Boyle's acquaintance with both men, and Locke's having attended Westminster with an associate of Sydenham's; John Mapletoft. That Locke was struck by this new approach to the restoration of health is instanced in the inclusion of a poem of fulsome praise tagged on to the end of the second edition. The other most notable addition to the text was a new section dealing with the disease that had struck with such force in London in 1665: the plague. It is in these two additions that we can see the start of a fruitful collaboration between the two men, and it is to a careful analysis of these additions that we must now turn.

Locke could hardly have been more admiring in his attitude towards Sydenham in the poem he wrote for his friend, attributing to him an "*equally amazing skill and*

[3] It could not have been published later than this, as this was the date of the publication of an abstract of the book in the *Philosophical Transactions of the Royal Society* 7 May 1666, Vol. I, pt.12, pp.210-213.

success" (MCF p.227), and stating that by Sydenham's treatment the plague had been brought under control:

> Who would believe in Plague subdued at last, mastered by our Art and now bereft of all its ancient threats? After deaths in thousands, with graves heaped up with the dead, the dreaded scourge lies conquered by a little wound (MCF p.228).

This last reference was to Sydenham's recommendation of drastic venesection as a procedure to cure the illness. This supposed success Locke found all the more laudatory in comparison with the sad state of medicine previously: "A thousand cures has Medicine essayed, yet still the Fever burns" (MCF p.227). This Locke attributed to the intractable problem which the previous physicians had attempted to solve. They were concerned with discovering the causes of disease, which pursuit was hampered by the obscurity of aetiology:

> The Physician ponders the Fever's cause and course, the darkness of flames and burning without light (Ibid.).

Sydenham, in Locke's eulogistic verse, pursued another course. He refrained from entering into the disputes of the schools and concentrated on the practicalities of treatment:

> SYDENHAM, at last, opposing both Fever and the Schools, both fever probed and treatment understood. Not for him, fires of occult corruption or those "humours" that breed fevers ... Not for him those squabbles whose heat exceeds the fires (Ibid.).

All this Locke applauded, and commended to the reader. Additionally, we can see that, even at this early stage in their association, Locke had clearly picked out the three main threads that were uniquely worthwhile in Sydenham's programme: the removing of scholastic disputes, the dismissal of aetiology and the endorsements of treatments that were gained through experience. It is these three tenets that would become characteristic of what will be the "Lockean" attitude to natural philosophy, and it was in this poem published in 1668, that they first appeared.

It is, of course, worth bearing in mind the complete turn-around here illustrated in Locke's outlook on these matters in the period 1666 to 1667. In 1666 Locke was receptive to theories of aetiology that were clearly suspect on Sydenham's account. Since this poem must have been at the printers in time for the publication of the book as a whole, we can see that by the end of 1667 at the latest, Locke had rejected a great deal of his previous medical training and had adopted this revolutionary teaching in its stead.

This change of attitude was swift and decisive, and the tone set in the verse was even stronger than that which Sydenham had used in the first edition of his book.

This strengthening of position was also expressed in the extra section that Sydenham added to the book concerning the treatment of the plague. Here, Sydenham stated even more forcefully his preference for experience over controversy and bickering:

> I have ever held that any accession whatever to the art of healing, even if it went no further than the cutting of corns or the curing of toothaches, was of far higher value than all the knowledge of fine points and all the pomp of subtle speculations; matters which are as useful to the physician in driving away diseases as music is to masons in laying bricks (MCF p.215).

In the practicalities of treatment, experience was the only sure way of healing. In those cases where theory and observation conflict, Sydenham was clear where his sympathies lay. He always relied upon a close examination of the matters of fact: "This," he said, "enabled me to prefer my own experience to any theoretical precepts" (MCF p.205).

Sydenham also re-stated his thought that each disease had its own essence, upon which its observable effects depended, "each species of malady ... hath taken as its portion its own state: proper permanent, unequivocal, derivative from its essence (MCF pp.175&177). Sydenham was unyielding in his assertion that, while we know that nature's mode of operation is regular, what this mode is, we cannot discern:

> It is in accordance with immutable laws, and by a scheme known to herself only, that Parent Nature accomplishes the generation of all things; and though many things she may bring forward from the abyss of cause into the open daylight of effect, it is in deepest darkness that she veils their essences, their constituent differentiae, their inherent natures (MCF p.175).

This particular point, using the metaphor of "light", and "darkness" as regards the knowledge we have of causes and effects, was just the same metaphor as that Locke had used in his verse.

There is no documentary evidence that Locke had any influence on the writing of this new section of the text, but telling considerations could make the assertion highly probable. As we have seen, Sydenham's method of treatment with regard to the plague was a very radical venesection, or bloodletting. As well as his own experience and practice as a justification for this treatment, Sydenham also referred to a number of other authors who supported this therapy. As Guy Meynell has pointed out,[4] this

[4] "Sydenham, Locke and Sydenham's *De Peste Sive Febre Pestilentiali*" in *Medical History* 37 (1993) pp.330-332.

reference on Sydenham's part was extremely uncharacteristic, not least because a reliance upon learned authority was one of the worst practices of "the Schools". I will summarise the main thrust of Meynell's thinking on this point. Sydenham first mentioned the opinion of Diemerbroek that bloodletting was not a good or useful remedy in the face of the plague. Nonetheless Sydenham continued by stating that "In truth, many authors (and those good ones) have all along perceived that bleeding is proper in the plague" (Ibid.). Sydenham then listed thirteen names individually, and cited the existence of "others" (Ibid.). All the authors listed by Sydenham are also listed in a book by Diemerbroek, the *Tractatus de peste* (Arnhem 1646). Moreover, Sydenham listed these authors in roughly the same order as that given by Diemerbroek. Finally, in the latter's list some authors were given with both surname and forename, for example "Ludovicus Mercatus", and some only by their surname, for example "Altomarus". This pattern of naming was copied exactly in Sydenham's list. This would strongly suggest that *Tractatus de peste* by Diemerbroek was the source for this passage in the second edition of the *Methodus*.

Sydenham is not known to have had an extensive library, though he presumably owned some books, yet there is no evidence of his having engaged in the encyclopaedic reading of some of his contemporaries, Locke most notably. In fact, Locke had noted this work in his previous studies, and his interest in it is recorded in one of his medical common-place books:

> Diemerbroek: Isbrandus de Diemerbroek de peste 4° Arenaci 1646 (BM Add MS 32554 f.33r cf. ff.66v, 77v and 91r).

It is likely that Locke owned a copy of this book at the time that he met Sydenham. Locke certainly owned a copy of it in 1681, as is shown in the catalogue of his library (H&L 962 cf. Appendix I, p.271).[5] Given the comparative reading habits of the two

[5] This conclusion might seem to be contradicted by the apparent sale of a copy of this book by Locke to his friend John Strachey. In his memorandum book for 1667, Locke recorded the following item:
Strachey sent him may.1.66
Diemerbroek –0-6-6 (BL MS Film 79 p.9)
Other books are listed here and on page 6 of the same notebook. This was followed up several pages later (BL MS Film 79 p.28) with the entry:
Strachey 27 Apr 67 Rec^{d} them of M^{r} Strachey 1-7-8 for the books on p.6. & p.9
However, Locke was in the habit of buying books that he thought Strachey would like, and sending them to him. This was most likely because Strachey, stuck in the countryside outside Bristol, was unlikely to have had the same access to booksellers as Locke did. For example, on the 20th of April 1662, Strachey signed off his letter with the following comments: "I give thanks for the last booke you sent mee which intruth is a very good one and is the best company I now enjoy. If you have any other Authour that in my melancholy moode I may play withall, I pray send it, I wont tell you I will pay you what you disburse, I conceive you believe it as likewise that I am Sir your faithful friend and servant Jo: Strachey (CJL 131 cf.

men and the likelihood of acquaintance with works of this sort, it is probable that Locke was the source of these references. He knew that Sydenham was preparing a second edition of the book, and knew that it was concerned with the plague, as exemplified by the poem. He was also acquainted with the work in question, as well as several of those by authors cited in the list. Sydenham, on the other hand, was likely not so. It seems then, that Locke brought this work to the attention of Sydenham, who decided to include it in his own writing on the plague.

If this conclusion is accepted, it is perfectly plausible to assume that Locke was acquainted with Sydenham at the time of the preparation of the text, which must, given the time of the arrival of Locke in London, and the giving of the manuscript to the printers, be at some point between May and December 1667. It also allows the possibility that it was Locke who had a hand in some of the more poetic conceits of the text itself.

Notwithstanding these speculations as to the influence of Locke on the writing of Sydenham at this time, we can sum up the practical approach to medicine, despite our ignorance of the quiddity of disease:

> the questions as to how we can cure diseases, whilst we know nothing of their causes, gives us no trouble. It is not by the knowledge of causes but by that of methods at once suitable and approved by experience that the cure of the majority of diseases is accomplished (MCF p.177).

It appears that by the end of 1667, Locke was in full agreement with this. He had endorsed Sydenham's approach to medicine and was accompanying Sydenham on his trips out to see patients. Locke had left behind the learning and disputes of Oxford, and had embraced the practicalities of life in London. This was further typified by the collaboration with Sydenham over the next few years.

CJL 107). Diemerbroek's book was likely another one of these: Locke bought Strachey another copy, and did not sell his own.

Anatomia

As well as learning medicine at the bedside, the year 1668 saw the production of a document in Locke's hand that considerably expanded upon the themes present in the *Methodus Curandi Febres*. *Anatomia* is preserved at the Public Record Office in London amongst the Shaftesbury Papers, along with another important medical paper *De Arte Medica*, again in Locke's hand (PRO 30/24/47/2 ff.31-8 and ff.47-56 respectively). The authorship of both of these documents is disputed. Both of the papers were hastily written and have many corrections and additions suggesting that they were rough first drafts, rather than definitive texts. As we shall see, Locke did act as an amanuensis for Sydenham on several occasions in 1670-1, so it is possible that these papers' hasty compositional style was the result of just such an arrangement. In the case of *Anatomia*, this appears all the more plausible given the fact that the opening sentence is in Sydenham's hand, and the rest is in Locke's. However, the writing positively flows in comparison to Sydenham's usual leaden prose, and contains several striking analogies and metaphors, as well as phrasings that are characteristic of Locke's own writing in the composition of the Drafts for the *Essay Concerning Human Understanding* in 1671. In addition, the contents of both essays concerned general themes in this new approach to medicine, and did not require any great knowledge of the practice of medicine. These pieces were expositions and justifications of the themes that were presupposed by Sydenham's work. By the end of 1667, when Locke's poem to Sydenham was composed, Locke had fully grasped the precepts of his associate's theory. So, it is perfectly plausible to suggest that the composition of these papers was well within Locke's intellectual capabilities. Given also that Sydenham's own prose style was rather tedious, it seems that the balance of probability weighs in favour of Locke as the author of these two documents, although this conclusion is by no means certain.[6] A plausible suggestion for the appearance of Sydenham's hand at the top of *Anatomia*, then, is that these papers were written by Locke to provide some theoretical backing for Sydenham's system, at Sydenham's behest. Moreover, the piece in Sydenham's hand at the beginning of the paper was most likely a later addition to the work: Sydenham's remarks filled up the paper above Locke's text, but also spilled over into the margin. This suggests that these lines of text were added only after Locke had begun writing and were not intended

[6] The arguments presented here are abbreviated versions of those given by Guy Meynell in "Locke as the Author of *Anatomia* and *De Arte Medica*" in TLN 25 (1994) pp.65-73.

as a guide for Locke to follow. This makes it less plausible to suppose that Sydenham began the paper for Locke to continue, and more plausible that Sydenham appropriated the paper only after Locke had finished it. These papers, then, appear to be Locke's attempt to justify and elucidate the fundamental tenets of Sydenham's approach to medicine. It is not unlikely that the practical physician wanted to leave the elegant exposition of the methodology to his more learned and bookish friend. Even if all this speculation were contrary to fact, and Sydenham was the true author of these papers, we will see that Locke fully endorsed these sentiments throughout his subsequent career.

Anatomia was mainly concerned to show that the pursuit of anatomical studies was of no use to a practising physician. This proposition was backed up by two main arguments. The first argument was to the effect that we can *never* hope to penetrate into the hidden workings of nature. The second was that even if this impossible dream were to be fulfilled, it would still be of no use in the treatment of illness. Both of these claims themselves were backed up by subsidiary considerations and arguments. With this broad plan in mind we can now turn to the detail of the text.

The first section of the essay, and the only part of it in Sydenham's hand, laid out the project attempted. Some people, wrote Sydenham, "have ... pompously & speciously prosecuted the promoting of this art ⟨of anatomy⟩ ... but with how little success such endeavors have bin or are like to be attended I shall here in some measure make appear" (PRO 30/24/47/2 f.31r). The scribal hand then became Locke's, and some initial concessions were made to the benefit of this practice. Anatomy was admitted to be "absolutely necessary to a Chirurgien & to a physitian who would direct a Surgion in incision trepaning & severall other operations" (Ibid.). It was also admitted that anatomy could be of use and benefit in the application of certain methods to the physician: it "may give him some light in the observations he shall make in the history of diseases, & the ideas he shall frame of them. w^{ch} though not perhaps true in its self yet will be a great help to his memory & guid to his practice" (Ibid.). In this sense, anatomy may be deemed useful. But this usefulness was strictly limited:

> that anatomie is like to afford any great improvem^{ts} to the practice of physic or assist a man in the findeing out & establishing a true method I have reason to doubt (Ibid.).

The reason given for this assertion was straightforward: "All that anatomie can doe is only to shew us the grosse & sensible parts of the body" (Ibid.). This was of no use to a physician in his treatment of the sick. In order for the physician to have a use for

anatomy, this art would have to give him knowledge of the causes of illness, a knowledge of the "constitution & that texture whereby it operates ⟨which⟩ he cannot possibly know" (Ibid.). The point was made even more firmly:

> it is certaine & beyond controversy that nature perform all her operations in the body by parts soe minute. & in sensible that I thinke noe body will ever hope or pretend even by the assistance of glasses or any other invention to come to a sight of them (Ibid.).

This was quite unequivocal. Whereas in the *Methodus*, Sydenham was pessimistic about the possibilities of finding the hidden causes in nature, the author of *Anatomia* believed such prying to be impossible. This point was made repeatedly in the text. As regards what it is that caused disease "it is certainly some thing more subtile & fine then what our senses can take cognizance of" (PRO 30/24/47/2 f.35v), it was "too curious & fine for us to discerne" (PRO 30/24/47/2 f.36v), "the cause be very small in bulke & insensible in its parts" (PRO 30/24/47/2 f.36r) and we cannot know it because "the tooles where with nature works & the changes she produces in these particles ⟨are⟩ too small & too subtle for the observation of our senses" (PRO 30/24/47/2 f.34r). We might sum up the position thus:

> I thinke it is cleare that after all our porings & mangling the parts of animals we know noething but the grosse parts, see not the tooles & contrivances by w^{ch} nature works· & are as far off from the discoverys we aime at as ever (f.32v).

All our knowledge from anatomy, then, was useless with regard to aetiology: all we acquire is a "superficiall knowledg" (PRO 30/24/47/2 f.33r), and "we see but the outside of things & make but a new superficies for our selves to stare at" (Ibid.).

This scepticism with regard to our perceptual faculties was stated as if it were completely common knowledge that required little, if any, justification. It was only towards the end of the paper that some arguments were given for this claim, were the reader not to be convinced by the repeated assertions of purported fact. Nor should the reader have been convinced. After all, great advances were being made in microscopy and there seemed to be no *a priori* reason why such advances should not continue. Hooke in 1665 had published his *Micrographia*, based on observations obtained through microscopes. Hooke saw no reason to doubt that further progress would be made into the discovery of the hidden workings of nature. In his preface to the work he stated that

> It seems not improbable, but that by these helps ⟨i.e. the improvements in microscope technologies⟩ the subtilty of the composition of Bodies, the structure of their parts, the various textures of their matter, the instruments and manner of their inward motions,

> and all the other possible appearances of things, may come to be more fully discovered (*Micrographia*, Preface).

Opinion, then, was not quite so universally behind Locke's position as he might have liked to imply. Locke was, however, happy "to put it beyond doubt that anatomie is never like to shew us the minute organs of the parts or subtile particles of the juices on w^{ch} depend all its operations & our health" (PRO 30/24/47/2 f.36v-37r). He did this by alluding to Hooke's own discoveries, and used them to rebut Hooke's optimistic assertions. In order to do this Locke wanted to "mention a mite or rather a little creature by the help of microscopes lately discovered in some kinde of sand" (PRO 30/24/47/2 f.37r). This is a clear reference to *Micrographia*: Hooke, in Observation LV, "Of Mites" (pp.213-215), had described the following discovery:

> The least of the *Reptiles* I have hitherto met with, is a Mite, a Creature whereof there are some so very small, that the sharpest sight, unassisted with Glasses, is not able to discern them, though, being white of themselves, they move on a black and smooth surface (*Micrographia* p.213).

Locke had read the book and noted that this mite was an "animall soe small, that it is not to be discernd by the naked eye & yet has life & motion" (PRO 30/24/47/2 f.37r). Locke thought that consequent upon this, we have to suppose that this creature must have all the organs and faculties necessary to sustain life. All of these organs would have to be contained in "a insensible particle of matter" (Ibid.).

The anatomist with all his microscopical aids had only discovered further, smaller, creatures not the way whereby such creatures subsisted. The challenge facing the anatomist was to "shew the parts in one of these insects". It is only then that Locke "shall beleive ⟨the anatomist⟩ will be able to shew the very operations of those parts in a man & till he dos that he does very litle towards the discovery of the cause & cure of diseases" (Ibid.). This possibility was as far from realisable as might be supposed. It is evident that the premise of the discovery of a mite at the unobservable level does not entail that, given further progress, such discoveries about the causes of disease will not be made. Locke's point was rather to illustrate the poverty of the discoveries so far produced. With the use of microscopes, all that has been discovered were new and tinier life-forms. This gave reason to suppose that upon further magnification, more and more of these smaller creatures would be found, and thus no definitive end would be reached in this search. Locke's argument was not decisive by any means, but it did demonstrate that there had been no appreciable progress made by the use of optical aids. Hooke had

in no way shown that by using the microscope he was in any way closer to discovering the mechanism of life: all he had found was a further example which was in need of explanation. It was on this basis that Locke concluded his argument:

> Tis certaine therefor notwithstanding all our anatomicall scrutinys we are still ignorant & like to be soe of the true essential causes of diseases, their manner of production, formalities, & ways of ceaseing (Ibid.).

Even if this conclusion was not accepted, Locke committed to paper a second line of argument against anatomical studies: were we to obtain the knowledge of the inner mechanisms of nature, this would be of little value for a physician:

> for suppose any one should have so sharp a knife & sight as to discover the secret & effective composure of any part, could he make an ocular demonstration that the pores of the parenchyma of the liver or kidneys were either round or square & that the parts of urin & gall seperatd in these parts were in size & figure answerable to those pores, I aske how this would at all direct him in the cure either of jaundice or stopage of urin what would this advantage his method or guid him to fit medecins (PRO 30/24/47/2 f.31v).

This knowledge, could we but acquire it, would not help us in the treatment of disease. It was not by a thorough knowledge of anatomy that we know whether "rhubarb or pellitory have in them fit wedges to divide the bloud into such parts ... fitted to open those passages" (Ibid.). Since it was the treatment of illness that was important, and anatomy gave us no clear knowledge in this regard, it was of no real use at all.

Again, it is clear that this argument is highly dubitable, as it is far from obvious that the conclusion followed from the premises. Locke was assuming that a knowledge of anatomy itself would not give us an insight into the active parts of other substances. This is clearly true: human anatomy is the study of the human body. Presumably, though, since we are supposing that the technical ability exists to pry into the mechanisms of the body, it is reasonable to suppose that the same technology could be applied to an examination of the internal structures of other substances, most importantly, into the mechanisms of possible cures. If we can see the pores of the liver, and the constitution of gall correspondent to this, why might we not also see the constitution of some substance, to see if it has the requisite qualities that will permit the unhindered production of gall? Clearly knowledge of anatomy alone will not produce this sort of remedy, but it is naive to assume that this is the sole type of knowledge that will be pursued by a physician.

As a point of principle, then, Locke's argument did not rule out the possibility that we might acquire useful knowledge through a study of anatomy, provided that it

was allied with other non-physiological examinations. From a practical point of view, however, some defence of Locke's position might be made. It is perfectly possible to suppose we can see that pellitory will, when directly added to the liver, unblock the pores that produce the gall. That this is the case, could, presumably be demonstrated in a laboratory. However, this would not in any way indicate how it is we should administer this drug to the patient. It is not as if we can just place the substance right onto the liver. It will have to be ingested in some way or other, and then become prey to all the processes of digestion. Such processes could alter the substance taken and render it ineffective. It is equally likely that such a drug, whilst helping the liver, has a damaging effect on other parts of the body. None of these possibilities is ruled out by a knowledge of the liver and pellitory alone. The implication here was that, aside from the superficial knowledge we can gain from anatomy, unless we can know all about the body's mechanisms, we might as well know nothing at all. This, of course, was a much greater project than was first imagined, and could seriously limit the benefits gained by an exact anatomical knowledge of any one part of the body. As far as this point of practice is concerned, we can even see it in action even today, where it is only through clinical trials that the effectiveness and side-effects of many drugs are discovered. Locke himself made just the same point. We may suppose that we can attribute some illness to the acidity of some part of the body, so that the doctor will need to "mortifie this acidity" (PRO 30/24/47/2 f.37v), but it is not as easy to cure someone, as to prescribe an alkali remedy:

> for the alterations that both our food & physick receives in our mouths stomachs guts glandules &c are soe many & soe unintelligible to us before they come to the places we designe them, that they are quite another thing then we imagine & worke not as we phansie but as nature pleases (Ibid.).

Thus, anatomists' jobs are made so much harder, because they have now to account not just for a particular body part and remedy, but also the whole body:

> the anatomist will hardly be inabled to tell us therefor what changes any particular medecin makes or receives in the body till he can inform us by what artifice & in what shops in the bodys of animals, nature makes volatil salts out of the juice of plants w^{ch} appear not to have any such substance in them (PRO 30/24/47/2 f.38r).

In this regard at least, Locke had, and to some extent still has, a point.

Locke thought that he has reached two conclusions. Firstly that anatomy will never show us the way nature operates, and secondly, that even if it did, it would be of no use to us:

> for supposeing it were the acidum amarum & acre of the great Hippocrates or the sal sulphur & mercury, the volatile & the fixd of the chymists that made disorders in the body ... what indication would this give a practicall physician in the cure of ... diseases (PRO 30/24/47/2 f.37r-v).

So, we will never be able to discover unobservable causes. Locke had, in his piece *Morbus*, alluded to the "strainer" theory of Descartes, and now referred to both ancient and modern alternatives. The question as to which one of these possibilities was the true model of the facts was undecidable. We can ask whether nature's operations are performed by some "organicall texture" or a "kinde of ferment" (PRO 30/24/47/2 f.31r), but in respect of this point,

> whether it be donne by one or both of these ways is yet a question & like to be soe alway notwithstanding all the endeavours of the most accurate dissections (PRO 30/24/47/2 f.31r-v).

This was because we are prevented from getting down to the level of observation which would give us the answers we wanted. Locke, consequently, adopted a position of strict agnosticism regarding the fundamental structure of nature. This was a sharp contrast with the Locke of two years earlier. In 1666 he had been quite content to ascribe several phenomena of nature to the "Archeus" and its "ferments", and several others to non-seminal interactions that produced "ebullitions". In 1668 he backed off from these sorts of questions and refused to give any sort of reply when asked about the quiddity of health and disease. Indeed, where he once found such animistic notions as the "Archeus" acceptable, now he found them much less so. Contrasting this explanation with its ancient counterpart, Locke wrote:

> Therefor this hidden δημιουργὸξ[7] was soe much out of the reach of the senses yea & the apprehension of the ancients that not knowing what to concieve it, they went above the clouds for a name and cald it φμσιν αναλογον τῶ τῶν ἀστρων ατοιχήῳ,[8] an expression however obscure & insignificant more like to give us a usefull notion of the thing, then the anatomist to shew us this archeus by w^{ch} name Helmont has as clearely & intelligibly explained it to us as Aristotle by his description[9] (PRO 30/24/47/2 f.36v).

[7] "Demiurge".

[8] "a nature analogous to the element of the stars".

[9] This reference from Aristotle is to the *Generation of Animals* Book II, Chapter III 736b 35ff, and I would like to thank Dr Milton for pointing this out to me. There is no evidence to show that Locke read this book, although it is possible that he did. However, it is certain that he read many works of Daniel Sennert, and Sennert, in his *De Consensu & Dissensu Galenicorum & Peripateticorum cum Chymicis* (*Opera Omnia* pp.177-284) quoted exactly this passage (*op cit.* p.200). It seems highly likely that Sennert is the source of this reference, rather than Aristotle, as we know that Locke studied the former carefully, but was not overly concerned with the latter.

The "Demiurge" and "archeus" were on a par, both terms being "obscure and insignificant". Not quite the ringing endorsement of two years previous. It is worth noting, however, that in this particular attack, the object was to deride the two animistic explanations of physiology. There was no mention here of the corpuscular philosophy. So, while Locke asserted that all three attempts to deal with medicine were equally dogmatic, he picked out these two theories for further criticism. This was presumably because the "Demiurge" and the "archeus" were purely theoretical entities that had no grounding in everyday experience. We cannot see the "archeus". We might infer its existence, and attribute to it various faculties in order to explain the phenomena of health and illness. Nevertheless, we have no experience of it. Nor do we experience the "Demiurge". Locke did not think that a study of anatomy was likely to show us either of these things. It was on this basis that the terms were dismissed as "obscure and insignificant". Such a charge could not be levelled at a purely mechanical explanation of the workings of the body, as this theory was based upon exactly those properties of objects that we do see in everyday experience; namely, the characteristics of matter and motion. This was possibly the reason why the corpuscular theory was saved from this extra attack. I do not mean to say that Locke thereby accepted the mechanical theory, but merely that he did not lodge this extra objection against it.

These failings of anatomy, coupled with the controversies regarding the workings of nature, led to further problems. An instance of this was given by Locke in regard to the anatomical exploration of the lungs:

> Let us consider the lungs a part of that constant necessity that we cannot live a minute without its exercise & yet there being noe sensible a separation of anything in this viscus, we are still at a perfect loss in its use, (not to say any thing that though anatomy had taught us its use yet it would not doe us much service towards the cure of its diseases.) & whether respiration serve to coole the bloud, or give vent to its vapours, or to adde a ferm^{t} to it, or to pound & mix its minute particles or whether anything else is in dispute amongst the learned from whose controversys about it are like to arise rather more doubts then any cleare determination of the point & all that anatomie has donne in this case as well as severall others. is. but to offer new conjectures & fresh matter for endlesse disputations (PRO 30/24/47/2 f.33r-v).

Could Locke give any more clear a repudiation of his former opinions? His piece *Respirationis Usus* of 1666 was a disputation intended to decide the purpose of respiration. This exercise Locke now took to be completely useless. All that any such endeavour would achieve, he was sure, was to raise further profitless controversy without ever reaching a conclusion. Even if anatomy had taught us the use of the lungs,

which supposition Locke took to be quite fantastic, it would still not be of any moment in the treatment of disease. This was some change of heart.

Conceding Locke his arguments, we might ask how we are supposed to proceed in medical matters, if anatomy was of no use to us. To this, Locke had a simple and by now unsurprising response. The solution to the problem was experience. It was this that should guide the physician's hand in the treatment of patients. If a doctor wanted to know what to prescribe, he had to fall back upon his observations from the bedside:

> how regulate his dose, to mix his simples & prescribe all in a due method, all this is only from history & the advantage of a diligent observation of these diseases, of their begining progresse & ways of cure. w^{ch} a physician may as well doe without a scrupulos enquiry into the anatomy of the parts, as a gardener, may by his art & observation, be able to ripen, meliorali{...} & preserve his fruit without examining, what kindes of juices fibres pores &c are to be found in the roots barke or body of the tree (PRO 30/24/47/2 f.31v).

It was a history of the disease that would help the patient, and not the "porings and manglings" of parts of the body. This Locke took to be evident, and gave an instance in the case of American Indians, "who by enquirys suitable to wise though unlearned men· had found out the ways of cureing many diseases, w^{ch} exceeded ⟨t⟩he skill of the best read D^{rs} that came out of Europ" (Ibid.). The method of treatment was to be found not in cutting up corpses and microscopical observations, "but by acquainting ⟨ones⟩ self with the nature & history of the disease" (PRO 30/24/47/2 f.35r).

Anatomia conspicuously followed in the footsteps of the arguments and positions put forward in *Methodus Curandi Febres*. It expanded upon these thoughts, and provided more lucid arguments for them, but was clearly derived from this former source. The opinions voiced here were in direct contradiction to those expressed by Locke only a few months earlier, when he was committed to notions which he now took to be "obscure and insignificant", and was engaged in disputes likely to raise "more doubts than any clear determination of ⟨the⟩ point".

The arguments presented by Locke in this text cannot be considered decisive. Locke was right in one respect regarding microscopes: so far their use had only illustrated farther and deeper levels of complexity than were previously anticipated. Indeed, there was ground for saying that successive microscopical advances would have a similar effect and we would find that the levels of complexity in the world exceed both our imaginations and our possible abilities to fathom them. This may be plausible, but it is not a decisive ground for asserting that we will never be able to reach the final goal, in

spite of all Locke's asservations. There was no *a priori* reason why microscopical advances would never allow us to see the working of nature. Locke could not be certain that the workings of nature were necessarily unknowable. He may have asserted this, and it may be true, but he had not proved it so. In addition we can question his assumption about the usefulness of anatomy were we to see nature's workings. We may well be able to see into the workings of other bodies if we have a good anatomical knowledge. This knowledge could guide the physician's hand.

Locke followed in Sydenham's footsteps in denying the knowledge of causes, in attacking the scholastic philosophers, and in emphasising the role of experience. *Anatomia* concentrated on the first of these three themes and added original and perceptive touches to it. But, presuming Locke as the author, as well as the scribe of the piece, we can see that the main themes were derived from Sydenham, and it was this physician's outlook that dominated the paper.

1668 also saw something of a change in Locke's application of his medical learning. In Oxford, Locke had never really had a medical practice and had never treated a serious illness. This changed dramatically in May 1668 as his new patron became gravely ill with an "indisposition of the liver". Locke supervised the treatment of the illness, which was thought to be life-threatening. He brought in a number of renowned physicians to consult on the case, including Sydenham and Glisson,[10] and Ashley was eventually persuaded to undergo surgery. The operation, performed on the 12th of June, was successful. Ashley's gratitude to Locke is recounted by the third Earl of Shaftesbury (Ashley's grandson, whom Locke later tutored):

> After this cure, Mr. Locke grew so much in esteem with my grandfather that as great a man as he had experienced him in physics, he looked upon this as but the least part. He encouraged him to turn his thoughts another way, nor would he suffer him to practice physic except in his own family and as a kindesse to some particular friend (JLPP p.38).

Although Locke did not take part in the actual surgery, we can assume from the gratitude subsequently shown, that he was instrumental in persuading his friend to go under the knife. It should be remembered that this was a highly risky procedure.[11] This excitement notwithstanding, Locke continued to pursue his interest in medicine and science. It was another of Ashley's friends, Sir Paul Neile, who proposed Locke as a

[10] PRO 30/24/47/2 ff.10-11 and f.3 respectively.

[11] A large number of papers relating to this incident are preserved at the Public Record Office (PRO 30/24/47/2 ff.1-30). See also CJL 230 and 231. An account of the Ashley's illness, the operation and Locke's role, is given by Sir William Osler "John Locke as Physician" in *Lancet*, 2 (20 Oct. 1900) pp.1115-1123.

candidate to the Royal Society of London on the 19th of November.[12] Locke became a Fellow on the 26th.[13] Locke's training was finally being put to good use, and he was beginning to put into practice some of his medical learning. He was gaining experience, rather than relying on dry theories. All this at a time when he was working closely with Sydenham.

[12] *The History of the Royal Society of London* (London 1756-1757) II pp.322-324.
[13] *op cit.* pp.327-328.

De Arte Medica

The year 1669 saw Locke and Sydenham's collaboration deepen, and the written work of these two medical men, increase. One of the most significant pieces was a short and unfinished tract in Locke's hand entitled *De Arte Medica*. This is another text whose authorship is disputed. Since it has a great many characteristics in common with *Anatomia*, and no handwriting from Sydenham, we can once more assume Locke to be the author, for want of any contradictory evidence. One significant similarity between the two papers was that *De Arte Medica* shared a general theoretical outlook with both the *Methodus* and *Anatomia*: the triple attack on learned dispute, a denial of the possibility of a knowledge of nature's operations, and an emphasis on the practical value of experience. The emphasis in the *Methodus* was predominately on practice, that of *Anatomia* was on hidden causes, so interestingly *De Arte Medica* emphasised the harm done to medicine by the use of learned methods and thought.

One slight difference between *De Arte Medica* and *Anatomia* was that whilst the latter was a self-contained piece, the former was only the beginning of what would have been a much larger treatise. That this is the case can be seen by the fact that towards the end of the text a list of several goals was set out shortly before the text itself came to an end. Most of the remarks then, because they came before the main aims of the projected treatise were laid down, must be seen as a number of prefatory comments designed to clear the way for the work to follow. The piece began with a call to arms for physicians to better conquer disease:

> My intention therefor is to propose some few things to the consideration of the Learned men of this soe usefull a faculty & to excite their mutuall assistance to perfect the art & establish a setled certaine practice in the cure of sicknesses (PRO 30/24/47/2 f.49r).

If this exhortation to the "Learned men" was intended to reach out to those involved in the more traditional approach to medicine, then the request was destined to fall on deaf ears. This was so because the rest of the paper was a lengthy explanation of just why it was that these learned men were so ruinous of medicine. Locke thought that this call to arms would be responded to favourably because of "the great improvem^{t} some parts of medecin have received within this few years" (PRO 30/24/47/2 ff.49r&50r), presumably referring to the works of Sydenham. Locke asserted that since these advances have been made, he had "confidence to beleive that ⟨medicine⟩ is yet capable

of great additions & that in a way some thing different from what hitherto seems to have beene generally followed" (PRO 30/24/47/2 f.50r). Locke then embarked upon a long exposition of why it was that the way "generally followed" had failed to produce the desired aim of medicine, namely "Length of life with freedome from infirmity & pain" (PRO 30/24/47/2 f.49r). All we have to do to understand the previous shortcomings of medicine was to look carefully at the writings of the previous generations of physicians. Despite the fact that they had little improved medicine,

> they are not to be blamed that they did that w^{ch} is very agreeable to the nature of mans understanding, w^{ch} not contenting its self to observe the operation of nature & the event of things, is very inquisitive after their cause & very restlesse & unquiet till in those things w^{ch} it is conversant about, it has framed to its self some hypothesis & laid a foundation whereon to establish all its reasonings (PRO 30/24/47/2 f.50r).

This point was repeatedly emphasised in the course of the essay: it is one of the facets of human beings that they "would needs penetrate into the hidden causes of things lay downe principles & establish maxims to him self about the operations of nature, & then vainely expect, that Nature or in truth god him self should proceede according to those laws his maximes had prescribed him" (PRO 30/24/47/2 ff.52r&53r). And again, when a physician "could not discover the principles & causes & methods of natures workmanship, he would needs fashion all those out of his owne thought & make a world to him self· framed & governd by his owne intelligence" (PRO 30/24/47/2 f.53r). This sort of enterprise was not going to be the most profitable way to expand a useful knowledge of the world, nor improve the practice of medicine. Locke spent some time pointing out the flaws of such presumptions, by illustrating what these speculations actually amounted to. Such speculative principles

> are much like the curious imagery men sometimes see in the clouds w^{ch} they are pleased to call the heavens, w^{ch} though they are for the most part phantasticall & at best but the accidentall contexture of a mist yet doe really hinder the sight & shorten the prospect (PRO 30/24/47/2 f.51r).

The sum product of this reliance upon our own creation was not likely to profit us any great deal, being merely a product of fancy and imagination. A physician who followed this path "has indeed done some thing to enlarge the art of talkeing & perhaps Laid a foundation for endlesse disputs" (PRO 30/24/47/2 ff.51r&52r).

Not only did Locke accuse these "Learned men" of relying upon "phantasticall" notions, but he also said that they confined themselves solely to these things. In the face

of an anomalous observation, these physicians would not deny the theory, but would rather ignore the fact. This clearly was not the way of progress:

> I think I may confidently affirme, that those hypothesis w^{ch} tied the long & elaborate discourses of the ancientts & suffered not their enquirys to extend them selves any farther then how the phenomena of diseases might be explaind by these doctrines & the rules of practise accomodated to the recieved principles has at last but confined & narrowed mens thoughts, amused their understanding with fine but uselesse speculations, & diverted their enquiries from the true & advantageous knowledg of things (PRO 30/24/47/2 f.51r).

This was trenchant criticism, and if Locke's aim really was to persuade these rival physicians then he might well have adopted a more conciliatory tone. It does not appear that Locke would win over his opponents by flattery, nor were they likely to be inveigled by a barrage of criticism.

Leaving aside the strategic merits of Locke's appeal, we can see that there was a familiar premise underlying this criticism of medical practitioners. The root of the problem that Locke identified was the human reaction to nature, where we were eternally enquiring after the causes of things. This was not detrimental to medicine *a priori*. However, when it was coupled with the assumption that the operations of nature are unknowable to us, we can see how trouble was generated. Physicians were "curious in imagining the secret workemanship of nature & the severall unperceptible tooles wherwith she wrought" (PRO 30/24/47/2 f.50r). This was just the same assertion as was found in the *Methodus* and *Anatomia*. One attempted justification of position was attempted with dubitable success in *Anatomia*. This attempt, however, was not repeated in *De Arte Medica*. Instead, another more general consideration was brought forward, leaving aside the technical limitations of microscopy. Locke considered a physician who wanted to penetrate into nature's workings. This physician's

> narrow weake facultys could reach noe farther then the observation & memory of some few effects produced by visible & externall causes but in away utterly out of reach of his apprehension, it being perhaps noe absurdity to thinke that this great & curious fabrique of the world the workemanship of the almighty cannot be perfectly comprehended by any understandg but his that made it (PRO 30/24/47/2 f.53r).

Here the assertion was the usual one that nature's workings are beyond the faculties that we possess but, instead of pointing out the problems faced by microscopes, Locke pointed to the incomprehsibility of God as the root cause of our inability to understand completely his creation. As an argument this left much to be desired, not least because its premise was the possibility of God's having created a non-

understandable world, where the conclusion stated that we are not actually able to pry into nature's workings. The premise merely mentioned this possibility, and so cannot underwrite the factual nature of the conclusion. If Locke were to assert that God did, in fact, create the world in the requisite way, then things would be more promising. A fact that follows from the essence of the divine must be considered as having some sort of necessity, even if it was not a purely logical one. This, then, would lead to the conclusion that we can never, not even possibly, pry into the workmanship of nature. This alternative argument would be considerably stronger than that actually given here. But its central premise would be highly dubitable. Nevertheless, in the adoption of this position, Locke was moving towards an argument that will give him something like the conclusion that he wanted. God, being omnipotent, seems to have the requisite power to guarantee the restrictions Locke discerned in the situation. Locke had taken something of a step forward in the justification of his thesis.

Having established this first conclusion regarding our inability to know natural causes, and having demonstrated the problems that developed when this was coupled with out natural inclination to search out just such causes, Locke then presented the alternative solution to the problem posed by disease. It was our faithful friend, experience:

> the begining & improvem^{t} of useful arts, & the assistances of human life have all sprung from industry & observation true knowledg grew first in the wor⟨l⟩d, by experience & rationall operations & had this method beene continued & all mens thoughts beene imploid to adde their owne tryalls to the observation of others noe question physick as well as many other arts, had been in a far better condition then now it is (PRO 30/24/47/2 f.52r).

Having laid down these points, Locke then set forth his plan of action as how to remedy these defects brought on by these compound problems. He wanted to identify the present state of medicine, pick out what had contributed to this in the various sub-fields of the discipline and outline "What yet may be further donne towards the more speedy & certain cure of diseases" (PRO 30/24/47/2 f.55r). The paper ended with an unfinished section designed to show the four sorts of diseases extant as categorised by their amenability to treatment. Only the first section on this topic was commenced.

It is apparent that the projected treatise was intended to be much longer than the portion that was actually finished. This may possibly be due to the fact that, once the prefatory remarks were completed, Locke would have had to embark upon a much more detailed account of the practice of medicine. As something of a defector from the

group of "Learned men", it is likely that Locke was much more able to deal with the theoretical topics treated in *Anatomia* and *De Arte Medica*, and was not at all capable of presenting detailed accounts of diseases and treatments, given his limited clinical experience. This could provide an explanation as to why the text stopped where it does in *De Arte Medica*. Locke simply did not have the requisite knowledge to continue a discourse on the practice of medicine. At this point, it would have been much wiser to leave these points to his more experienced colleague, Sydenham.

Medical Observations

We have already seen that on the 2nd of April 1668 Sydenham wrote to Boyle to describe some of his recent activities. As well as pointing out Locke's trips to the bedside, it was also recorded that there were some intended additions to the second edition of the *Methodus* that, due to time considerations, he had not been able to include in the book. These intended additions comprised a great deal of the work done by Sydenham on the smallpox:

> It is a disease, wherein as I have been more exercised this year than ever I thought I could have been, so I discovered more of its days than I ever thought I should have done (BW VI p.649).

Sydenham went on to express the wish to tell Boyle more of these discoveries when they met. By the middle of 1669, Sydenham decided to prepare some new publication on the basis of all this extra clinical experience regarding smallpox and brought in Locke to assist him. That this is the case can be seen by examining a wide variety of manuscripts, from which we can piece together something approaching a whole work. In the Shaftesbury Papers at the Public Record Office there are two pieces from 1669 that relate to smallpox, an Epistolary Dedication (PRO 30/24/47/2 ff.60-63) and a Preface (PRO 30/24/47/2 ff.64-69).[14] Both of these are in Locke's hand and appear to have been hastily composed. Both pieces are in the first person. The first one, the dedication, appears to be directed towards Lord Ashley and mentioned that the author of the dedication had treated members of Ashley's family (PRO 30/24/47/2 f.62r). By 1669 this claim could be made regarding both Locke and Sydenham, as both had a documented contribution to the treatment of Lord Ashley's liver disease in 1668 (PRO 30/24/47/2 ff.1-2 and ff.10-11).[15] It is not therefore possible to say with certainty, when this paper is considered in isolation, who the author was. The case with the Preface, however, is different. Here the author was clearly Sydenham: Locke was merely the amanuensis. The piece began with an attack upon doctors of previous ages who have not discovered the cure of the disease. The author of the piece was not merely content to follow in the footsteps of his predecessors, despite the fact that this would lead to ready fame and fortune:

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[14] These have been transcribed by Dewhurst (*Thomas Sydenham (1624-1689)* (London 1966) pp.101-102 and 102-109). These should be treated with the circumspection due to all of Dewhurst's work.
[15] Locke also made some notes upon the treatment of Lady Dorothy Ashley (BM Add MS 5714 f.17r).

> If therefore I had regarded ease & fame, Sennertus or Riverius or almost any practitioner extant, would in this case have directed me quickly to it I needed not have troubld my head with pensive thoughts & great labour of minde, to seeke out a more effectual method (PRO 30/24/47/2 f.64v).

The author of the piece then continued to lament the trouble that such a new method has unjustly brought upon him, and how the medical establishment had sought to attack and denigrate him:

> what storys of extravagancy & folly have y^{e} talk of prejudiced people brought upon me soe much that it has been told to persons of quality y^{t} I have taken those who have had y^{e} smallpox out of their beds & put them into cold water. How much some of my owne faculty have fomented & increased these reports they themselves know & with what designe I leave it to their owne consciences to tell them (PRO 30/24/47/2 f.65r).

The preface then went on to describe how it was that a cure of smallpox by cooling, or at least, not unnecessarily heating the patient, was developed over time through repeated experimentation and observation. This cooling treatment for the smallpox was in direct contradiction to the established methods and theories of the learned medical faculty. Indeed, it was unsurprising that Sydenham encountered hostility and derision, given the status of those who supported the approach he was attacking. For example, Riverius noted the following in the treatment of the small-pox:

> First that the patients be kept in a warm room, to the end their pores may be kept open, & a breaking out of the small Pox may there be farthered. Therefore they must be kept in a chamber well shut, which cold air must in no wise enter into. For many Children that had benigne Pox, have been killed by letting in the cold ayr upon them viz. The morbifick matter being thereby driven back into the inward parts. And for the same cause they must be moderately covered with Cloathes (TPP p.641).

It was this sort of practice, often taken to extremes by concerned carers, that Sydenham was attacking in his work, and it was the denigration he received for this that he is lamenting in this preface. The preface ended with a further attack upon the "grave old gentlewoman or the experienced nurse" (PRO 30/24/47/2 f.68r) who insisted upon the administration of "strong liquors" (PRO 30/24/47/2 f.68v) to the patient.

This piece could only be the work of Sydenham: Locke had received no such vilification. Locke was acting as Sydenham's amanuensis, and was merely copying down his friend's thoughts. This makes it all the more likely that the Epistolary Dedication was another example of Sydenham's thoughts, but Locke's handwriting. Indeed the general contention that Locke was merely acting as an amanuensis is given

circumstantial support by the fact that we have documentary evidence that this was precisely the role played by Locke in some of Sydenham's other writings.

There are two copies of the text that would go on to make up the body of the projected treatise on small-pox. One is in a collection of essays entitled *Medical Observations* (RCP MS 572 ff.20r-26r),[16] and the other is in one of Locke's own notebooks (BL MS Locke f.21 pp.3-16). The relationship between these two documents is not difficult to establish. The collection of essays, *Medical Observations*, contained a fair version of the text in Sydenham's own hand, and ended with a note to the effect that it was written in July 1669. There are, however, a number of minor corrections in the text. For example, in discussing the history of the disease Sydenham wrote about spots that appeared on the body:

> First little red spotts noe bigger then small pins heads begin to show themselves here & there *first* upon the face most comonly or about the neck or bosome, & afterward upon the wholl body (RCP MS 572 f.20r).

Between the occurrence of the words "there" and "upon" the word "*first*" was inserted in this manuscript. When this passage was written down by Locke (BL MS Locke f.21 p.3), the insertion was incorporated into the main body of the text, showing that Locke's version was copied from Sydenham's original. The same incorporation occurred elsewhere in the respective texts. The text in *Medical Observations* ended with a rather self-pitying passage where Sydenham lamented the fact that he was "enterteyning ... a perfect contempt & undervalluing" (RCP MS 572 f.25v). This was a passage that Locke neglected to copy.

This paper by Sydenham, given the title "Small Pox of the years 1667 & 1668" (RCP MS 572 f.20r), dealt in the main with purely historical notes on the disease and its treatment. There was little attention given to the theoretical matters that Locke had laboured with in his previous two papers. However, it is clear that the overall emphasis was the same: experience was to be the guide in creating rules of practice, so Sydenham gave extremely detailed descriptions of the appropriate clinical matters. However, in one instance where some background assumptions were mentioned, Sydenham gave the following admonition:

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[16] A discussion of the provenance and contents of this important MS, as well as a transcription of the text, is provided by Guy Meynell in *Thomas Sydenham's 'Observationes Medicae' and his 'Medical Observations' With new transcripts of related Locke MSS, in the Bodleian Library* (Folkestone 1991).

> now what this disease is in its essence I know not nor am I able to apprehend by reason of the com⟨m⟩on & naturall defects of humane understanding (RCP MS 572 f.22r cf. BL MS Locke f.21 p.7).

This was just the same sort of point as had been made previously and which Locke had repeated. However, it is not possible to know whether or not this explicit statement was influenced by the writings that Locke had previously attempted. It is in the nature of this close collaboration, and a lack of decisive documentary evidence, that makes it impossible to know just whose ideas or arguments came first. Sydenham clearly had a developed position in 1666, before he had met Locke, and Locke, if we believe him to be responsible for the works *Anatomia* and *De Arte Medica*, was answerable for expanding and elaborating these arguments. It is not possible to determine the extent to which these elaborations were independent of Sydenham's own input. In the light of this sort of problem it is probably best to treat such statements as the product of the collaboration between the two men, as opposed to groundlessly asserting some point to be the work of one or other of them. Here, at least, is an example of Sydenham and Locke sharing the same sort of view and expressing it in the same sort of language.

This joint attribution also seems most fitting for another of the papers at the Public Record Office, the paper endorsed by Locke as the "Small pox Preface 70" (PRO 30/24/47/2 f.57). This 19-line piece in Locke's hand is presumably either an alternative or an addition to that preface already mentioned. It is just a summary of the conflict between these two medical men and the hypothesising of their predecessors:

> tis but ostentation & losse of time to lay downe hypothesis [& enquire] w^{ch} are many times false always uncertain & make a show to enquire into the essences of things & pretend to shew the way & manner of their observation things that we [with little] cannot know being beyond the [reach] *information* of our sences or the reach of our understanding & therefor with very little advantage pretend to them (PRO 30/24/47/2 f.57r).

The only use assigned to the role of hypothesis was of that as the aid to memory:

> Hypothesises serveing after the thing is discovered very well for helps to our memory but very seldom are sound & sure enough without experience to warrant our practice or lead us into the right way of operation (Ibid.).[17]

The points here are largely those made already.

[17] A photographic reproduction and transcription of this document appears in Romanell's *John Locke and Medicine* pp.70-72. The transcription is accurate for the most part, but it must be noted that word 11 on line 18 is "woods", not "words".

If the treatise on smallpox was ever intended to reach the public, the hope was in vain. No such work was published. However, the notes made on smallpox did see the light of day, as they were combined with the section *De Variolis* in the *Methodus* to form a section of Sydenham's magnum opus, *Observationes Medicae* (London 1676).

A possible reason why the treatise on smallpox was never published independently was the fact that Sydenham, at this time, was collecting a large variety of observations in areas wider than just this single topic. These were recorded in the bulk of the *Medical Observations*. It is perhaps at this time that work on the smaller treatise was superseded by a larger project. This larger project also illustrated the fact that Locke acted as Sydenham's amanuensis. As a specimen case we may look at the paper by Sydenham entitled "Epidemicall diseases of the year 1669" (RCP MS 572 ff.17v-19r). This paper was first dictated to Locke who wrote it down in his own notes (BL MS Locke c.29 f.19r-v). To demonstrate the relationship between the two documents it is necessary to show how the changes made in one document were incorporated into the other. Turning first to Locke's own notes we can chose a representative passage and compare Sydenham's own version. Let us then consider the final passage of the text in Locke's notebooks, written in Locke's hand:

> upon the invasion of [Fevers] *winter &* very hard weather ye Cholera morbus gripeing of the guts & dysentery above mentioned totaly ceased & in stead of them the small pox (wch in the [som] sommer of this year as it had donne in the same season of the preceding yeare was almost gon) returnd again and became [more] *more* rife - in wch posture it continues at the writing hereof viz [Jan 166] the beginning of the yeare 1670
> Ex attenta et faelice observatione
> Tho: Sydenham. (BL MS Locke c.29 f.19v).

The revision of this text as written by Sydenham in *Medical Observations* was as follows:

> Upon the invasion of winter & very hard weather the Cholera morbus griping of the gutts & dysentery all ceased & insteed of them the small pox (w^{ch} in the sum⟨m⟩er of this year, as it had don in that of the preceding, was allmost gon) returned agayne & together with the measles became rife and so continue at the writing herof. Feb. 12°. 1669/70 (RCP MS 572 f.19r).

The revised version in Sydenham's hand incorporated all of the changes made to the Lockean version, and added further changes. Locke's version was going to be dated as coming from "Jan 166⟨9/70⟩", and Sydenham's was dated as February of that same year. Locke's version came first, and was a record of Sydenham's dictation. The version in *Medical Observations* also incorporated a number of passages from previous editions of the *Methodus*, which had only been signalled in Locke's original notes. This suggests that

the notes Locke took were for Sydenham's use to enable him to create an expanded version of his previous works. This relationship continued in further essays from *Medical Observations* around this period. For example "Variolae" was first written in rough form by Locke (BL MS Locke c.29 f.22r), and dated "17° Feb 69/70". This was then copied out in fair hand by him in *Medical Observations* (RCP MS 572 f.34v-35r), incorporating all the previous changes made. So too with "Febres Intermittentes" (BL MS Locke c.29 ff.25r-28r cf. RCP MS 572 ff.30r-32v).

In addition to these rough notes, Locke also made fair copies of the essays as they were set down in *Medical Observations*, presumably for his own use. The essays in the notebook (BL MS Locke f.21) incorporated the alterations made in *Medical Observations*. For example, on the front of folio 23 of *Medical Observations*, the insertion "then Physicians" was incorporated into the version in Locke's own notebook (BL MS Locke f.21 p.10). There are several other examples of this.

Locke continued to make his own fair copies of Sydenham's work up until the spring of 1671, copying out "Epidemicall diseases of the year 1670" (RCP MS 572 ff.42v-46v) into his own notebook (BL MS Locke f.21 p.17. 42-5, 50-6, 58, 60 & 151 onwards). The next large addition Sydenham made to his *Medical Observations*, presumably in early 1673, was his "Epidemicall diseases of the year 1671.1672" (RCP MS 572 ff.47r-52r). There is no copy of such a work in Locke's notebooks. Locke had written to his school friend John Mapletoft on the 14th of February 1673 to tell him that

> Dr Sydenham & I mention you sometimes, for we doe not now meet often, my businesse now allowing me but little leisure for visits: but I hope I shall in a short space bring it back to terms (CJL 269).

Locke was very busy at this point. From the summer of 1671 onwards he had been concerned with the revision of his new essay *Intellectus Humanus*. He had also become much more busy in his work for Lord Ashley. By 1673, the collaboration with Sydenham was largely over, but the seeds of thought that were planted in Locke's mind were carefully nurtured in the subsequent years to produce the mighty *Essay Concerning Human Understanding*.

The Natural Philosophy of Draft A

The Text

During 1671 Locke had less time to pursue the medical interests that had taken up so much of his previous years. A major distraction was his new interest in the subject of human understanding. In the "Epistle to the Reader" of the *Essay*, Locke described the genesis of this interest in a characteristically exiguous fashion. A handful of his friends were discussing a subject "very remote" from that of the capacity of the human intellect when "they found themselves quickly at a stand, by the Difficulties that rose on every side" (*Essay* p.7). Locke recounted his solution to this problem:

> it came into my Thoughts, that we took a wrong course; and that, before we set our selves upon Enquiries of that Nature, it was necessary to examine our own Abilities, and see, what Objects our Understandings were, or were not fitted to deal with. This I proposed to the Company, who all readily assented; and thereupon it was agreed, that this should be our first Enquiry. Some hasty and undigested Thoughts, on a Subject I had never before considered, which I set down against our next Meeting, gave the first entrance into this Discourse (Ibid.).

Given the size of the completed *Essay*, it is pleasing to note that Locke thought his own first attempt at the subject would wrap up all his enquiries quite quickly:

> I thought all I should have to say on this Matter, would have been contained in one sheet of Paper; but the farther I went, the larger Prospect I had (*Essay* pp.7-8).

Successive increases in size can be seen in the Drafts, and in the hefty proportions of the *Essay* itself.

There are three extant Drafts of the *Essay*. The first two of these, Drafts A and B, were both dated "1671" by Locke; the third, Draft C, was from 1685, when the *Essay* was nearing its completion. Draft A is arguably the most interesting early version of the *Essay* for Locke scholars, in that it differs widely from the final version of the text in both structure and content. It also exhibits notable similarities to some of the work that Locke had previously undertaken in natural philosophy. However, before we turn to an examination of the Draft's contents, it is in order to make some comments upon its structure and Locke's writing in the piece.

It is highly unlikely that Draft A comprises the very first "hasty and undigested Thoughts" (Ibid.) that Locke mentioned in the "Epistle to the Reader". It is considerably longer than "one sheet of Paper" (Ibid.). Moreover, the Draft is in a commonplace book ("Adversaria 1661" – this notebook is in private hands, but there is a microfilm copy of it in the Bodleian: BL MS Film 77). We can assume that Locke would not have used a

such a notebook to record his very first thoughts on the subject, if these thoughts were going to be presented to his friends. In fact, the Draft itself exhibits, albeit loosely, a structure which indicates a degree of serious thought upon the topic prior to the commencement of writing. Sections 1 and 2 deal with our ideas, their origin and their connecting together into ideas of substances. Sections 3 to 26 deal with "Relations" between ideas in various forms. Sections 27 to 31 summarise what it is we can know with certainty, and also contains something of an attack on scholastic attempts to acquire knowledge of the natural world. Sections 32 to 42 contain a discussion of those beliefs that do not amount to knowledge, which Locke called opinion and probability. Finally, Sections 43 to 45, clearly written after the main body of the text (Draft A, §43, p.74, n.17), respond to objections to the preceding arguments, mostly concerned with the possibility of innate ideas. There are also a number of memoranda at the end of the text. Draft A is not free from defects, but the thoughts are not altogether "hasty and undigested". It is likely that Draft A is something of an elaboration on the very first notes Locke made.

One obvious fault of Draft A was Locke's freewheeling treatment of the issues in the text. He made his points extremely quickly, as if there were little debate about them, and wrote as if the whole matter could be cleared up in very little time. That this was not the case is exhibited in another annoying feature of this early work, namely, Locke's tendency to digress. It seems as if in solving one problem to his own satisfaction, Locke noted another related issue, and then hared off after his new target. This often meant that one Section contains several apparently unrelated topics, as a consequence of different digressions from the original point. There are also a number of revisions in the Draft, which, when coupled with the points made in the memoranda, show that Locke was far from satisfied with these early thoughts. It is perhaps this dissatisfaction that led Locke to leave Draft A unfinished, and commence Draft B instead.

In attempting to give a faithful account of the content of Draft A, some of the above faults hinder an easy understanding of the work. Additionally, most readers will come to this text having been acquainted with the final version of the *Essay*. With a solid grounding in Locke's thought from 1689, it is possible that they will miss some of the more subtle differences between the two positions. With this in mind, I feel that it would be appropriate to start my consideration of Draft A by noting some of the interesting similarities the document has, not with the final version of the *Essay*, but rather with the work on medical methodology that had been completed with Sydenham.

The Influence of Sydenham

Locke worked closely with Sydenham up until the spring of 1671 at least, and possibly later.[1] Some of Draft A was being written around July of the same year (Draft A, §27, p.43), and the meeting Locke referred to in the "Epistle" was prior to this. So, Locke's first Draft of the *Essay* was written at a time of collaboration with this physician. Sydenham held that we have no knowledge of the aetiology of diseases. Consequently, we should not waste time in attempting to discover what these causes are, or argue about this: such disputes are incapable of resolution. The way to proceed is to rely upon experience and the testimony of our senses to determine the various species of disease and their cure. Locke evidently came to agree with all these points, and elaborated upon them in *Anatomia* and *De Arte Medica*. It should occasion little surprise to see that only two years after the completion of the latter work, and whilst still working with Sydenham, Locke continued to adhere to these three tenets.

The first of these three points can clearly be seen in Locke's discussion of cause and effect. In discussing the type of knowledge we have of this relation, Locke was adamant that it was acquired at the everyday, observable level only:

> I can have noe other certein undoubted knowledg of the constant connection of assigned causes & effects then what I have by my senses. which too is but a grosse kinde of knowledg is noe more then this, that when I apply fire to gold it melts it (Draft A, §15, p.30).

The reason why we have such a "grosse kind of knowledg" in these cases is that we have "noe knowledg of the *modus* ***operandi***, the way how these effects are produced" (Draft A, §15, p.31; Locke's italics and emphasis). This is the case because of the limitations of our senses in their ability to give us knowledge of such things:

> because these alterations being made by particles soe small & minute that they come not within the observation of my senses I cannot get knowledg how they operate, but only am informd by my senses that the alterations are indeed made from whence by the by we may take a litle light how much in the information of out understandings we are beholding to our senses (Ibid.).

[1] Locke continued to make his own fair copies of Sydenham's work up until the spring of 1671, copying out "Epidemicall diseases of the year 1670" (RCP MS 572 ff.42v-46v) into his own notebook (BL MS Locke f.21 p.17. 42-4, 50-6, 58, 60 & 151 onwards).

Locke then explained how the world might be, had we more acute senses, so as to know such causal processes. But, this possibility he was very quick to exclude on the ground that

> our senses faileing us in the discovery of those fine & insensible particles our understandings are unavoidably in the darke (Ibid.).

Locke was quite happy to state that there was no possibility of discovering the internal causal processes in bodies, so we are "unavoidably in the darke". Draft A does not contain any argument for this assertion. Perhaps this was simply due to an oversight, or possibly it may be because Locke felt that his position had been suitably justified in *Anatomia* and *De Arte Medica*, the arguments from which could be incorporated at a later date. Nevertheless, it is clear that Locke still agreed with Sydenham that we could not know "the uncertain philosophical cause" (Draft A, §17, p.32) of phenomena.

The medical papers had also contained an attack upon the "learned men" (PRO 30/24/47/2 f.49r) who followed the "narrow & unsound foundations ... of the ancientts" (PRO 30/24/47/2 f.51r). When coming to write upon a more general topic in Draft A, Locke took a broader approach to scholastic methods of learning, and spent a great deal of time denigrating learned disputes. Whereas he had previously attacked only Galenism, here Locke censured the teaching of the whole Aristotelean tradition.

Locke first looked to the main method of scholastic argument: the disputation. He took part in such things at Oxford and wrote papers in this style, for example the *Essays on the Law of Nature* and *Respirationis Usus*. Possibly this was because it was required by the university. In any event, he later entirely repudiated disputations as a method for arriving at truth: a dispute was more "like to arise rather more doubts then any clear determination of the point" (PRO 30/24/47/2 f.33v). Locke, in Draft A, was quite clear about this activity:

> men speakeing the proper language of their country ie according to the grammar or rules of that language doe yet speake gibberish to one another the notions their words which are but signes stand for not being determind amongst them, & soe they often fall into endlesse & often senselesse disputes. which I cannot but say is much improved by the learned arts of disputeing which generally serve more then vulgar conversation to perplex & make undetermind & doubtfull the signification of words, which hath hitherto passed under the laudable name, though it be a very uselesse Skill, of subtilty & accutenesse (Draft A, §4, p.14)

The criticism was the same as had previously been put forward in 1668 and 1669. However, even in those cases where we were clear about the meaning of the words we use, here too disputing was of little use. Sections 27 and 28 of Draft A, which

concentrate upon the use of "self evident principles" which were looked upon "as the ground of all demonstration" (Draft A, §27, p.44), show how little advantage such principles, and the arguments based upon them, bestow. Locke had in mind such principles as "**what is, is**" and "It is impossible for the same thing both to be & not to be". These were the usual tools of a scholastic disputation, and were looked on as "the great standards & measures of truth & falsehood" (Ibid.). Evidently, arguments that employ these principles will merely be barren elucidations of the notions under scrutiny and will not give us any extra information about the things considered. Locke was pleased to point this out:

> haveing fixed certeine significations to these following words anima forma, εντελεχεια, homo, ratio, animal, substantia I can make severall undoubted propositions nay even demonstrations about the soule without haveing the least knowledg what the soule realy is & of this sort a man may finde an infinite number of propositions reasonings & conclusions in books of Metaphysicks, Schoole divinity, & some sort of natural phylosophy & after all know as little of god spirits or bodys as he did before he set out (Draft A, §27, p.52).

But not only did the scholastic method of dispute provide at best an empty manipulation of ideas and at worst an obfuscation of the truth of the matter, it also engendered a very narrow outlook on the world. In discussing what it is appropriate to believe, Locke noted that some people would not believe even what their own senses tell them:

> what way will you take to convince a man of any improbable opinion he holds who with some peripateticks hath laid downe this as a foundation of reasoning that he must believe his reason against his senses (Draft A, §42, p.71).

The mode of enquiry that Locke was criticising is that of reason and dispute and was also closely linked to the commentary given in *De Arte Medica*, where the "Learned"

> sufferd not their enquirys to extend them selves any farther then how the phenomena of diseases might be explained by these doctrines and rules of practice accomodated to the recievd principles (PRO 30/24/47/2 f.51).

Locke was highlighting the reactionary streak in scholastic teaching, which meant that any innovation or change inconsistent with their teaching was ignored or dismissed. The scholastics were determined to hold their ground, as they felt that they had tradition on their side. Locke gave an example:

> it would be a shamefull thing for a grave Doctor & that which his scarlet would blush for, to have his authority of 30 years standing wrought out of hard rock greeke & lattin in frosty nights by farthing candles & confirmd by generall tradition & a reverend beard in an instant overturnd by an unlearned Novice & he made to confesse, that what he

> taught his pupils 30 years agoe was all error & mistake & that he sold them hard words & ignorance at a very deare rate (Draft A, §42, p.72).

If mere argumentation was not enough to decide what is true, we will have to turn to some other method of acquiring knowledge. Locke's prescription in Draft A was, as in his earlier medical writings, to turn to experience:

> the clearest best & most certain knowledg that man kinde can possibly have of things existing without him is but Experience, which is noe thing else but the Experience & observation of his senses about particular objects (Draft A, §33, pp.62-63).

What then is "the Experience & observation of ⟨our⟩ senses about particular objects?" Locke answered this question in the very opening line of Draft A:

> our senses conversant about particular objects ... give us … simple Ideas or Images of things & thus we come to have Ideas of heat & light, hard & soft (Draft A, §1, p.1).

Experience of objects gives us "Ideas", and these "Ideas", Locke also calls "Images". Locke noted that "all knowledg is founded on and ultimately derives its self from sense or something analogous to it" (Ibid.). This something being an "internal sense" of reflection which gives us ideas of the "operations of our owne minds" (Draft A, §2, p.7). Reflection, "though it be not sense, yet it is some thing very like it & may properly be called sensation" (Ibid.). Thus, we can see that both sources of experience produce "Ideas or Images". The only difference between sensation and reflection was the objects they dealt with, the one external, the other internal. This assertion, that the contents of experience comprised "Images", was one that Locke had expressed previously in his *Essays on the Law of Nature*, where he outlined the respective roles of sensation and reason,

> sensation furnishing reason with the ideas of particular sense-objects and supplying the subject-matter of discourse, reason on the other hand guiding the faculty of sense, and arranging together the images of things derived from sense perception[2] (ELN p.147).

Ideas then, are images from internal or external sense.[3] However Locke had only accounted for simple ideas, for example of "heat or light, yellow or blew sweet or bitter

[2] "sensus rerum particularium sensibilium ideas rationi administrat et suggerit discursus materiam, ratio e contra sensum dirigit et ab eo haustas rerum imagines inter se componit" (BL MS Locke f.31 f.48 cf. ELN p.146).

[3] This attribution to Locke of an imagist theory of mind is controversial, and cannot easily be defended in the limited space available. Nonetheless the case for Locke being an imagist is substantial. Further evidence will be adduced in the treatment of Draft B, and a good discussion of Locke's mature imagism is included in Volume I, Chapter 5 of M.R. Ayers' *Locke: Epistemology and Ontology*: "Ideas as Images" pp.44-51.

&c" (Draft A, §1, p.1). But, experience is not made up solely of simple ideas, rather it is comprised of objects, for example, statues, books, clouds and postcards. Since we are concerned here with Locke's natural philosophy we need first to understand what "things" or "objects" were for Locke, and how we could come to have a "scientific" knowledge of them. It should be borne in mind that our conception of "science" is different from that of the seventeenth century. In the Aristotelean system, a "science" was a series of deductions about the properties of an object in the move from genus to species. This was the sense in which Locke was accustomed to using the word: a science required certainty.

To understand how we acquire "scientific" knowledge, we have to see how we move from ideas of colours, smells, tastes, pains, etc. to ideas of things. Locke tried to account for our experience of objects by describing the way we come by the idea of substance:

> The senses by frequent conversation with certain objects finde that a certeine number of those simple Ideas goe constantly togeather which therefor the understanding takes to belong to one thing & therefor words following our apprehensions are called soe united in one subject by one name, which by inadvertency we are apt afterwards to talke of & consider as one simple Idea, which is indeed a complication of many simple Ideas togeather & soe are all Ideas of substances such as man, horse sun water Iron (Draft A, §1, p.1).

Ideas of objects are merely collections of the simple ideas that go around together. This view, however, seems not to capture entirely what it is to be an object, since there seems to be no necessity that the individual ideas that make a thing up are co-instantiated. The ideas that we collect could merely be arbitrarily associated. It seems that to be a "thing", a collection of ideas has to be tied or connected together in some way, in order to explain why it is to be accounted a thing at all. Locke turned to the notion of an underlying support to explain this feature of objects. A man can collect together the ideas from an object

> which because he cannot apprehend how they should subsist alone he supposes they rest & are united in some fit & common subject which being as it were the support of those sensible qualitys he cals substance or mater, though it be certain that he hath noe other idea of that matter but what he hath barely of those sensible qualitys supposd to be inhærent in it (Draft A, §1, pp.1-2).

This supposition of a "we know not what" as the support of our ideas was one that Locke held on to until the publication of the *Essay*. (This passage was the basis for the

introductory paragraph of Chapter XXIII of the *Essay*, "*Of our Complex* Ideas *of Substances*").

It is worth emphasising the strangeness of this "substance or mater", at this point. It should be clear that we have no ordinary *idea* of substance, in the same way as we have an idea of "red", for example. This is so because any idea we could have would not be the ultimate support of others, itself being in need of such support. Substance is defined as that thing which stands underneath ordinary ideas, and so cannot be one of them. It should also be noted that for Locke this "idea" of substance was entirely a product of what we can and cannot conceive. Locke did not say that the idea attempts to pick out anything independent of us, nor did he say that it is caused by anything outside of us. In this way the idea of substance can be seen as internal to the understanding: the understanding needs the idea in order to conceive of objects, rather than arbitrarily associated simple ideas. It is worth noting that during this discussion of our idea of substance, Locke did not make any reference to any particular ontology, or indeed, to the actual constitution of any external object. The description that Locke gave of the idea of substance did not purport to describe the external world in any way, rather it dealt with the supposed connectedness that we attribute to groups of simple ideas that we observe constantly together. It is the understanding that supposes a substance which underpins various simple ideas because Locke thought that we "cannot apprehend how they should subsist alone" (Draft A, §1, p.1). It was this that led him to the supposition of a substance. The idea was a place marker, "with a⟨n⟩ ignorance of what it is" (Draft A, §2, p.7), which enables us to experience objects rather than juxtaposed sensations. It is far from clear that Locke was entitled to this "idea" of substance, as he had so far only explained simple ideas and the fact that we collect them together. Nor is it at all obvious what such a supposition of support amounts to, nor why it is that we can't suppose that ideas "should subsist alone".[4]

Applying similar reasoning to the ideas we have from internal sensation, Locke goes on to point out what he thinks is a corollary of the obscurity involved in the concept of substance. We may,

[4] Here, however, we also face another difficulty, in that, under Locke's description, the idea of substance cemented together the ideas we have in our mind, rather than the causes of these ideas. As will be shown below, Locke had not, as yet, outlined clearly the distinction between an idea and its cause. So, in this, Locke's first account of our idea of substance, we are faced with the peculiar thought that everyday objects are merely collections of ideas, united by the idea of substance in general. Clearly this was far too close to what will later be called idealism, and as we shall subsequently see, the account was modified to rule out this possible construal of Locke's position.

> take notice that the idea of matter is as remote from our understandings & apprehensions as that of spirit & therefor from our not haveing any notion of the essence of the one we can noe more conclude its non existence then we can of the other (Draft A, §1, p.2).

Matter and spirit are equally mysterious and we know the essence of neither. What makes one essentially spiritual and the other material is unclear. How they support the ideas we observe is unclear. In fact, the only thing we do assert regarding them is that they need to be posited in order to account for our experience. This we do on the basis of our not being able to apprehend how it is that simple ideas can "subsist alone".

Science

We might then ask when we have a "scientific" knowledge of such a substance, according to Locke? In Draft A, he first looked at the everyday knowledge that we might have of a substance such as gold:

> He that frames an Idea consisting of such a collection of simple Ideas as are in that & belong not to any other subject hath a distinct knowledg, soe he that unites all these simple Ideas: bright yellow, weighty ... fusibility, ductility, solubility in aq regia hath a distinct knowledg or Idea of gold (Draft A, §7, p.17).

This type of collection, though, was not taken to be the full characterisation of the substance, but merely qualified one to use the term "gold" in the correct way. It was not enough merely to list some of the more common ideas we have of bodies in order to attain a "scientific" knowledge of a substance. Something more was required:

> He that frames an Idea that consists of a collection of all those simple Ideas which are in any thing hath a perfect knowledg of that thing ... ⟨and⟩ ... may speake proper⟨ly⟩ & define perfectly & scientifically (Ibid.).

In Draft A, a perfect knowledge of any substance was the collection of *all* the ideas of the particular substance. This was, of course, no straightforward requirement, there being, in principle, an infinite number of such observable qualities that a material thing might have. Any material thing could be placed in a huge variety of varying circumstances, and the number of interactions with other bodies in these circumstances has no *a priori* limit. This was no doubt why Locke said, at this point in his exposition, that he "must forbeare an instance ⟨of the perfect knowledge of a thing⟩ till ⟨he⟩ can finde one" (Ibid.).

This approach to a "science" of bodies was quite consistent with that put forward by Sydenham in his writings and by Locke in the period of their collaboration. It was, in effect, a "science" of bodies which consisted of natural histories, or lists of the observable features of things. However the knowledge of bodies so far outlined was confined to individual things; this piece of gold, or that eagle, whereas a "science" of bodies was concerned more with sorts, or types of things. This concern was expressed in the scholastic debate about genera and species, and Locke turned to this discussion as the starting point for his own treatment of this issue.

Just as Locke treated particular substances as collections of simple ideas, so ideas of "genera" and "species" could be similarly described:

> the man comeing to observe a certeine number of these simple ideas to be found in several particular subjects ranks them togeather or else findes them ranked togeather by others under one general name, which we cal a species & if more comprehensive a genus or in plaine English a sort or kinde (Draft A, §2, p.8).

It is not at all clear from this definition of "species" what exactly determines what a species is; whether they are real features of the world, or merely products of our own classifications. This uncertainty was illustrated in the second treatment Locke gave the issue. He first wrote that species were collected ideas we "thinke" go together. However, this might not allow for there being genuine species in the world, so he deleted this word and wrote that a "species" was a collection of ideas "we have observd or doe thinke belong to one sort of things" (Draft A, §5, p.15). This allowed for the possibility that "species" really did exist independently, and were not arbitrary features of our classifications. This allowance was not an unreasonable one given Locke's statement that we do not know the internal structure of nature. But, whether there are "species" independent of us or not, we still collected ideas together as classifications of different sorts. As these collections applied to more or less particular things, we could talk of what the scholastics called "genera" and "species".

It was for each person to form their own collection of ideas of things. So, the addition or omission of some simple idea from the complex could be a cause of error:

> because our senses doe not quickly discover to us how many of these simple Ideas or qualitys are constantly united in one subject therefor our Ideas of Substantiall or materiall objects comeing under determinate names and consequently our definitions of such words are often very imperfect & therefor the foundations of great errors & disputes & therfor are best made by those who haveing oftenest & with the greatest care examind all the simple sensible qualitys of any subject, findes such a number of them certainly & constantly united togeather (Draft A, §1, p.2).

The most complete knowledge of an object was to be found in a careful observation of the object in question. Equally clearly there was a possible source of error in so far as different people had different ideas of any one species:

> Now this collection of simple Ideas into one compound specific Idea depending on us, enquiry attention & observation is different in one man from an other, & different in the same man at different times, whilst the word that is used to expresse this collected specific Idea is constantly notwithstanding the same whence follows that confusion & disagreement of men in the use of their words, one makeing that sound stand for other simple Ideas then an other man doth (Draft A, §5, pp.15-16).

In Draft A, then, the sort of error that could arise in our consideration of substances was one where people's ideas of a thing or species differ; disputes arose when people used the same word to stand for different collections of simple ideas.

Thus far, our knowledge of bodies comprised of simple ideas collected together with the supposition that each group of these ideas was held together by some substance. This substance was not a contentful idea itself; rather it was merely what was supposed to explain the fact that the ideas go together. We have also seen that our classifications of "species" of things depended upon noted similarities between individuals. However, the ideas that we have spoken of were concerned only with the directly observable features of the object itself - that it is yellow, or round, for example. This will not suffice for a full account of natural phenomena, as objects do not exist in isolation of one another. Rather, they interact with one another. These capacities of bodies Locke called "powers":

> Amongst the simple Ideas I have spoken of the powers of produceing or receiveing them have been mentioned because there is scarse any one subject in which some one or more of them are not considerd as makeing up the complex specific Idea of that subject, as risible, rational, the power of speakeing in man, fusible flexible ductil &c in gold which active or passive capacitys are by men considering them lookd on as qualitys or Ideas actually existing in those subjects (Draft A, §14, p.29).

A number of points can be made regarding this passage. The first is the fact that the powers here mentioned were not considered to reside in the ideas we have, but were rather to be found in the "subjects". Powers, although manifested by ideas in our experience, and counted as part of what makes up the idea we have of a substance, were not to be identified solely with actual ideas, like blue or sweet. Locke also distinguished between the active and passive powers of bodies. This distinction was one commonly made in scholastic philosophy. Locke was taking over this part of his medieval heritage. This is illustrated by Peter of Spain's *Tractatus*, where he said that

> Action is that in the subject in accordance with which we are said to act. So, for example, a person cutting is said to act in that he cuts. Thus, cutting is an action, and the person who cuts, insofar as he cuts, acts in accordance with cutting. Beating is also an action.
> It is proper to action that it implies a passion (CTMPT I p.98).

This was illuminatively contrasted with Peter's description of passion:

> Passion is an effect and consequence of action – e.g., being heated is an effect and consequence of heating.
> It is proper to passion that it be previously a consequence of action. Furthermore, passion is not in the one acting, but in the one undergoing (Ibid.).

Leaving aside the obvious vapidity of such assertions, we can note that in Draft A, Locke described the powers of bodies as

> either active as an ability or aptnesse to produce certeine sensible qualitys in some other subject or else passive i.e. an aptnesse to receive the alteration of some sensible qualitys from an other subject (Draft A, §2, p.8).

In a later discussion, Locke gave more detail:

> active powers are noe more but this, that this thing knowne to me under the name of. v.g. fire will when applied in certain degrees to Lead produce in it fluidity i.e. a new simple Idea or a quality whereof I have the Idea & applyed to it in farther degrees will produce other qualitys or simple Ideas ... The passive potentialitys are when any subject hath ordinarily one sort of Ideas is capable by the application of something else to it to have these simple Ideas changed into others v.g. wax which is ordinarily hard or consistent is fusible i.e is capable by the application of certain degrees of heat to be made fluid (Draft A, §14, p.29).

In itself this distinction was merely a taxonomy of which thing acted and which was acted upon in any natural interaction. Fire is active in the heating of wax, yet is passive in its extinction by water. There is no hint here of any great philosophical import in this distinction.

Powers, for Locke, were causal relations between things. We become aware of these powers in objects thanks to different ideas brought about in us by these capacities. However, knowledge of the processes working at the unobservable level were impossible to attain, so our notion of cause and effect dealt solely with the observable realm. In Draft A, the knowledge that we had of powers was merely a set of relations between sets of simple ideas. This was stated in the very first Section:

> The next thing comeing into our understandings by the observation of our senses is the connexion of causes & effects in some materiall thing viz heat causeth fluidity in wax consistency in clay &c, which is noe more but this i.e. that thing which in my sense of feeleing produces that Idea which I call heat in that thing which hath a certeine kind of yellow & sweet whereof I have setled Ideas & by the language I am used to, have learnd to call wax doth cause another sensible Idea which I call fluidity (Draft A, §1, p.6).

Locke expanded upon this initial treatment in Section 15. Of cause and effect Locke had "noe certain knowledg farther then ⟨his⟩ senses doe or have informd" him (Draft A, §15, p.30). This meant that we could not extrapolate from one observed case of causation to another. For Locke it was possible to have certain knowledge of such causal generalisations, for example, that all lode-stones will attract nails. However, in

such situations the certainty conferred was purely stipulative and expressed no knowledge of a necessity in nature:

> For if I say I know this universal proposition to be true that all load stones will draw iron it is certainly true when I include this power of drawing iron in the very Idea of the thing I call a load stone or make that quality or power part of the definition of the word load stone (Draft A, §15, p.30).

This truth was merely verbal and did not express any constraint in the actual situation. It is conceivable that I could meet with a body that has all the other qualities of a lode-stone but which failed to attract iron. Using the above criterion the question now becomes whether I should call it a lode-stone or not. Such universal propositions will not help us decide the substantive question of whether or not a body which has all the other qualities of a lode-stone will attract iron too. Locke was adamant that, in these situations, "I have no certain knowledg, & therefor in universal propositions connecting causes & effects I cannot be assured that they are true" (Ibid.). The only way we could have such a comprehensive knowledge of the causes and effects would be if we were to "know the whole extent & efficacy of all possible agents to produce that effect" (Ibid.). However, in line with his general scepticism on this point, "such a comprehensive knowledg of causes & effects as I have last mentioned is I thinke out of the reach of humane understanding" (Ibid.). As everywhere else in Draft A, Locke confined the certainty of our knowledge to the information had by our senses. So, any substantive assertion about the causal efficacy of bodies which was not merely verbal, could not be counted as something we truly know; such a claim would go beyond what we have experienced. Nonetheless, Locke was happy to assert that beliefs about causes and effects enjoyed the "highest degree of probability" (Draft A, §34, p.63). Such propositions were low-level empirical generalisations:

> such are all the setled constitutions & propertys of natural things & the regular proceedings of causes & effects in the ordinary course of nature. v.g That the sun is sometimes to be seen in Spain. That fire turnd wood into ashes. That a bullet of lead sunke in water. &c. (Ibid.).

Such was the status of causation in Draft A: all we were sure of regarding causes were well-confirmed regularities at the observable level. Thus, in Draft A, a science of bodies consisted solely in a knowledge of the observable features that a body exhibited to us, either by itself, or in interaction with other things. The "science" will not take account of processes at the unobservable level, as these are beyond our reach and so form no part of our knowledge of bodies.

Qualities

There was another point made in the passage quoted from Section 14 that we have yet to examine. In talking about the powers of bodies, Locke said that they were "lookd on as qualitys or Ideas actualy existing in those subjects" (Draft A, §14 p.29). Anyone thoroughly acquainted with the final version of the *Essay* will here note a difference between Draft A and the finished work. In the *Essay* the distinction between ideas and qualities was clearly stated under the heading "Ideas *in the Mind, Qualities in Bodies*" (II.vii.7-8). In Draft A, Locke often wrote as if both the idea and the quality could exist in the body. It is not clear what this can mean, given Locke's statement in Section 1 of Draft A, that "Ideas" were sensations or images of things. Even in Section 1 itself, there was a running together of "Ideas" and "qualitys". Talking of the most basic ideas we have, Locke said:

> therefor I thinke, that those things which we call sensible qualitys are the simplest Ideas we have & the first objects of or understandings (Ibid.).

At this early stage of the writing of Draft A, there was no clear-cut distinction between "qualitys" and "Ideas". The word "quality" did not stand solely for the cause of a perception.[5]

This may, at first sight, appear puzzling to a reader acquainted with the final version of the *Essay*, but taking an historical perspective such puzzlement can be dispelled. The term "quality" was a technical one that had its origins in Aristotelean philosophy. Like "substance", it was one of Aristotle's categories, themselves a classification of the types of questions that you can ask of a thing. The "quality" of something is its "What's it like-ness". For example I could ask of a horse what it was like, and receive the answer, "black".[6]

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[5] This ambiguity may plausibly explain Locke's reference to our idea of substance as being that thing which we suppose unites ideas. If he meant to apply the term "idea" indifferently to our sensations and the causes of them, it is plausible to suppose that when talking of our idea of substance he was referring to our supposition of a connection between the causes of the collections of ideas that we account as things. It was Locke's lack of clarity about ideas and their causes that led to the problems we encountered in his first account of substance.

[6] Aristotle's description and of the categories occurs in chapter four of the *Categories*. These were discussed and commented upon by various authors, one of the most influential being Porphyry's own introduction to the *Categories*, *Isagoge*. This formed the basis for most medieval interpretations of Aristotle's thought. Peter of Spain's treatment of these issues is as succinct and lucid as can be hoped for (CTMPT I pp.88-101). Here a quality is described as "that on the basis of which we are said to be qualified. For example, we are said to be white on the basis of whiteness, coloured on the basis of colour, and just on the basis of

This categorial classification was also used as a part of the account given of perception in the scholastic theory. In this theory the form of the body in question is materially transmitted via a "phantasm" or "visible species" to inform the imagination, a material faculty of the brain. The form of the thing was then stripped of its matter to become a "notion" or "intelligible species" in the intellect. It is the same form in the thing as finally ends up being contemplated in the intellect.[7] When it came to things like "blackness", these were accounted "real qualities", or "accidental forms". So, in this case, the accidental form of "blackness" was the same in both the thing and the intellect. So to ask what something was like on the scholastic view was to pose a question indifferently to the thing itself, or our perception of it.

However, in the revival of mechanism begun by Descartes, Gassendi and Boyle, the possibility arose that what the thing was like in itself differed from how it appeared to us. This was because the world was composed solely of matter which, in itself, had no colour, smell or taste, etc. Thus, when posing the Aristotelean question "What is it like?", in a mechanistic context, we are faced with an ambiguity of meaning: does the question refer to the thing, or our perception of it?

It seems that in most of Draft A, Locke had not properly dealt with this issue, as qualities and ideas floated uneasily between our minds and the things themselves. Locke clearly felt, however, that this wavering was not satisfactory. Despite the fact that he disavowed any knowledge of unobservable natural causation, Locke knew that either one of the corpuscular and Aristotelean accounts might be true. The possibility was open, then, that the world was not exactly as he perceived it. He would have to decide whether the question, "What is it like?" referred to things or our ideas of them.

Boyle, in his *Origine of Formes and Qualities*, had pointed out the difference between the mechanical world and the perceptions that we have of it. In this way, he opened up the possibility discussed above. He did not, however, clearly elucidate what the word "quality" referred to; the thing itself, or our idea of it. For example, he spent a great deal of time trying to explain that not "*every thing men are wont to call a Quality* must needs be a Real and Physical Entity" (OFQ p.33), suggesting that some qualities were merely

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justice" (CTMPT I p.96). It is in writing such as this that we can see why the word "scholastic" became a pejorative term.

[7] For a useful discussion of early scholastic theories of perception and cognition see "Sense, Intellect and Cognition in Albert, Thomas and Siger" (CHLMP pp.602-622). Although these figures pre-date Locke by a number of years, they set the tone of this debate in the philosophy of mind, and had a great influence upon the writers that Locke studied. For the Cartesian distinction between the intellect and the imagination see the passage in *Mediation* II regarding the wax (CSM II pp.20-1) and that in *Meditations* VI

perceptions. His statement, however, came in a book prefaced by comments about bodies such as

> we scarce know anything else in bodies, upon whose account they can worke upon our Senses, save their Qualities ... And ... tis by their Qualities, that Bodies act Immediately upon our Senses. (OFQ The Præface).

This would seem to imply that the qualities were in the things themselves. In point of fact, Boyle was so unsure of what "quality" meant, that as far as he was concerned, the efforts to define the word left him "still to seek for a right and intelligible Definition of Quality in general" (OFQ p.36). Boyle sought to circumvent this difficulty by using the term in what was taken to be its correct context, rather than having to define it:

> I have chosen to Declare what I mean by Qualities, rather by Examples than Definitions (OFQ p.33).

Later in the same work Boyle drew his own distinction between the "Primary Accidents of the Sensible Object" (OFQ p.41), which are "the Size, Shape, and Motion or Rest, of its component Particles, together with that Texture of the whole, which results from their being so contriv'd as they are" (Ibid.), and what Boyle called the "Sensible Qualities" (OFQ p.40), such as light, colour, sound and odour. These latter, Boyle later called "Secondary Qualities" which were to be contrasted with the "simpler and more Primitive Affections of Matter" (OFQ p.43). It might seem that despite his previous remarks, the word "qualities" applied solely to our perceptions of things as "there is in the Body to which these Sensible Qualities are attributed, nothing … Real and Physical" (OFQ p.41), except the motion and rest of the bodies constituent particles. This was despite the fact that "we have been from our infancy apt to imagine, that these Sensible Qualities are Real Beings, in the Objects they denominate" (OFQ p.40). There are these sensible qualities, for example sensations of sounds and smells, but they are not in the objects.

This conclusion regarding Boyle's use of the word "quality" is tempting, but it is also false, for in the very same paragraph, Boyle talked of the mechanical affectations of a body and called these "qualities" too:

> the Pin in it self is onely slender, stiff, and sharp, and by those qualities happens to make a Solution of Continuity in my Organ of Touching (OFQ pp.41-42).

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on the chiliagon (CSM II pp.50-1). Note also that Descartes used the word "idea" to stand for the objects of apprehension in both faculties. This is illustrated in his reply to Hobbes (CSM II pp.121-137).

We can see that Boyle was careless in his use of the word "quality"; he applied it to a perception in some places, and to the causes of perceptions in others.

Seen in this light, Locke's usage seems much less surprising. But despite this, in some parts of Draft A, Locke did distinguish between our perceptions or sensations, clearly labelling them "Ideas", and the causes of these perceptions, "qualitys". But it is notable that these distinctions are insertions into the text, and corrections of what Locke clearly felt to be mistakes. For example, prior to correction, Section 5 of Draft A read:

> the objects of our senses & operations of our mindes imprint upon our understandings the particular simple Ideas of them selves which it is not in our power to alter but those simple Ideas in the objects we have beene conversant about, are constant evident & destinct (Draft A, §5, p.15).

Ideas are in the objects. However, Locke disliked this description and so deleted the phrase "in the objects" and amended it to read "those simple Ideas produced in us by sensible qualities". Another example of Locke finding his previous wording careless appears in Section 10. Locke was examining the claims we could make about our ideas and their causes in the outside world. Initially it read:

> The first & most natural predication or affirmation is of the existence not of the Idea but something without my minde answering that Idea, as haveing in my minde the Idea of white the question is whether any such quality doth really exist i.e hath a being without me? (Draft A, §10, p.20).

Here it was asked whether there is "any such quality" as "the Idea of white" which exists in the thing causing the idea. There does not appear to be a clear distinction between the causes and the effects: the "quality" appears to be an idea of whiteness in the thing itself. Locke found this unsatisfying and added, after the word "quality", an explication of what he meant by the term; "i.e. that whose appearance before my eys always causes that Idea" (Ibid.). This clarified the difference between the quality of the thing in itself and our idea of it. These corrections appear to have been made as Locke was checking over his work, since they are not made in the regular lineation of the text, but were rather added in between the lines, or in the margin. This suggests that the main work was done at one time, filling up the lines, and the corrections were made afterwards, as there was no room for them left in the ordinary lineation. This is supported by the fact that Locke added a number of memoranda at the end of Draft A. These were obviously made after a re-reading of the whole of the Draft, and were intended to be reminders of points to be recalled in further writings on the subject (Draft A, p.74, n.17). Checking his work,

Locke noticed at least some of his slips and also noted at the end of the work that a clear distinction needed to be made in the future.

> Memorandum ... When I speak of simple Ideas as existing in things I would be understood to mean. such a constitution of that thing which produces the Idea in our mindes. soe that when that Idea it is spoken of as being in our understanding is the very perception or thought we have there, when it is spoken of as existing without is the cause of that perception. & is supposed to be resembled by it. & this also I call quality. whereby I meane anything existing without us which affecting any of our senses produces any simple Idea in us (Draft A, §45, pp.82-83).

We can see that it was during the very composition of Draft A that Locke drew the distinction between ideas and qualities. He refined the Aristotelean terminology by making the word "quality" apply exclusively to the things themselves, so the categorial question "What is it like?" applied only to the object and not the idea it produces in us. Locke had made an important move towards the final position in the *Essay*, a move, moreover, that superseded Boyle's work on the subject.

In this later addition to the Draft, Locke also re-worked his thinking on the status of powers. These Locke took to be "actualy existing in those subjects" (Draft A, §14, p.29). This meant that powers too would have to be accounted as qualities:

> because the powers or capacitys of things which too are all conversant about simple Ideas, are considerd in the nature of the thing & make up a part of that complex Idea we have of them therefor I call those also qualitys (Draft A, §45, p.83).

Locke then went on to distinguish between that actual and potential qualities of bodies:

> the actuall qualitys in salt are those which any way affect our senses being duely applied to them & soe cause simple Ideas in us as its tast colour smell & tangible qualitys. The potential qualitys in it are all the alteration it can of its actual qualitys receive from any thing else, or all the alteration it can make in other things v:g solution in water, fusion in a strong fire corrosion of Iron &c. (Ibid.).

This taxonomy consisted of a distinction between those qualities that were actually present in a body as presented to us in ordinary life, and those not presently manifest. This does not seem to be an alternative taxonomy to that of the active and passive powers, but rather a distinction of a level above it. The actual qualities were those that immediately affected our senses, whereas the potential qualities were those that arose through interaction with other bodies. Since potential qualities did not act directly on a person's sense organs, and this type of interaction was dealt with by the active and passive quality distinction, the active and passive powers were merely sub-divisions of potential qualities. These distinctions do not appear to have had any great philosophical

import. We can once more note that Locke was re-using a scholastic distinction, that between the actual and the potential, as a part of his natural philosophy.

Relations with Descartes

Locke had given his account of natural philosophy in Draft A. He had shown how we come to know objects in the world, and what our idea of substance was (although an early ambiguity about ideas and qualities muddied the waters somewhat). He had shown what our ideas of species are. He had outlined his account of causation and drawn a contrast between the ideas we have of things, and the causes of those ideas. He had also stated what a "science" of bodies would consist in, that is to say, a natural history. All of this being consistent with the three main natural philosophical themes he inherited from Sydenham. We are now in a position to draw some interesting corollaries from these points.

The first of these concerned a consequence that flowed from Locke's characterisation of our idea of substance. As material substance was just the "substratum to those simple Ideas that we receive from without" (Draft A, §2, p.7), and was not something we have a positive idea of, Locke thought that we could not possibly have "any notion of the essence" of substance (Draft A, §1, p.2). This led Locke into a direct conflict with Descartes, who asserted that extension was the essence or nature of body. Locke took all the ideas we have of material things to be on a par; no one idea took precedence over others, so none would characterise the essence of matter. Indeed, given Locke's definition of substance as the support of the ideas that we have, it would be impossible to have any content in the idea of substance in general, and therefore, impossible to have any idea of the essence of substance.

Since Locke did not agree with Descartes about the essence of material substance, he did not follow Descartes in the argument about the possibility of a vacuum. Locke's approach to this question in Draft A was a careful one. We have already seen that Locke rejected a knowledge of the essence of material substance, and so denied the major premise upon which Descartes' argument was based. Locke was prepared to concede, nonetheless, that he did have an idea of extension, and even that he could characterise an idea of body solely in these terms:

> he that with Cartes shall frame in his minde an Idea of what he cals Body to be Extension & cals that Idea of Extension constantly body may easily demonstrate that there is noe **vacuum i.e space** without body by this universal affirmative proposition what is is. for his Idea of Body being Extension & his idea of Space also being Extension, his knowledg that space cannot be without body is certain, i.e he knows his owne Idea of Extension clearly & distinctly & knows that it is what it is and not another Idea though it be cald by those 3 names Extension Body Space which three words

> standing for one & the same Idea may noe doubt with the same evidence & demonstration be demonstrated one of an other as each is of its self & it is as certain, that whilst I use them all to stand for one & the same Idea this prædication is as true & identical in its signification that space is body as this prædication is true & Identical that Body is body both in signification & Sound. (Draft A, §27, pp.45-46).

It might seem that Locke conceded Descartes' point, and agreed that it was impossible that there should be a vacuum. This, however, would be to take the quotation out of context, as the example used was one where we do not "demonstrate the reality of the thing but the connection or dependence of our Notions or Ideas about it with them selves or other Ideas" (Draft A, §27, p.45). Locke was merely saying that if we identify some ideas in a certain way then various conclusions follow. We need not identify ideas in this way, though, as none of our ideas is essential to our notion of body. What we choose as our idea of body is entirely up to us, so that

> if an other shall come & make to himself an other different Idea from Cartes of the thing which yet with Cartes he calls by the same name Body. & make his Idea which he expresses by the word Body to consist of Extension & impenitrability or resistibility togeather he will as easily demonstrate that there may be a Vacuum or Space without a body as Cartes demonstrated the contrary (Draft A, §27, p.46).

If we choose to annex different ideas to the same words, then we can as easily demonstrate that there is a vacuum, as demonstrate that there is not. In this latter case, "Body" is not only something that is extended in space, but is something that can exclude anything else from the space that it occupies, by its "impenetrability". Anything that lacks this quality cannot count as a body, so something that has length, breadth and depth, but has no power of exclusion from these spatial limits, is not body, and is just extended space. And this space which has no body in it is a vacuum.

It seems that Locke took either account of the nature of body to be at least plausible, but held that neither "can prove that Body doth exist or what it is as it exists" (Ibid.). These sorts of demonstrations were of little use for Locke in getting to the facts of the matter, as such demonstrations related not to the things themselves, but only to certain of our ideas. This is perhaps why Locke abstained from saying that the Cartesian definition was false, and its atomistic counterpart, true. Such an assertion, prior to an examination of the relation of our ideas to things themselves, would be highly premature. This is why Locke commented that "we are left only to our senses to discover to us as far as they can" (Ibid.). Locke disagreed with Descartes about the essence of substance but had not, as yet, any reason to rule out one consequence of Descartes' theory, namely that there is no vacuum.

But this was a rather limited conclusion regarding one variation of one of the three main accounts of the nature of the world that Locke was acquainted with. The question remains: "What was Locke's ontology in Draft A?"

Rival Theories

In Draft A, Locke was prepared to make use of several scholastic doctrines, which in the *Essay* were strongly attacked. The evidence for this claim comes not from any specific endorsement of hylemorphic theory, but rather from a use of scholastic terms of art and a positing of scholastic explanations. In Section 25 Locke talked of how we might correct an improper framing of an idea of a type of thing:

> For those substantial beings or species I here mention being things that doe realy exist & come within the examination of our senses we may by imploying them about those objects know whether our Ideas are conformable to them or noe (Draft A, §25, pp.39-40).

Locke's phrasing here suggests that he really believed "species" to exist: there really were substantial species of things in the world for us to examine.

Locke also seemed prepared to use scholastic modes of explanation. In Section 17, he examined the relative natures of some of our ideas, one of which was a consideration of what might be the cause of some sensation in us:

> the greatest part of man kinde who never perplex their thoughts to examin wherein the nature of that thing which when they looke on they call white & feele the same sensation themselves, as a philosopher doth, have perfectly the same Ideas of white that any philosopher hath who thinkes he hath found out the very essence nature or formality thereof or the way whereby it produces such a sensation in him (Draft A, §17, pp.32-33).

Locke had a scholastic explanation in mind, the "formailty" of a thing, when accounting for the nature of bodies. However, the passage referred to the views of a "philosopher". Locke may just have been reporting the commonly accepted scholastic view at this point, and not giving his own explanation. But more substantial evidence of Aristotelean doctrine in the early stages of Locke's philosophical career is found in his discussion of our ideas of substances, where

> we are apt to collect a certain number of those simple Ideas put togeather after a certain manner, & give that precise Idea soe collected a name which we will have belong to a whole species & which name doth of right belong to that Idea in our mindes, which Idea is thought to conteine the essence or formality of something existing without us (Draft A, §27, p.49).

Here, Locke's use the word "formality" was much more his own. He did use this type of description in the Draft.

Scholastic terms can also be found in the Sections of Draft A dealing with the assent we should give to propositions that are concerned with unobservables. Whilst some propositions could in principle be tested against experience, there were others "which being concerning matters out of the reach of our senses are capable neither of Observation nor consequently of Testimony" (Draft A, §38, p.65). The opinions in these cases were of two sorts: Firstly concerning the spiritual world and secondly, "Concerning the existence, modifications & manner of operation of insensible materiall things" (Ibid.). One of the prime examples of this second sort of proposition was concerned with "The forme soule or Effluviums of a load stone whereby it draws iron" (Draft A, §38, p.66). Here again Locke used the scholastic notion of a "form" as a putative explanation of the causal powers in material things. It seems that talk of forms was quite acceptable to Locke at this point in his career, and so we could see his postulating the existence of substantial species mentioned previously as relatively unobjectionable.[1] Immediately before the example of the lode-stone, Locke also mentioned "Natural spirits in animals". This again appears to be a reference to a scholastic hypothesis: natural spirits were the Galenic explanation of how it was that creatures were nourished and grew.[2] We may fruitfully compare this passage to the corresponding passage in the *Essay*. Here the second set of propositions beyond the realm of the senses was described as follows:

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[1] Locke's ambiguous attitude to "species" in Draft A can be attributed to a number of conflicting factors. Locke had an avowed scepticism about our ability to know the underlying structure of nature. This extended to all the possible ontologies that Locke had encountered, Aristoteleanism included. This would seem to provide a reason for Locke to have allowed at least the possibility of genuine existing species in the world. Moreover, "species" of disease were an essential part of Sydenham's medical methodology, although Sydenham was never quite clear what ontological status a "species" had. Locke had deferred to Sydenham on almost all methodological matters. This would provide another strong reason why Locke would have admitted the existence of genuine "species". Yet, on the other hand, Locke was a strict nominalist in Draft A, and is quite sure that we have "noe notion of generall things" (Draft A, ə2, p.9). This would seem to rule out the possibility of "species" as traditionally conceived. In Draft A Locke was not entirely clear as to what he took "species" to be. At one point he was prepared to talk as if these things existed and were within the reach of our senses (Draft A, ə25, pp.39-40), but at other times he said that species were just "generall words" (Draft A, ə2, p.9). It is this conflicting and shifting pattern of interests that influences Locke's discussion of this issue in Draft A. Nonetheless, given the number of times that Locke made comments which did seem to posit the existence of species, and the fact that he clearly did refer to "formes" of things, it seems that we should suppose that the real existence of "species" were genuine possibilities for Locke in Draft A. We shall see that one of the numerous improvements made in Draft B was the clearing up of this untidy conceptual muddle.

[2] See, for example, Daniel Sennert's *Institutionum Medicinæ*, B.I Ch.IX "*Of the Natural Faculty; and first of Nutrition and Augmentation*".

> Concerning the manner of Operation in most parts of the Works of Nature: wherein though we see the sensible effects, yet their causes are unknown, and we perceive not the ways and manner how they are produced. We see Animals are generated, nourished and move; the Load-stone draws Iron; and the parts of a Candle successively melting, turn into flame, and give us both light and heat (IV.xvi.12).

In this later passage, the forms or souls of Draft A were carefully removed, and the Galenic explanation of nourishment and growth was replaced by the mere facts of these phenomena. So on these points at least, there was a clear change in Locke's position. It may just be that he was more careful in the language he employed when he wrote the *Essay*, but the textual evidence suggests that the Locke of Draft A used theoretical terminology that the Locke of the *Essay* later wholly dismissed. It would be injudicious, though, to infer that Locke took Aristotelean philosophy as the main source of his account of the material world.

In addition to the evocation of the scholastic past, Locke also used the language and theory of his contemporary corpuscularians. He was not averse to giving explanations of the causes of our ideas in terms of an interaction of corpuscles with our sense organs, stating that "white or sweet & many other sensations in us be perhaps causd in us constantly by particles of certeine figures" (Draft A, §17, p.32). In point of fact, this particular allusion to the corpuscular theory was the only one in Draft A which could be construed as a reference to the primary and secondary quality distinction, where ideas are produced by mechanical causes. However, the reference was a brief one, and did not carry with it any remarks concerning a resemblance theory. Locke also said that "perhaps" ideas are caused in this way, not that they were so caused. Moreover, Locke used corpuscular theory when illustrating our lack of knowledge of causes:

> For had we but senses that could discover to us the particles of water their figure site motion &c when it is fluid. And also the different postures of those very particles, or the addition or separation of some particles &c when water is frozen i.e. hardened, we should as well know the very modus or way whereby cold produces hardness & consistency in water, as we doe the way how a joyner puts several peices of wood togeather to make a box or table which by tenants nails & pins we well enough perceive how it hangs togeather. And the motions of an animal would be as intelligible to us as those of a watch (Draft A, §15, p.31).

Locke then stated that we have no such knowledge. He also mentioned elsewhere how it was that bodies came to be generated anew. He described creation in corpuscularian terms, as "when the thing wholy made de novo i.e noe part there of did ever exist as before as when a new particle of matter, doth begin to exist" (Draft A, §16, p.31). In Draft A, there was no clear reference to the Helmont's theories. It is possible that since

Helmont's work mostly concerned medicine, Locke did not feel that the theory was applicable to a wider domain. Alternatively, it is possible that Sydenham discredited the theory so much in Locke's eyes that he did not feel that it was worth the refutation. Whatever the reason, it was not explicitly mentioned, whereas hylemorphism and corpuscularianism were.

What are we to make of this use of alternative theories? In just two Sections of Draft A, Sections 16 and 17, Locke alluded to two competing world-views. To understand this, it is once more necessary to turn to Locke's work with Sydenham. In *De Arte Medica* and *Anatomia*, arguments were advanced to the effect that we could never have knowledge of the "undiscoverable organs & tooles" of the body (PRO 30/24/47/2 f.32r). In order to put forward this argument, Locke often used terms of art from the three main theories to show just what it was that he was talking about, i.e. the nature of causes, and that he did not sign up to any of these possible explanations. *Anatomia*, for example, had many references to the theoretical debates of that time. Locke's attitude to physiological inquiries into the lungs, changed dramatically after meeting Sydenham. In *Anatomia*, Locke asked

> whether respiration serve to coole the bloud, or give vent to its vapours or adde a ferment to it, or to pound and mix its minute particles (PRO 30/24/47/2 f.33v).

Here explanations from three rival accounts were mentioned, though all are subsumed under Locke's general scepticism about our ability to pry into natural causes. As in the rest of *Anatomia*, he alternated between different accounts as his scepticism precluded him from adhering to any one explanation in particular. He switched between talking about an "organicall texture or ... ⟨a⟩ kinde of ferment" (PRO 30/24/47/2 f.31r) and talk of the "humours" in the body (PRO 30/24/47/2 ff.34v and 36r). He supposed what the world might be like if it were as described by the corpuscular theory and

> any one should have so sharp a knife & sight as to discover the secret & effective composure of any part, could he make an occular demonstration that the pores of the parenchyma of the liver or kidneys were either round or square & that the parts of urin & gall separatd in these parts were in size & figure answerable to these pores (PRO 30/24/47/2 f.31v).

This came in the same piece where Locke referred to the "manner of production, formalities, & ways of ceasing" of diseases (PRO 30/24/47/2 f.37r), and the "ferments

streiynings ⟨and⟩ mixtures" (PRO 30/24/47/2 f.34r) that bodily fluids receive.[3] In these two documents, Locke was happy to adopt theoretical terms from hypotheses he was agnostic about.

The conclusion that can be drawn regarding Draft A is obvious. Just as in the earlier works, Locke was clear that we had no knowledge of nature's agency. But he continued to use the explanations and terms of art of the various rival theories just because there was no way of conclusively deciding between them. In this regard, there is no difference between Draft A and the medical writings, *De Arte Medica* and *Anatomia*. At the time of writing of Draft A, Locke had been recently working with Sydenham, and Draft A exemplified the same themes as the previous collaborative work. Draft A also mentioned the differing explanations without signing up to any one in particular. It seems probable, therefore, that the examples given in Draft A were merely that and do not signify any underlying adherence to particular theory. In this way Draft A is yet another illustration of the inspiration that Sydenham gave Locke in the realm of natural philosophy.

This sentiment will, in fact, suffice as a conclusion to this discussion of the natural philosophy of Draft A. In a sense, a lot of the work done by Locke in this document was merely an epistemological codification of the work that Sydenham undertook in the field of medical methodology. Locke's analysis of the idea we have of substance underpinned the account he gave of causation, which in turn led to his previously held agnosticism about the make up of the unobservable world. This produced the repudiation of all other attempts to understand nature except in terms of natural histories. Other strands of natural philosophical thought were developed in Draft A, for example, in Locke's distinction between the things in themselves and the ideas that we have of them. Locke then went on to make his own distinctions between the various types of qualities there are, not in terms of whether the ideas resemble their

[3] There was only one place in *Anatomia* where Locke appears to have held back slightly in his descriptions of the aetiology of disease, as he deleted the word "formall" when referring to the "essential causes of diseases" (PRO 30/24/47/2 f.37r). The same sort of thing occurred in *De Arte Medica* where, in talking of "the causes of distempers" (PRO 30/24/47/2 f.50r), Locke felt the need to be more specific, and inserted the phrase "*hidden & forma*" between the words "the" and "causes". Locke changed his mind about this latter word as he wrote it, perhaps thinking that it was too strongly attached to a particular ontology: the other uses were always contrasted against each other, but in this passage there was no alternative. So, with the preceding ampersand, it was deleted to leave the phrase "the *hidden* causes". These two examples were the only places that Locke appears to have rejected an explanation from one of the three theories in either of these important texts. It is not clear why this is so. Perhaps it was because in both the cases mentioned Locke was talking of what we actually know of things in themselves, which clearly he thought to be very little. Using these words in this context could have given an ambiguous impression that he did not want to put forward. The general point stands, nonetheless.

causes or not, but rather in terms of what the active agent was in any natural interaction. Locke also criticised Descartes in a rather oblique manner, but did not dismiss him outright, leaving the issue to be decided by the ultimate arbiter in these matters, experience.

One notable difference in Draft A, as compared to the *Essay*, is the fact that Draft A was far from being the work of a committed corpuscularian. There are no positive comments in support of the theory, nor is there an advocacy of the distinction between primary and secondary qualities. Such a possibility is mentioned, but in line with the agnosticism discussed above, it is only "perhaps" the case. We can see that Boyle is no more a significant influence upon the work and thought of Draft A of the *Essay* than he had been previously. There is no evidence in Draft A that Locke regarded Boyle's corpuscular theories more favourably than any of its rivals. It was the strong influence of Sydenham that pervaded the thought in Draft A and that provided the inspiration for Locke's particular brand of natural philosophy.

The Natural Philosophy of Draft B

The Text

The inclusion of a number of memoranda at the end of Draft A indicated Locke's intention to continue work on the topic of human understanding. Draft B shows that this plan was vigorously acted upon. Unlike Draft A, Draft B was not a part of a notebook, but was a separate document. This might imply a desire on Locke's part to create an essay fit for publication. It was constructed from octavo sheets which were subsequently bound together. It was dated "1671", showing that Locke was quick to follow up his new interest in the subject. However, despite the fact that the document was written soon after the completion of Draft A, there were significant divergences in the content of the two works.

Draft A expounded view of natural philosophy based on Sydenham's methodological precepts, and the positions taken, though more general, were the same as those presented in *De Arte Medica* and *Anatomia*. These themes, in turn, were traceable back to the first edition of the *Methodus Curandi Febres*. Draft B, whilst retaining these positions, expanded upon and drew further consequence from them. Locke was starting to produce his own variations upon Sydenham's themes. However, before we turn to a consideration of these new arguments, it is as well to make some general remarks on the differences of structure and content between Drafts A and B.

Draft B was considerably longer than Draft A. Virtually every topic that was dealt with in both Drafts, was considerably expanded upon in the later version. Draft B also exhibited a more systematic treatment of the issues than Draft A, and was more structured. The former Draft dealt with issues roughly thus: Ideas and Substances, Relations, Knowledge, and Faith and Opinion. Sections 43 to 45 dealt with objections to the preceding and were mostly concerned with the possibility of innate ideas.

Draft B tackled things differently. In Draft A the objections from innatism had been dealt with by showing how the proposed candidates for innateness could be explained on an empiricist account. In Draft B this piecemeal approach was rejected, and the work opened with a new strategic ploy. Rather than wait for the objections, Locke made a pre-emptive strike. Sections 1 to 16 of Draft B dealt with the "generall received opinion that there are in the mindes of men some innate principles some primæ notiones" (Draft B, §4, p.103). Locke felt that he "cannot forbeare to give you the reasons I have to doubt of this opinion" (Draft B §4 pp.103-104). Supplying the general

reasons why innate ideas and principles were impossible, was to clear the field for Locke's own views. This attack on innatism was also the basis for Book I of the *Essay*.

Another notable alteration in Draft B was the splitting up of the content of the Draft into different parts dealing with simple and complex ideas. There was no hard-and-fast distinction along these lines in Draft A. Indeed, Section 1 of Draft A dealt first with the origin of simple ideas and then continued directly with a discussion of our ideas of substances. Whilst there was one interesting exception, it is a general rule that in Draft B, the discussion of simple ideas was confined to Sections 17 to 59, and complex ideas were discussed in Sections 60 to 162. It is also worth noting that the divisions in Draft B were not quite the same as those that appear in the final *Essay*. There, a discussion of ideas composed Book II, and our knowledge had by these ideas was placed in Book IV. In Draft B, Locke discussed the origin and nature of simple ideas, and then continued directly with an account of the knowledge had by these ideas (in Sections 32 to 59). This was also the case with some of the complex ideas that Locke talked about.

The Sections on complex ideas, which Locke took to be ideas of substances and ideas of relations, were divided by a large discussion of words. In Draft A, the discussion of substances was often followed by a discussion of words, and Draft B followed this form: Sections 60 to 63 outlined Locke's account of substance, and was followed by a discussion of words from 64 to 93f. These Sections formed the basis for Book III of the *Essay*. In Sections 93g to 95, Locke discussed the knowledge that we had about substances. The remainder of the Draft was concerned with relations and ended on page 473 of the manuscript (BL MS Locke f.26), halfway through a sentence. This incompleteness should not warrant much astonishment, as the Draft noticeably lacked a treatment of a central topic, namely a discussion of faith, probability, and opinion. This took up roughly a quarter of Draft A, but was not included at all in Draft B. So, whilst there was some material that will later make up Book IV of the E*ssay*, there was a lot that was not covered in the surviving document. It is not clear if this was because the relevant part of the text is now lost, or whether Locke just omitted this discussion from the Draft. Nevertheless, the Draft was taking on something of the shape that would appear in the completed *Essay*.

Experience

It is as well to start this exposition by highlighting the areas of continuity between these two Drafts, before moving on to a discussion of the new direction taken in Draft B. This should hopefully illustrate how Locke's thought evolved in the move from one Draft to another. This will show how Sydenham's influence on Draft A came to be modified, so as to produce the new positions of Draft B. Let us turn to Sydenham's themes.

The most important of these was the thought that our knowledge of the world was based upon experience. Locke made some remarks at the beginning of Draft B in order to show just what he meant when he talked of "Ideas":

> I shall use the word Idea for whatsoever is the object of the understanding when a man thinks & by it expresse all that is meant by Notion phantosme species, or what ever else the minde can be imploid about in thinkeing (Draft B, §3, p.103).

This was the first appearance of a notoriously vague definition of the term that later re-appeared in the *Essay* (I.i.8). However, we can glean some useful philosophical information from it. Firstly, we can see that ideas are object and not acts. Secondly, we can see that Locke here posited a single faculty of cognition, the "understanding". This was in contrast to the two-level approach of both Descartes and the scholastics. Locke used the single term "idea" in its one faculty, the understanding, to stand for "notion" and "phantasm", which pertained to the intellect and the imagination respectively. Locke deliberately ran these two terms together, and placed them under one head, in order to show that he believed in one undivided mind. However, it was not perspicuous, from this passage alone, just what type of faculty the understanding was, or what type of things ideas were. Nor could this be discerned in the discussion of innatism. So, it was not until §17 of Draft B that Locke made clear his position by putting forward his theory which precisely explained the origin and foundation of knowledge:

> I think that all our knowledge is founded on & ultimately derives its self from Experience & observation imploid either about externall sensible objects, or the internall operations of our owne mindes (Draft B, §17, p.128).

Locke then went on to say just what experience was in both these cases. Firstly:

> Our senses conversant about particular sensible objects doe convey into the minde severall destinct Ideas or Images of things according to those various ways wherein those objects doe affect them & thus we come by those Ideas we have of yellow. white. Heat Cold. hard soft ache smart bitter sweet (Draft B, §18, p.128).

According to Locke, these ideas depended solely on our senses and this means of conveying ideas to the mind Locke called "Sensation". There was, however, also the experience that we had of "the internall operations of owne mindes", yet to be dealt with. Locke continued directly:

> The other fountaine from which experience furnisheth the understanding with Ideas is within every man himself, & though it be not sense, (as having noething to doe with externall objects) yet it is very like it & might properly enough be called internall sense. & that is the Operations of our owne mindes within us, which when the soule comes to reflect on & consider doe furnish the understanding with another set of Ideas which could not be had, from things without & Such are Thinkeing, beleiving doubting loveing feareing, affirming, compareing (Draft B, §19, p.129).

These are ideas of "Reflection". In both cases Locke had merely expanded upon the treatment of these issues given in Draft A, the Section on Sensation in Draft B being based on Section 1 of the former work, and that on Reflection in Draft B coming from Section 2 in Draft A. The Draft B revisions were not exact copies, rather they were expanded modifications using similar language, but greater detail. Sensation and reflection were similar in so far as they produced the same types of things, i.e. ideas, but different in so far as they had different causes. In the case of sensation, the cause was something external to us and in reflection, internal operations. The central question, then, was what these ideas actually were.

We have seen, in Section 18, a hint of what Locke took them to be, namely "Images" of things, as he used the terms synonymously there. Indeed, this identification was present in the rest of Draft B. For example, Locke noted that the understanding had no power to refuse simple ideas, no power to alter them or to make new ones itself without sensation or reflection. In this way it can no more do these things

> then a mirror can refuse alter or change or produce in its self any other images or Ideas then the objects set before it doe therein produce (Draft B, §21, p.133).

In so far as we are concerned with simple ideas, the understanding was like a mirror, which passively received "images" of things. Another example concerned memory. Here Locke noted that, without frequent converse with the relevant objects or subsequent recollection, our ideas often

> are effaced by time & the imagery moulders away. The pictures drawne on our mindes are laid in fadeing colours (Draft B, §28, p.138).

Here ideas were pictures in the mind. Nor was this Locke's only imagistic reference in this Section. He also noted, most likely thanks to his medical training, that disease

> quite strips the minde of all its Ideas & the flames of a fever in a few days calcines all those images which seemd to be as lasting as if carvd in marble to dust & confusion (Ibid.).

Locke was saying that the ideas are the images which are destroyed, so we have a strict identification of the two. Ideas were also identified with pictures when Locke considered collective substances, i.e. ideas of things that contain several individual parts. Here, Locke did not think that he needed to have several different ideas, any more than a picture of several individuals had to be several pictures:

> It sufficeing to the unity of any Idea that it be considerd as one representation or picture though made up of never soe many particulars (Draft B, §61, p.165).

Moreover, even in the most complicated cases, seemingly the farthest removed from mental imagery, Locke was consistent in maintaining that the ideas were merely compounded from basic internal or external sensations. For example concerning the idea we have of God

> I thinke I may say we have noe other Idea of him but a complex one of wisdome, power, existence &c infinite aeternall, which are all destinct Ideas & some of them being relative are again compounded of others goe all to make up the Idea or notion we have of god, & which in their originall are all derived from simple Ideas which came into our understandings by reflection or Sensation.(Draft B, §94, p.213).

Our idea of God was just the product of our simple ideas of reflection. These were just ideas of internal sense, for Locke, and were just mental images, or pictures (in a broad sense). Even in the last extant Section of the Draft, dealing with "That vice we call Murther", Locke insisted that this complex moral action

> when the whole is examind & the particulars collected will amont to a collection of simple Ideas, received from Reflection or Sensation (Draft B, §162, p.270).

Thus, we can infer that for Locke *all* ideas, even the most abstruse, were merely collections of mental images or sensations. In Draft B, Locke was an imagist through and through; the sole contents of the understanding were mental images. So, in thinking of something, all I do is form the mental image of that thing and manipulate it. Thus to conceive something was just to imagine it: thought is imagination. What else could Locke take it to be given his description of "Ideas"?

Having dealt with the more general topic of the nature of ideas, we are now in a position to return to Locke's introduction to his account of experience. In Section 1 of

Draft A, Locke's description of the origin of ideas was immediately followed by his account of how we form ideas of substances. We have also noted that in Draft B, Locke separated the consideration of simple ideas from that of complex ones. However, there was one exception to this practice: Section 19. Having clarified the origin of the contents of our experience, Locke asserted that these two sources of ideas "are the two only principles or originalls from whence we receive any Ideas whatsoever" (Draft B, §19, p.129). He then stated the obvious corollary of this point:

> the understanding hath not the least glimmering of any Idea which it doth not receive from one of these two. soe neither can Externall objects furnish the understanding with any Ideas but of sensible qualitys because they operate on the senses noe other way & soe we can have noe other notice of them nor the minde furnish the understanding with any Ideas of its owne operations & the severall ways & modes thereof (Draft B, §19, p.129).

So far he was dealing with simple ideas, but by drawing out what Locke took to be a direct consequence of these facts, he embarked upon a discussion of our complex ideas of substances:

> Hence it comes to passe that we have noe Ideas nor notion of the essence of matter, but it lies wholy in the darke (Ibid.).

Such a bald statement, in itself, was surely unsatisfactory. It was far from clear how the conclusion followed from the premise. Locke directly supplied the reasoning behind this assertion by considering the idea we have of substance. The reason that we have no idea of the essence of matter was

> Because when we talke of or thinke on those things which we call material substances as man horse stone the Idea we have of either of them is but the complication or collection of those particular simple Ideas of sensible qualitys which we use to finde united in the thing cald horse or stone (as I shall hereafter shew more at large) & which are the immediate objects of our sense which because we cannot apprehend how they should subsist alone or one in an other we suppose they subsist & are united in some fit & common subject, which being as we suppose the support of those sensible qualitys we call substance or matter, though it be certeine we have noe other Idea of that matter or substance but what we have barely of those sensible qualitys supposed to inhære in it (Draft B, §19, pp.129-130).

Locke then went on to make a similar point about the idea we have of an immaterial substance. The argument was similar to that in Draft A: the alleged idea of substance was not really any contentful idea at all, but is merely a supposition of a uniting support of some set of ideas. Indeed, the section of the passage just quoted that appears after the brackets, was taken from Section 1 of Draft A. The only alterations made were a switch from "his" and "he" in Draft A to "our" and "we" in Draft B. These words were first

copied into the Draft B version but were then altered, presumably because they did not fit with the tone of the work. The only other emendation to the Draft B text was the admission of the extra possibility that ideas could be supported "one in an other". Locke also left a textual hint as to his own feeling that this passage was premature in the bracketed section of his text (which was written outside of the regular lineation). He saw that this was not the correct place for a discussion of the idea we have of material substance, but could not help making the point where he thought it most obvious. We cannot have ideas of the essence of substances because we have no contentful idea of substance at all. Locke illustrated this in his comparison of material and spiritual substance:

> The one being supposd to be without knowing what it is, the substratum to those simple Ideas we have from without, & the other supposd, (with a like ignorance of what it is) to be the substratum to those actions or workings which we experiment in our selves within Tis plain then that the Idea of matter is as remote from our understandings and apprehensions as that of Spirit (Draft B, §19, p.130).

Locke was pointing out one of the most important consequences of his empiricism at the earliest opportunity, and this anomaly in the *Essay's* structure continued up until Draft C in 1685 (Draft C, II.i.5-6). Locke clearly felt this point important enough to justify its disorderly placement.

The basic account of substance as briefly outlined in Section 19 was merely a part of the treatment given to the issue in Section 1 of Draft A. It was only in Sections 60, 61 and 63 of Draft B that Locke offered a more detailed account of the idea we have of substance. Here, too, he drew upon the work done in the opening parts of the first Draft, but they did not add any new significant philosophical points. Section 60 of Draft B was an expanded treatment of Locke's first writing on substance in Section 1 of Draft A and incorporated a large part of this Section of Draft A. However, some of this Section in Draft A was used as the basis for Section 19 of Draft B. This part of the text of Draft A was left out of the treatment of substance in Section 60 of Draft B, and where this omission occurred in Section 60, a reference was given to Section 19, so as to preserve the continuity of the argument. Locke clearly had Draft A in front of him when he was writing this Section of Draft B, and was aware of the fact that he had already re-used part of the text. The first third of Section 61 was new and was made up of a discussion of active and passive powers of bodies. It was an expansion of the points made in a similar vein in Section 2 of Draft B. The second third of Section 61 was made up of a discussion of the difference between qualities and ideas, and was taken almost

word for word from Section 45 of Draft A. The final third of Section 61 was a discussion of "*Collective Substances*" and was completely new. Section 63 was new and was a recapitulation of all of this. Here, Locke gave an example of what he had in mind by talking about the idea we might have of a particular substance, e.g. a swan. To call something a "swan" was to assert that it is a substance in which a whole group of ideas co-exist.

There are a number of points made in these passages, but considering only the account that Locke gives of substance, we can see that his position has changed not at all from that expressed in Draft A:

> In short then the Ideas of substances are noething else but a collection of a certain number of simple Ideas received from our senses or reflection upon the operations of our owne minde or made by the Compounding faculty of our owne understandings which collection of simple Ideas considerd as united in one thing makes the complex Idea of that substance (Draft B, §63, p.166).

It is the understanding that puts together certain simple ideas into one thing, and the understanding that creates, as it were, the idea of substance to do the uniting. It is merely the supposition of something that binds parts of our experience together.

These passages, being so closely related to Draft A also share some of the defects of this former work, prior to Locke's corrections and memoranda. For example, the idea of substance was supposed to glue together the ideas that we have of the things, whereas Locke himself had already noted in the memoranda of Draft A that when referring to the things themselves, it was proper to talk only of the qualities as opposed to the ideas. So when, in Section 60, Locke was talking of the sun, and said that our idea of the thing itself "is but an aggregate of these severall simple Ideas, bright, hot roundish" (Draft B, §60, p.163), he needed to point out that the sun itself was a collection of the qualities that cause these ideas. Such a clear distinction was somewhat problematic in Draft B, in so far as Locke was still having a little trouble formulating the distinction between the causes of our ideas and the idea themselves. The first mention of this was in Section 35 of Draft B.

What Locke first wrote was remarkably similar to the questionable position of Draft A:

> By the actuall receiveing in of these Ideas we have a certain knowledg. that some thing doth exist at that time without us *answering that Idea within* which causes that Idea in us, & of which we imagin the Idea within to be a resemblance (Draft B, §35, p.142).

This was just the view that the memorandum in Section 45 of Draft A was supposed to restrain us from stating; the quality of the body "answers" the idea and was conceived as a resemblance of that idea. The view was much too close to scholasticism for comfort. Locke was dissatisfied with this description of the causes of our ideas, and so altered the passage in an attempt to try to remove the offending associations:

> By the actuall receiveing in of these Ideas we have a certain knowledg. that some thing doth exist at that time without us which causes that Idea in us, & from the produceing constantly that Idea in our mindes we give it a name as of a destinct quality answering that Idea, which is noe more but that it produces such an Idea, or rather when any object produces any Idea in us we denominate it as if that Idea were the image of that quality which whether it be or noe matters not (Draft B, §35, pp.142-143).

Locke removed that notion of resemblance, but replaced one instance of the quality "answering" the idea with another, and added the supposition of the idea being an image of the quality. This supposition need not actually be the truth of the matter, but it was still far from clear that Locke had distanced himself from scholasticism in the way that the memorandum of Draft A required. In order to do this he went back to add another interlinear qualification, this time about the quality "answering" the idea, so as to make perspicuous what he felt the relation of quality to idea actually amounted to:

> By the actuall receiveing in of these Ideas we have a certain knowledg. that some thing doth exist at that time without us which causes that Idea in us, & from the produceing constantly that Idea in our mindes we give it a name as of a destinct quality answering *& as we commonly judg resembling though in truth only causeing that* Idea which is noe more but that it produces such an Idea, or rather when any object produces any Idea in us we denominate it as if that Idea were the image of that quality which whether it be or noe matters not (Draft B, §35, pp.142-143).

Only now did Locke arrive at a proper outline of the relation between qualities and ideas. Our ideas were not to be seen as resembling qualities, even though people usually supposed that this was so; all that can really be said of them was that the qualities of the bodies *cause* the ideas that we perceive. The statement at the end of the passage, that we denominate the idea "as if it were the image of that quality", was now much more sceptical concerning whether or not this naming is legitimate. It was only after a great deal of correction and re-formulation on Locke's part that he arrived at an account that attained the standards set in Section 45 of Draft A. We can see in this first discussion of qualities and ideas in Draft B that Locke was still trying to work out in his own mind what the distinction was, and how best to express it.

However, despite the teething problems of Section 35, Locke was clear on the difference between qualities and ideas. Locke repeated the points he made in Draft A's memorandum, after he gave his account of substance in Section 60 of Draft B.

> Also when I speake of simple Ideas as existing in things v.g heat in the fire & red in a cherry I would be understood to meane such a constitution of that thing as produces that Idea in our mindes. Soe that, by Idea when it is spoken of as being in our understandings, the very thought & perception we have there, when it is spoken of as existing without us I meane the cause of that perception & is vulgarly supposd to be resembled by it & this cause I call also quality, whereby I meane any thing which produces or causes any simple Idea in us (Draft B, §61, p.164).

This was a close copy of Draft A, but had one change regarding the resemblance between the quality and the idea. In Draft A Locke, who had only just rejected the use of scholastic terminology, said that the idea was "supposd to be resembled by its cause" (Draft A, §45, p.83); Locke was merely noting the scholastic thinking on this point and was not yet rejecting it outright. In Draft B, however, this supposition was "vulgar". Locke was hinting that this supposition was an unreflective one which, presumably, would be found wanting upon serious consideration. This change moved Locke closer to the final position of the *Essay*, where, in II.viii.7, he made the same distinction between ideas and qualities "so that we *may not* think (as perhaps is usually done) that ⟨ideas⟩ are exactly the Images and *Resemblances* of something inherent in the subject". This slight alteration indicated a change of mood with regard to the scholastic theory, which Locke tolerated in Draft A, but which was "vulgar" in Draft B.

This modification may also clarify remarks made previously in Section 35 of Draft B. Locke did not want to accept the supposition of a resemblance between ideas and things, and so was only prepared to say of the things that cause our ideas *that* they cause these ideas, and nothing further. Whether or not these qualities resembled the ideas they cause was a point upon which Locke was not yet prepared to commit himself. It was this distinction between ideas and qualities, as incorporated into the discussion of substance, that made clear the underlying thrust of Locke's position in Drafts A and B. The thought was that material substance was that which we suppose unites that external causes of our ideas, which uniting factor explains the co-occurrence of a set of ideas we have noticed going around together. Locke did not mean to say that the idea of substance was something that unites the ideas themselves, rather it was supposed to be the "glue" that stuck together those things that cause the ideas. So, the idea of a substance was clearly our idea of something that was supposed to unite the causes of our ideas. All this clarification notwithstanding, it should once more be emphasised that this

idea of substance was merely a supposition that we make in order to slice up our experience into objects:

> not imagining how these simple Ideas can subsist of them selves we inure our selves to suppose some substratum where in they do subsist & from which they do result which therefor we call substances (Draft B, §60, pp.162-163).

It should also be borne in mind that this account of substance was all but identical to that put forward in Draft A. The only change made was the clarification regarding qualities. This meant that the account was *independent* of any particular ontology. There was not the slightest intimation in Locke's exposition that he was depending on this or that conception of the world. Nor ought there to be, since the account was developed when Locke was completely agnostic concerning theories that purported to account for observable experience.

The clarification between ideas and qualities made, Locke went on, as he did in Draft A, to make further distinctions amongst qualities in bodies. At the end of Section 45 in Draft A, Locke distinguished between the actual and potential qualities, but had also made a distinction between active and passive ones. In Draft B, the two distinctions were given their appropriate roles:

> ⟨I⟩ destinguish qualitys into actuall & potential. By actuall qualitys I meane all those simple Ideas or to speake righter the causes of them that are in any thing. v.g that taste colour smell & tangible qualitys of all the component parts of a cherry. By potentiall qualitys I meane the fitnesse it hath to change the simple Ideas of any other thing or to have its owne simple Ideas changed by any other thing. v.g. it is a potentiall quality of lead to be melted by fire & of fire to melt lead i e change its solidity into fluidity. which potentiall qualitys may again if any one pleases be destinguishd into active & passive (Draft B, §61, pp.164-165).

This distinguishing of qualities into actual and potential was unobjectionable, even if it was still highly reminiscent of scholastic philosophy. The actual qualities were those that affect a human observer when the object observed was not interacting with other bodies, and the potential being those that were exhibited to us when bodies interacted. This interaction changed the qualities in the bodies and thus altered the ideas we received. Since the active and passive quality distinction was couched solely in terms of the interaction of bodies with each other, it was clear that this distinction applied to the potential qualities alone, as Locke pointed out. The active/passive distinction of Draft B (Draft B, §61, p.163, §67, p.170, §85, p.192 and §50, p.262) was just the same as in Draft A and the *Essay*; no substantial conclusions were drawn from its postulation - it was merely a convenient taxonomy.

It is evident that a great deal of the basic account of experience in Draft B was based on Draft A. Parts of Draft A were often placed differently according to the new structure Locke adopted, but in so far as the basic theories of ideas, qualities and substances go, Locke had simply incorporated the points in the memorandum of Section 45 to produce a more plausible account of our experience of material things.

Causation

Having dealt with material bodies and our experience of them, we are now in a position to turn to another theme, namely the knowledge of natural causes. This had been mentioned in the first Section of Draft A, but only briefly, and was expanded upon in Sections 14 to 16. Thanks to the new structure of Draft B, the issue was dealt with under the heading of causation, a species of relations. So, it did not appear until late on in the Draft, in Sections 131 to 140. A large part of the discussion was copied from Draft A. The previous description of cause had been brief and somewhat inadequate:

> heat causeth fluidity in wax consistency in clay &c, which is noe more but this i.e. that that thing which in my sense of feeleing produces that Idea of which I call heat in that thing which a certaine kinde of yellow & sweet whereof I have the setled Ideas & by the language I am used to, have learnd to call wax doth cause another sensible Idea which I call fluidity (Draft A, §1, p.6).

In this passage, cause and effect were relations between the simple ideas of different substances. However, this was to ignore the bringing into being of different substances. A more satisfactory treatment was given in Section 132 of Draft B, entitled "The begining of any simple Idea or substance by the operation of any other Idea or substance observed by our senses gives us the Idea of Cause & effect". Locke explained his view thus:

> we finde that certain simple Ideas doe in severall subjects begin to exist which before were not there & also that severall substances doe begin to exist observing also that these simple Ideas or substances are thus produced by the due application of some other simple Idea or substance which therefor being considerd by us as conduceing to the existence of that simple Idea or substance we frame the notion or Idea of cause & effect, calling that which doth operate toward the existence of any simple Idea or substance cause, & that which is thus produced effect (Draft B, §132, pp.253-254).

Section 133 gave a more succinct description of this relation, and Section 134, discriminated amongst different types of cause, this classification being a copy of the first part of §16 in Draft A.

These clarifications out of the way, Locke then went on to discuss the kind of knowledge of causation obtained through the senses. Once more there was a continuity of thought and text from Draft A. Locke was quite adamant that

> we know any thing to be the cause of such an effect as far as our senses doe informe us but by knowing any thing to be the cause of any effect & soe giveing it that relation I doe not know the way of workeing or the manner wherby the effect is produced (Draft B, §136, p.255).

Locke then went on to give examples taken from the second half of Section 15 from Draft A. So, in terms of a knowledge of any causal process "all I know hereby is that the effect follows but very seldom come to any discovery of the modus operandi or the way those effects are brought to passe" (Draft B, §136, pp.255-256 cf. Draft A, §15, pp.30-31). This was because these interactions, "being brought about by particles soe small & minute that they come not within the observation of my senses I can not get any knowledg how they operate" (Draft B, §136, p.256 cf. Draft A, §15, p.31). Section 137 of Draft B copied the another part of Draft A, and exhibited a clear continuity of opinion:

> And here by the way we may receive a litle light how much in the information of our understandings we are beholding to our senses. For had we but senses that could discover to us the particles of water with their figures site motion &c when it is fluid, & also the different postures of those very particles or the addition or separation of some particles &c when the water was frozen, we should as well know the very maner or way whereby cold produces hardnesse & consistency in water as we doe the way how a joyner puts severall peices of wood togeather to make a box or table, which by tenants nailes & pins we well enough perceive how it is made to hang togeather. And I doubt not but the motions of an animall would be as intelligible to us as those of a watch were our eyes sharp sighted enough to perceive them. But our organs faileing us in the discovery of those fine & insensible particles our understandings are unavoidably in the darke (Draft B, §137, p.256 cf. Draft A, §15, pp.30-31.)

Section 139 was a copy of the first half of Section 15 from Draft A, and detailed Locke's opinion that we can have no further knowledge of causes and effects, other than that which we come to by the use of our senses. This had the consequence that

> I cannot make universall propositions concerning causes & effects of whose truth I can be assures unlesse it be of those powers which I include in the Idea of that subject or definition of that name & then such proposition is but verbal (Draft B, §139, p.257 cf. Draft A, §15, p.30).

Locke still insisted in this Draft of the *Essay* that "a comprehensive knowledg of causes & effects as I have last mentioned is I thinke out of the reach of humane understanding" (Ibid.). Section 140 outlined Locke's thought that "**Every thing that hath a begining hath a cause**", and was comprised of a number of additions to a central passage from the second half of Section 16 in Draft A.

In conclusion, Locke's attitude to our knowledge of causes was that same as that in Draft A, and thus the same as that first proposed by Sydenham in the *Methodus Curandi Febres*, and elucidated by Locke in *Anatomia* and *De Arte Medica*. Locke was unvarying in his assertion that we have no knowledge of the underlying structures in nature that produce observable relations of cause and effect.

Scholastic Method

In two of the three Sydenhamian themes, Locke's thought was the same as in Draft A. What of learned dispute? Sydenham had abhorred such things in his writings and Locke later echoed this attitude. What was the position of Draft B?

The tools of scholastic dispute, the "speculative principles" (Draft B, §11, p.119) made a relatively early appearance in the Draft since they were thought by the "masters of demonstration" (Ibid.) to be innate. Locke was far from sure that this was the case, mostly because he did "not thinke them self evident … the knowledg we have of them depends upon something else" (Ibid.). Secondly, however, he did "not thinke them soe usefull as is imagind or that they doe influence our knowledg to any purpose at all, since we cannot by them alone evidence to our selves the truth of any one thing realy existing without us, which is the great concernment of our understandings" (Ibid.). Even at the very outset of the Draft, Locke was sceptical about the use of scholastic methods, and attacked them in spite of the fact that he had not, at that point, given the reader any alternative account. He said: "I must therefor beg you a little to lay by your prejudice & suspend your censure, till in the progresse of this discourse you have heard me to those points" (Ibid.).

This was a relatively minor skirmish compared to the onslaught that Locke later unleashed. Sections 86 to 88 were based upon the last half of Section 4 from Draft A which dealt with the obscurity of words. In Draft A, this discussion led into something of a lament on Locke's part

> that men speakeing the proper language of their country ie according to the grammar or rules of that language doe yet speake gibberish to one another the notions their words which are but signes stand for not being agreed & determind amongst them, & soe they fall into endlesse & often senslesse disputes (Draft A, §4, p.14 cf. Draft B, §87, p.194).

Locke's treatment of this passage in Draft B was to copy it out and embellish it with further points and elaborations. He did so by noting that people

> by their argueing one with another make but small progresse in the discovery of usefull truths & the knowledg of things as they are to be found in themselves & not in our imaginations (Draft B, §87, p.194).

This was a criticism not at all unlike that Locke made of scholasticism in *De Arte Medica*, where learned disputes

> amused ⟨the⟩ understanding with fine but uselesse speculations, & diverted their enquirys from the true & advantageous knowledg of things (PRO 30/24/47/2 f.51r).

The problem was only exacerbated by the techniques of disputation:

> To this mischief Logic & a great part of scholastique learning as it hath been handled in the schooles hath given reputation & the learned arts of disputeing have added much to the natural imperfection of languages, whilst they have been made use of & fitted to perplex the signification of words & to make their meaneing more undetermind & doubtfull then they were before in ordinary conversation This though a very uselesse skill hath yet passed hitherto under the laudable & esteemd names of Subtilty & acutenesse & hath had the applause of the schooles (Draft B, §88, p.194 cf. Draft A, §4, p.14).

In Draft A Locke then continued this attack by giving examples of bad scholastic practise; for example, the switching of the meanings of words, and letters (Draft A, §4, pp.14-15). These examples appeared in Draft B, but not before Locke had added a diatribe on the obscurity of scholasticism and how this perpetuated a continued adherence to the style, despite the fact that it produced no new truths. Locke believed that scholasticism developed in the way that it did because "great & universall knowledg ⟨is⟩ easier a great deale to be pretended to then realy acquired" (Draft B, §88, p.194). Since these school philosophers wanted to feign a great knowledge they

> found ⟨disputing⟩ a good expedient to cover their ignorance with a curious & unexplicable webb of perplexed words & drew to them selves the admiration of others by unintelligible termes the apter to produce wonder because they could not be understood (Draft B, §88, p.195).

Locke thought that this was due, in part at least, to the influence of

> the church of Rome, who found noe easier way to that pitch of authority & dominion she hath attaind then by amuseing the men of businesse & ignorant with hard words or imploying the ingenious & idle in intricate disputs about unintelligible termes, & holding them perpetualy intangled in that endlesse laborinth nor was there any other way to defend their infalibility & other absurd doctrines then by guarding them round with legions of obscure doubtfull & undifined words (Ibid.).

Locke then continued this Section with the examples from Draft A, and finally ended his attack by referring to the learned influence on the world of human affairs.

It is worth noting that Locke's blaming the dire state of learning on the Roman Church was reminiscent of Hobbes' observations on this subject. At the end of *Leviathan*, Hobbes noted some of the problems that he thought stood in the way of a true grasp on philosophy. In Part IV, Chapter 46 "Of the Darkness from Vain Philosophy, and Fabulous Traditions", Hobbes attacked what he saw as the corruption of academic learning, and laid the blame at the door of the Catholic church:

> for the study of philosophy, it hath no other place, than as a hand-maid to the Roman religion: and since the authority of Aristotle is only current there, that study is not properly philosophy, (the nature whereof dependeth not on authors), but *Aristotelity*. (HW III p.670).

In the next chapter, "Of the Benefit that Proceedeth from such Darkness, and to Whom it Accrueth", Hobbes once more denounced scholasticism, and this time gave some examples of just why it was that the philosophy that was usually taught had been so obscure:

> the metaphysics, ethics, and politics of Aristotle, the frivolous distinctions, barbarous terms, and obscure language of the Schoolmen, taught in the universities, which have all been erected and regulated by the Pope's authority, serve them to keep these errors from being detected, and to make men mistake the *ignis fatuus* of vain philosophy, for the light of the Gospel (HW III p.693).

Hobbes was quite clear that the benefit accrued to the church that sponsored and inculcated such inanity, so as to prevent a challenge to their authority:

> The authors therefore of this darkness in religion, are the Roman, and the presbyterian clergy (HW III p.691).

In censuring corrupt religion for the obscurity in philosophy, Locke was following Hobbes. And in so far as scholasticism was perpetuated by Rome, they were in complete agreement.

In Draft B, Locke continued to emphasise this final theme of Sydenham's writings (albeit with examples taken from other sources). He was still unhappy about the disputation as a method for arriving at truths, and held that the received scholastic principles were of no use in arriving at "true knowledg". However, he had also started to highlight one reason for the uselessness of scholasticism, namely in its use of "obscure" and "unintelligible termes", so that "this learned ignorance & this art of keepeing even inquisitive men from true knowledg hath been propagated in the world & hath much perplexd whilst it pretended to informe the understanding" (Draft B §88, p.195). Thus, so far in Draft B, we have seen elaborations of the thought presented in Draft A, but have not seen any changes being made. Locke still held these three themes close to his heart, and described experience in roughly the same way as previously (subject to the minor alterations regarding ideas and qualities). Are we therefore to conclude that the natural philosophy in Draft B was merely a repetition of views put forward in the previous work? In short the answer is no.

The Rejection of Hylemorphism

One of the most interesting features of Draft A was its seeming indifference regarding the use of explanations for natural phenomena. On the one hand Locke talked of "natural sprits" and "formes" (Draft A, §38, p.66), and on the other he referred to the "figure site motion &c" of the particles of water to explain its fluidity (Draft A, §15, p.31). This usage was traced back to Locke's previous medical work, where the terms were used merely as examples; they did not betray any particular approbation of one theory or another. Locke's agnosticism was due to his belief that we had no possibility of coming to know the internal natural processes that explain observable phenomena. This scepticism was present in Draft A, and so, consequently, was the agnosticism. As we have seen, this scepticism was also present in Draft B. The agnosticism, however, was not. In Draft B hylemorphism was unequivocally rejected. If this scepticism remains in place, how could this be so? Locke's answer was subtle and complicated.

Draft A had mentioned the possibility of there being "species" and "formes". This was not the case in Draft B. Let us consider "species" first. In Section 73, Locke wanted to examine why it was that "generall words or the specific names of Substances modes & relations … have not had determinate destinct complex Ideas to which they have been constantly applyd & annexd" (Draft B, §73, p.177). This, Locke thought, was a serious flaw in our knowledge of the world. The reason why we do not have adequate ideas of substances was that

> men have been taught that the severall species of things have had destinct essences the knowledg whereof was necessary for the cleare knowledg of this or that species. & soe men have been lead into a fruitlesse enquiry after the essences of things thereby to finde their different species (Ibid.).

It seems that in Draft B such an enquiry would be lost labour. Locke quickly supplied the reason why he thought this was so: species were not real universals, but were merely products of our classificatory schemes.

> the specific constitution & difference of things seems to be noe thing else, but collecting a certein number of simple Ideas, which usualy have been observed to goe togeather, in order to the nameing of the things in which they are found soe united for the conveniency of memory & discourse, & soe is an invention of man rankeing things under names according to the qualitys or simple Ideas where in they found them agreed, haveing found many particular things constantly to agree in a certain number of those qualitys for in the particular things we have to doe with our complex Ideas of them (by which we know them from one another as well as we doe one species from an other) is noe thing but a collection of those simple Ideas which our senses have informed us are in them (Draft B, §73, pp.177-178).

"Species" were merely the similarities we note amongst a group of objects. The features noted, moreover, depended entirely upon human invention and ease of use. For Locke, they did not have any great ontological significance. Since these collections of ideas were man-made, there was nothing that determines where any "species" started or ended: all depended upon the notion of a definer. Because of this, what was essential to the defined species were just those things that the definer chose to include as being constitutive of that particular species:

> That therefor & that only is properly essential to any species expressed by any name, which is one of those simple Ideas that always goes to makeing up that complex Idea which either common usage or a definition hath applyd that specific name to (Draft B, §73, p.179).

We need to be careful here in discerning exactly what Locke was saying. It is important to note that he was not talking of the things themselves, but merely our ideas of them. So to say that a "species" did not have any ontological significance was not to say that nature did not work in a regular manner. It was solely to say that in our careless way, we may collect together ideas that do not reflect anything in nature. Locke himself was clear on this point: he did not doubt "but that nature workeing regularly & uniformly for the most part doth produce great numbers of Individuals agreeing in qualitys one with an other & that are constantly soe" (Draft B, §77, p.184). His point was that the scholastic notion of a species, because it was based on our ideas of things, did not in any way reflect what was really going on in nature:

> therefor though there be a foundation in nature for divideing of things into sorts & tribes, yet because we seldom know the precise bounds where one ends & the other begins & where the destinction is made between them, & yet having need of names in the meane time, we devide them into in respect of our selves, that we may the better name them for having noe other knowledg of any thing but the simple Ideas that are in it & haveing observed severall particular things to agree with others in a collection of simple Ideas we make one complex Idea sometimes more sometimes lesse accurate & give that a generall name, for shortnesse sake (Draft B, §75, p.183).

Locke then concluded his discussion of species thus:

> I thinke our words stand not for, neither are used to expresse the setled destinct compleat natures of things but are the signes that every man makes use of to stand for his own particular complex Idea (Draft B, §76, p.184).

Locke was presenting a detailed analysis of the scholastic concept "species" in terms of his theory of ideas. "Species" were simply our own convenient classifications, used for

ease of dispatch in ordinary language. They did not exactly reflect the things as they were in themselves. Nor were they strange entities that individuals somehow partake of. In Draft A, Locke at times seemed happy to talk of species in a traditional scholastic fashion. In Draft B, his thought was thoroughly nominalist.

Yet the treatment that Locke subjected to the scholastic term "species" to was mild compared to that of "formes". In the first half of Section 72, Locke had been lamenting the dire state of our knowledge of natural bodies, which could only be ameliorated by "a laborious & exact scrutiny into the nature of the things" (Draft B, §72, p.176). Locke then felt it necessary to account for the sorry state that the affairs of natural philosophy had been in, of late:

> we are not to wonder soe little hath been donne in this point, because the philosophers of the world whose proper business it is. have been of the opinion that the specific constitution & difference of things hath depended on a forme, a secret undiscerneable forme, I may say without offence unintelligible to me & perhaps undistinguishable & unknowne to others but by the sensible simple Ideas that are supposed to flow from it (Draft B, §72, pp.176-177).

The supposition of a "forme" was of no use in the explanation of why a body had certain qualities, because it told us nothing of the causal processes involved in the production of an idea, except to say that those ideas that were produced by this "forme". In this way, then, the form was an utterly superfluous supposition:

> soe that this supposd forme helps them not at all in the knowledg of things or the destinction of one from another, but barely the simple Ideas or qualitys of the thing its self affecting our senses. For I aske how any one will know that the forme of gold is in any parcell of matter but by its colour weight ductility & other qualitys i.e a collection of simple Ideas that are united in it & doe affect the senses. the same may be demanded concerning a man a dog an Eagle whale apple Iron water &c how any one knows the forme of any of these is in any thing but by the simple sensible Ideas it produces in our mindes by our senses? & then to what purpose is the precarious supposition of a forme, which to me & perhaps to others is but a sound without signification or a word without an Idea belonging to it (Draft B, §72, p.177).

This was a radical turnaround from Draft A. Locke was asserting that the "forme" from which the qualities of bodies arose was "unknown" to him, and the word itself was "unintelligible". It was a "sound without signification or a word without an Idea belonging to it". So, the word did not signify anything at all. For Locke

> words ⟨serve⟩ for noething but being mere sounds unlesse where they signifie & expresse some Idea of the speaker & excite some such Idea in the hearer (Draft B, §65, p.168).

The problem with supposing that these "formes" were responsible for the ordinary everyday qualities we encounter, was that these "formes" did not, themselves,

correspond to any ideas we actually have. One consequence of this was that, when asserting that "formes" were the factors responsible for the sensible qualities that we perceive, we say nothing more than that these ideas are so produced. The assertion that it was a "forme" that did the work gave us no extra ideas at all, and nothing like any of our ideas. Locke clearly found this a most objectionable feature of the scholastic mode of explanation, but he did not say that these hylemorphic theory was thereby false. The words that were used in the theory did not stand for any of our ideas, so we cannot say whether the theory was true or false. Consequently, it was simply meaningless.

In point of fact Locke had used this criticism of unitelligibility in his attacks on scholastic methodology in Section 88. There, as we noted, he talked of an "unexplicable webb of perplexed words", "unintelligible termes" and "obscure doubtfull & undifined words". These comments were all new to Draft B, and did not appear in Draft A. Nonetheless, we ought not to infer that the presentation of this argument by Locke originated in Draft B alone. He had previously noted that some scholastic terms were meaningless. He did this in *Anatomia*. In the course of discussing aetiology, Locke had noted that two posited explanations were highly dubious:

> this hidden δημιουργὸξ was soe much out of the reach of the senses yea & apprehension of the ancients that not knowing what to conceive it, they went above the clouds for a name cald it φμσιν αναλογον τῶ τῶν ἀστρων ατοιχήῳ, an expression however obscure & insignificant more like to give us a usefull notion of the thing, then the anatomist to shew us this archeus by w^{ch} name Helmont has as clearely & intelligibly explained it to us as Aristotle by his description (PRO 30/24/47/2 f.36v).

In this medical context, Locke had given exactly the same criticism of Aristotleanism as he did in Draft B. This "δημιουργὸξ" was out of the "reach of the senses"; the expression was "obscure & insignificant" and the explanation, as well as Helmont's, was not "intelligible". In *Anatomia*, Locke made his criticism of these two theories alone and did not pick out mechanism for a similar treatment. This is not surprising, as the entities that mechanists describe are easily imaginable, and the terms that they used stand for observable qualities. In *Anatomia*, Locke did not draw any further conclusions from this observation about the rivals to mechanism.

So, the seed of Locke's criticism was present in this work with Sydenham. We might ask why it was that this seed did not germinate until Draft B? As with all historical matters of this sort, where there is no telling textual evidence, it is impossible to produce anything more than a plausible conjecture. Draft A was concerned mostly with the knowledge we can have of the world. Having given his account of experience and

causation, Locke remained agnostic about the different theories of the world and so used theoretical terms freely, as in his previous medical work. Draft B had a broader outlook and took in not only our knowledge of body, but also our theories about it and was informed by the same considerations as had been put forward in *Anatomia*.

Whilst we may not know what is going on at the unobservable level, we can still talk and think about it, and, moreover, formulate theories as to what goes on in this part of nature. None of these theories will be capable of being definitively confirmed or refuted. Nevertheless we can introduce a minimum acceptability requirement of any theory that deals with the unobservable realm, namely that the theory be meaningful. For this to be so, the theory must employ terms that refer to the types of things that we have ideas of. In Draft A, Locke's position was that all our knowledge was based on experience, and in Draft B he extended his position so that all our theorising must also be similarly based. All this argumentation was developed from the various strands of thought that Locke took over from Sydenham. It is in *Anatomia* that we see the basic point that will be developed into the rejection of hylemorphism in Draft B. Locke was not asserting that the theory of hylemorphism was false, but was saying that this doctrine's claims fall beyond the scope of our understanding, because they don't pick out any ideas. Hylemorphism was rejected on the grounds that it was unintelligible, not that it was untrue. This was a significant change from Draft A.

The Acceptance of Mechanism

The rejection of the medieval position is thrown into even more sharp relief by Locke's attitude to mechanism in Draft B. Corpuscular examples were widespread. We have already seen that Locke used such examples in his descriptions of natural philosophical problems, exactly as he did in Draft A. Most of the corpuscular examples from Sections 15 to 17 of Draft A were recycled at some point at some point in Draft B. Some extra examples that utilised corpuscular terminology were also added in the writing of the later Draft (see, for example, Draft B, §58, p.161 and §20, p.131). It is clear that Locke was quite happy with this theory in Draft B as it lived up to the minimum standards set for theories that attempt to account for natural phenomena. Nor should this warrant astonishment, as the corpuscular theory was designed as one that took the mechanical characteristics of everyday objects to be the ultimate explanations for all natural phenomena. In so far as we have ideas of the shape, size and motion of bodies, the corpuscular theory evidently met the criteria of meaningfulness that scholasticism so pointedly fell short of. This much is obvious. What is not so obvious was Locke's assertion that mechanism was the *only* acceptable candidate for consideration. That this was his position can be seen in a careful examination of his theorising about the efficacy of causal interactions in the natural world.

It will be recalled that Locke's discussion of causation in Draft B was based largely upon the work that was done in Draft A, and that most of the text on this subject was merely copied from the previous source. As the editors of Draft B noted, "§§137-9 contain exceptionally few alterations" (Draft B, p.256, n.11). This is consistent with the fact that they were copies of previously corrected work. Section 138, however, was entirely new to Draft B. This Section, entitled "The efficacy of causes can be imagind to be noething but motion" put forward a new and crucial point:

> though in the effects we dayly see produced in the world we perceive or know very little of the ways whereby their causes operate yet I thinke I may venture to say we can hardly conceive their efficacy to consist in anything but motion (Draft B, §138, p.256).

This was a bold and sweeping assertion: Locke was saying that all natural events could only be imagined or conceived of as effects of the motion of bodies. Here, of course, we can see an example of Locke using "imagine" and "conceive" as synonyms. To think of something was, for Locke, just to have the idea of it, and this was just to manipulate a mental image. Locke used "imagine" in the title, and "conceive" in the text,

as they were, for him, the same thing. Such a bold assertion, on its own, however, must surely be deemed unacceptable. Thus far, Locke had not provided any reason why we should accept with equanimity such a substantive and contentious claim. He did not fail to make up for this lacuna in his argumentation.

Section 150 of Draft B contained a discussion of the "power" of one thing to alter and affect another. Locke, having discussed what was to be considered cause and what effect in any interaction, came to a general conclusion of what causal power was:

> efficacy or action how ever various & the effects almost infinite we can I thinke conceive in Intellectuall agents to be noething else but modes of thinkeing in Corporeall noething else but modifications of motion, I say I thinke we cannot conceive to be any other but these two for what ever sort of action besides these produces any effect I confesse my self to have noe notion nor Idea of & soe are as far from my thoughts apprehension & knowledge & as much in the darke to me as the Ideas of colours to a blinde man or the apprehension of ten senses are to me (Draft B, §150, p.262).

In this passage, highly reminiscent of Descartes' approach to these questions, Locke explained why he thought that the efficacy of natural causes could only be motion. He thought that he had an *idea* of this efficacy in the case of impacting bodies, and did not have any such idea elsewhere. Thus, in so far as the mechanical hypothesis was the only theory that relied upon the central notion of the motion and impact of bodies, and given Locke's stated belief that motion was the only idea by which we can conceive corporeal causation, mechanism was the only conceivable theory available to us. For Locke, it was the only conceivable theory, full stop.

It was his view that the motion and impact of bodies gave us an idea of causal efficacy. So, for example, his assertion was that in the case of one billiard ball hitting another, we can see the first ball cause the second one to move. It is this experience that gives rise to the idea, and Locke asserted that this and similar cases were the only ones in which we have an idea of causal efficacy in the material world, *at all*. With hindsight, a modern commentator acquainted with Hume and Newton, would dismiss such a position as nonsense. It should be borne in mind, notwithstanding all these contemporary considerations, that *Locke was not a modern commentator, and did not have the benefit of hindsight where this issue is concerned*. He had not yet met Newton, or read the *Principia*, and was destined to die six years before the publication of Berkeley's attack on his position. Locke, in this passage from Draft B, was clearly asserting that in corporeal interactions we have an idea of the causal efficacy and effect of motion and impact. He was asserting that we have no other idea of causal efficacy. The conclusion drawn was

evident: Mechanism was the only conceivable/imaginable theory in the realm of natural philosophy.

No such assertion was made in Draft A. Locke had plainly made another major change in his attitude to natural philosophy. Previously, he had been agnostic about the nature of unobservable causes. In Draft B, on the other hand, he restricted his theorising about unobservable processes to theories that employ terms that were meaningful. That is to say, theories that employed terms that refer to ideas which we have attained through sensation or reflection. Locke believed there to be only one such theory: the mechanical hypothesis.

In coming to theorise about the unobservable realm we have to create theories that are thinkable by us and so must be composed of ideas that are available to us; that is to say, the only way we can think of the unobservable processes that produce changes in material things, is in terms of the causally efficacious mechanisms that we can see in the everyday realm. How else could we possibly think of these processes, if not by the ideas that we have obtained in everyday experience? It is these ideas alone that compose the contents of our understandings:

> I beleive every one upon the examination of his owne thoughts & a through search into his understanding will finde that all the originall Ideas he hath there are noe other then of the objects of his sence or the operations of his minde, & how great a masse of knowledg soever he imagins to be lodgd there he will upon takeing a strict view see that he hath not any Idea in his minde but what one of those two have imprinted though perhaps with infinite variety compounded & enlarged by the understanding (Draft B, §20, pp.130-131).

According to Locke, we have no other option but to impose our ideas on the unobservable realm, in order for this realm to be conceivable by us. In other words, in order to meaningfully talk and think about processes at the unobservable level, we can't help but employ ideas from everyday experience. Given Locke's opinion that the only idea we have of causal efficacy is that of mechanism, it is clear that this is the only type of interaction that we can conceive/imagine at the micro-level of natural causation.

The alternative Locke spelt out: such a theory as did not use our everyday ideas would be as meaningless to him "as the Ideas of colours to a blinde man or the apprehension of ten senses are to ⟨him⟩" (Draft B, §150, p.262). This comment gives us two points to consider: firstly, in regard of the tentative recommendation this sort of consideration bestows on the corpuscular theory, and secondly, a thought regarding the theory's truth and falsity. Regarding the first point, we might like to consider what position the above-mentioned blind man is in. Clearly he has no ideas of colours, and

consequently any talk of colours will be meaningless to him, as the names of these colours will not pick out or stand for any ideas in his understanding. Locke was saying that any theory that used terms that do not pick out any ideas in our understanding will be like telling the names of colours to a blind man. But we have already met such a theory when Locke asked

> to what purpose is the precarious supposition of a forme, which to me & perhaps to others is but a sound without signification or a word without an Idea belonging to it (Draft B, §72, p.177).

The hylemorphic account was clearly one such theory that Locke had in mind, and this theory was, for the same reason, called "unintelligible". The terms it used did not stand for ideas, and so were as meaningless to us as the names of colours were to a blind man. The corpuscular theory, on the other hand, using ideas of solid bodies in motion causing other bodies to move by impact, did not have this problem. So, it was not like the names of colours to a blind man, and was not, therefore, unintelligible. This, though, does not make the theory true.

The second comment Locke made upon some theories being like the "apprehension of ten senses" to an ordinary man, highlighted the limited nature of this recommendation of corpuscular theory. Section 20 of Draft B contained an interpolated addition which noted that we acquire all our ideas from sensation and reflection, and cannot even think of anything not derived from these sources. This did not rule out the possibility, however, that there was much more to the world than the limited ideas that we have of it. We cannot just assume that our ideas of the world will tell us all there is to know about it, even if we can't conceive of what the ideas experienced in such a possibility would be like:

> This is the reason why though we cannot beleive it impossible to god to make a creature with other organs, & more ways to convey into the understanding the notice of corporeall things then those 5 he hath given to man, yet I thinke it is not possible for any one to imagin any other qualitys in bodys how soever constituted whereby they can be taken notice of besides sounds tasts smells, visible & tangible qualitys. & had mankinde been made with fower, the qualitys then which are the objects of the fifth sense had been as far from his notice imagination or conception as now any belonging to a 6th. 7th or other 8th sense can possibly be (Draft B, §20, pp.131-132).

This emphasised the limited nature of the recommendation in Section 150, as it is perfectly possible that there were other ways in which the world could be perceived, even though those ways were clearly unknowable by us: had we different senses, we might have different ideas, some of which ideas are of other causally efficacious

processes in the world.[140] We have no notion of how it is that these unobservable changes take place, not knowing how God has made the world, so can only formulate accounts in terms of the ideas we have available to us. The corpuscular theory was not then supposed to be the only possible theory there was, but was rather the only theory we could possibly conceive/imagine, given the restricted grasp we have of reality thanks to the limited types of idea we could possibly acquire. The world had no restrictions placed upon it by our limited ability to form conceptions of it, and so our intelligible theory may be a woefully inadequate characterisation of the nature of the world and its causal processes. We have to use it, though, as for Locke it was the only way that we can think about the world. To say a theory was intelligible, then, was not to say that it is true, but is rather to say that it was thinkable. What recommended corpuscularianism was that it was conceivable, or imaginable, while the alternatives were not.

I cannot over-emphasise the importance of this point in coming to a full understanding of Locke's thought in the domain of natural philosophy. Locke signed up for mechanism because he believed that it was the only theory that was based in experience and that all our knowledge and theories about the world must be so based. It was during the period that he was writing Draft B that Locke became a fully committed mechanist.

[140] This may not seem clear at first, so an example is perhaps in order. Imagine a creature with only three senses: taste, smell and hearing. An oyster perhaps has only these three sensory modalities. Now, if oysters were the sorts of things that went about making up theories about natural processes, they might be hard pressed to come up with a conception of motion and impact, having no feelings of touch, and no visual perception of things bumping into each other. Their notions of causal processes would be most likely based upon the relations between smells and tastes, or some such. Since we are in the privileged position of having the senses of sight and touch, thinking of the world in terms of motion and impact is easily done. In spite of this, though, our conceptions may not exhaust the reality of the situation. In the same way as motion and impact is inconceivable to the Lockean oyster, thanks to its few and meagre senses, so might other causal processes be unthought of by us, for the same reason.

Relations with Descartes

What sort of mechanist was Locke? There had been ambivalence on his part towards the Cartesian position in the mechanistic tradition (Draft A, §27, pp.45-46). In Draft B there was another example of the development in Locke's thought, this time rooted in the nature of substance. Locke was happy to assert "that we have noe Ideas nor notion of the essence of matter, but it lies wholy in the darke" (Draft B, §19, p.129). This led to conflict with Descartes once more. Locke pointed out that some ideas enter the understanding by more than one sense: "v.g. extension by the eyes & touch" (Draft B, §29, p.139). He then speculated as to the origin of some of the doctrines of his recent philosophical predecessors, the target of his remarks clearly being Descartes:

> hence perhaps it comes to passe that some have made the whole essence of body to consist in extension, because their mindes were soe full of the Ideas of it, which still adhered to & was connected with all visible & tangible objects, & were soe forward to affirme that the essence of any body must needs be extension because we could not imagin any sensible quality of any body without extension (Ibid.).

In the earlier Draft, Locke had allowed that making the word "body" stand solely for the idea of extension was as legitimate as another definition which made the word stand for a complex idea composed of extension and impenetrability, such stipulations being concerned with words and not things. Section 29 of Draft B, while about the same topic, looked at it from a different angle; it was not just about the idea we have of "body", but about what we suppose the essence of body, or matter, actually is. In this regard, Locke was not so forgiving:

> had these men considerd their Ideas of tasts smells & sounds of hunger & thirst & other pains, they would have found that they included in them or had annexed to them noe Idea of Extension at all. which is but an affectation of body as well as all the rest discoverable by our senses which have noething at all to do with the essences of things (Ibid.).

Locke's first point was that several of the ideas of sensation we have, do not appear to have anything to do with extension at all; extension was not included in these ideas, nor was it "annexed" to it. This later term is odd, and may prefigure some of the thought that Locke had in the *Essay* about our ideas of secondary qualities, where God could "annex" certain ideas to things "with which they have no similitude" (II.viii.13), the ideas in the case of the *Essay* being the ideas of secondary qualities, which were annexed to various motions of tiny pieces of solid matter. Perhaps what Locke was saying in this

passage from Draft B was that extension *simpliciter* could not explain the occurrence of these ideas in us. The point of this passage seems to be very general; it was hard to maintain that extension was the essence of something with which it had no conceptual or causal connection. It is far from clear that this was a fair criticism of the Cartesian position, as Locke made no effort to specify what this "annexation" of ideas to extension amounted to. Nor had he given any plausible alternative account, as yet.

The second point was similar to that made in Section 19 of Draft B, namely, that since extension was just one idea among many, it could not comprise the body, substance or matter that was supposed to be the support of our ideas. Locke asserted that ideas have nothing to do with essences at all, so if Locke did not mean this in his argument of Section 19 of Draft B, it is clearly what he meant here. He did acknowledge the Cartesian argument from elimination, but found it wanting:

> if those Ideas which are constantly joynd to others in our thoughts must therefor be concluded to be the essence of those things which have those Ideas joynd to them & are inseperable from the then certainly **Unity** is the essence of every thing. For there is not any object of sensation or **Reflection** which besides its owne peculiar simple Idea doth not also suggest & insinuate that of Unity (Ibid.).

Locke meant this to be a *reductio ad absurdum* of the Cartesian position; just because some ideas always accompany others does not give these first ideas special status, as there are other "non-essential" ideas that have this property too. No one, Locke supposed, would want to say that "Unity" was the essence of everything. So, even supposing that extension was inseparable from the idea we have of body, this by no means signified a special relationship between these two ideas. It is not at all clear, however, that Locke's points counted against the Cartesian argument as the example used, that of "Unity", ranged over a wider domain than that of the Cartesian argument. Descartes had argued that all the clear and distinct ideas of things without us contained the notion of extension, and thus far Locke is correct in his exposition. But, Descartes was looking for some idea that only occurred in what Locke would call ideas of sensation, and did not occur at all in what Locke called ideas of reflection. For Locke then to argue that there were some ideas that accompany all ideas all the time, for example, the idea of "Unity", was for him to go beyond the scope of the original argument, and render his criticisms irrelevant. Descartes' argument was supposed to differentiate matter from spirit, and for Locke to find something common to both was not to show it was essential to either.

Locke was trying to move away from the Cartesian position, and when he stuck to his empiricist arguments regarding our idea of substance, he was on safe ground. But

he was not so successful in his attempts to show that the Cartesian idea of body was fundamentally flawed. He gestured towards some ideas that could not easily be accounted for solely by extension, but even Descartes himself insisted upon motion as being a vital part of the causal processes in nature.[141] Nor had Locke provided a suitably compelling alternative to Descartes' thought. He has attempted to refute Descartes' elimination argument, but did not properly take account of the scope of the discussion.

[141] Locke himself had made a very similar point himself some years earlier in the note on the Cartesian conception of a vacuum (BM Add MS 32554 ff.75r&95r).

The "primary Ideas" of Body

Locke may not have conclusively confuted the Cartesian position on mechanism at this point in his career. Nonetheless, the criticism of Descartes was interesting in so far as it raised the question of how ideas like pain, colour, sound and smell were to be accounted for in the Lockean system. Locke did not deal with this issue in a decisive manner when he was first composing Draft B. I shall show that it was only after the main body of text had been completed that Locke came to give the question serious consideration. However, in line with his mechanical outlook, there are some examples in the main text of Draft B in which Locke regaled us with stories of how ideas, such as colours and sounds, were caused in a mechanical world. For example, in a discussion of the scope and applicability of our knowledge of numbers, Locke came to consider how sound might be produced in us, and thus be made describable by numbers:

> all the degrees of sounds or any other simple Ideas, which difference of degrees comeing for aught I know from either a different number of particles affecting the sense or a swifter motion (which is a kinde of extension) of them, may also be very well resolved into number (Draft B, §46, p.154).

Here it was the difference of the motion or number of particles that may be responsible for the ideas we have of different sounds. Locke also used an account of the origins of colours and tastes that first appeared in Draft A:

> white or sweet &c & many other sensations & Ideas be perhaps caused in us, by particles of certain figures (Draft B §96, p.215 cf. Draft A, §17, p.32).

So, there were textual hints that particles were responsible for producing ideas in us.

It is noteworthy, also, that some points which in the later development of the *Essay* would play a significant role in the account Locke gave of colours, etc., appeared in Draft B. In Draft B, however, they did not play anything like the same roles. For example, the beginning of Book II, chapter VIII of the *Essay* said that positive ideas could come from privative causes. In Draft B, Locke's discussion of this possibility came right at the end of the discussion of simple ideas. In this way, it can be seen as a final point about simple ideas before beginning the discussion of our complex ideas of substances. The point was made not for any further philosophical argument to be developed, but was merely a point of interest which easily flowed as a consequence of the non-resemblance between our ideas and qualities (as had been painstakingly stated in

Section 35 of Draft B). A consequence, moreover, that was consonant with common sense. Locke noted that

> Before we wholy take leave these simple Ideas & goe on to the more complex ones we are to take notice that whatsoever alters the senses soe as to cause any sensation within in the minde, doth there produce in the understanding a simple Idea which is by the minde looked on & considerd to be a reall positive Idea in the understanding as much as any other whatsoever, though perhaps the cause of it which gives denomination to the subject whence the senses take that Idea be noe thing but a meere privation (Draft B, § 58, p.161).

He then continued in the same vein for the rest of the Section, noting that the ideas and the qualities were "two very different things & carefully to be destinguished. In Draft B, these points were just consequences of a distinction previously made. In the *Essay*, however, these Sections formed the basis of the first three Sections of Chapter VIII, Book II: "*Some farther Considerations concerning our simple* Ideas". This chapter is central to the study of Locke's natural philosophy because it is the main passage of argument involving the primary and secondary quality distinction. It is beyond the scope of this present chapter to examine the structure of this chapter of the *Essay* with the requisite care and detail, but some brief remarks might be useful at this point.

In Chapter VIII of Book II, these reflections, first noted in Section 58 of Draft B, were not supported by any sort of reasoning. Locke merely asserted that it was possible for positive ideas to be caused in us by what are privations in the things outside us. He further elaborated the possible reasons for this in Sections 4, 5 and 6 of this Chapter, the content of which is not to be found in Draft B. It was after these considerations that Locke, in the *Essay*, went on to make the distinction between the ideas we have of things and the qualities that cause them. This distinction was first made in Section 45 of Draft A, so chronologically it preceded the discussion of positive ideas form privative causes in Draft B. However, it was only in Section 7 of Book II, Chapter VIII that it appeared. The structure of Chapter VIII, then, does not really reflect the development of Locke's thought on this point. The order of the argument in the Drafts was precisely the opposite of that later presented in the *Essay*. In the Drafts Locke first distinguished between ideas and qualities (at the end of Draft A), and only then noted that that ideas could be positive even if their causes were privative (in §58 of Draft B). In Draft B, Locke did not draw any consequences from the points made in Section 58, and they were not used to support any further philosophical arguments.

Another example of this, was Locke's use of the hot and cold water experiment. In the *Essay* this was used as an argument in the debate concerning primary and

secondary qualities (II.viii.21). The same type of example occurs in Draft B, although the context it appeared in, and the point it was taken to make were entirely different from that of the *Essay*. Section 40 of Draft B was concerned with the knowledge that was acquired through the receiving of ideas from outside of us:

> In fine then when ever our senses doe actually convey into our understandings any Idea. we have a certein undoubted knowledg that there doth some thing at that time realy exist without us which doth affect our senses & by them give notice of its self to our apprehensive facultys, & actualy produce that Idea which we then perceive (Draft B, §40, pp.147-148).

This thought was qualified in the *Essay* by the consideration that this knowledge of existence truly extended so far as the testimony of the senses, and that as soon as something was beyond the reach of our senses, its existence was by no means guaranteed. This was not the sort of worry that troubled Locke when he was writing Draft B. Here the problem concerned what different ideas this same thing may cause in myself or others who had the same object before them. For example, if I become ill, what I yesterday perceived to be sweet, I will today taste as bitter. Locke then went on:

> And a mans owne hands may be soe orderd that the same water may at the same time feell warme to the one & cold to the other, in which case though his two hands give different reports of the same thing yet his Ideas of heat & cold are not thereby one jot disturbd or confounded but remain cleare & destinct as ever, & he certeinly knows that something exists without him which at that time produces in him those 2 different Ideas of hot & cold. though he doe not know what Ideas the same thing would produce in an other man that should apply his hands to it (Draft B, §40, p.148).

This was far from the point made in II.viii. We can also see that II.viii was a discussion that was put together from a variety of different sources. What may sometimes be taken as bad argumentation, was symptomatic of the cut-and-paste approach to the writing of this passage. Locke pulled lots of different bits of argumentation from various sources; that this failed to create a persuasive or clear-cut argument should not be too surprising. So, whatever the argument of Draft B, it was not going to be presented along the same lines as later found in the *Essay*. We will see this in Section 94 of Draft B, the very first time Locke made anything like the primary and secondary quality distinction.

Section 94 was, when first written, a succinct discussion that took up roughly half of a manuscript page. It started by stating that "We have a certain knowledg of the past existence of severall substances … but this knowledg also reaches noe farther then our senses" (Draft B, §94, p.208). The only exception Locke made to this general rule was the existence of God (Draft B, §94, p.215), which Locke promised to discuss "hereafter". So much for the first version of Section 94.

Locke did not make good his promise in the Sections that make up the remaining extant portion of the Draft. But he did not forget his undertaking, and in the evidence we have from the construction of the manuscript, we can see that the promise was kept after the bulk of the text was completed. In order to show this, however, we must first embark upon a digression about the method that Locke used in writing Draft B. The manuscript was originally constructed of unbound quires of paper. Locke only wrote on the right-hand pages at first, leaving the left-hand pages for any subsequent material that he might add. However, if an addition was longer then the space remaining on the left-hand page, a further sheet could be inserted into the quire. Consequently, another blank leaf would appear on the opposite side of the quire. Thus, if we find a blank piece of paper at this point we can safely assume that Locke wrote the addition at some point after the quire was full up with text. So, blank conjugate leaves indicate a later date of writing.

It is this reasoning which makes it likely that Locke did keep his promise in the way he described: he did discuss the idea of God, but in a later insertion which was placed into the text before the promise appeared in Section 94. We know that it was later because the insertion started on a left-hand page, MS page 306^{a} (BL MS Locke f.26, as marked on the MS itself and not as marked in the Nidditch and Rogers edition, so too with all the following MS references), and ran on to two extra inserted leaves (MS pp306^{d-g}) which corresponded to two blank leaves later in the quire (MS pp.314^{b-e}). In this insertion, Locke first discussed our notions of the essences of both material and spiritual substance, and then went on to discuss our ideas of God and spirits. He finished with a few notes on the knowledge we have thereby, and a sideswipe at the Cartesian proof of the existence of God from Meditation III (Draft B, §94, pp.214-215).

Notwithstanding all these additions, Locke had not finished with Section 94. Immediately after the discussion of our idea of substances, he made another insertion into the text. Because in the previous addition he had departed from his usual system of only using right-hand pages, and used the left-hand ones too, he had no spare space for the addition and had to insert yet another piece of paper into the quire (MS pp.306^{b-c}, correspondent to MS pp.314^{f-g}). This addition was clearly written later than the previous one, firstly because it over-ran that additional sheet and had to use the margin of a sheet previously added. Secondly, every other page in the document was written from left to right, except for this addition. The page was rotated ninety degrees clockwise as Locke wrote on it so that his writing was parallel to the margin. This means that, compared to

every other page, the writing starts at the bottom of the page, and goes to the top. This does seem to indicate a clear difference between this addition and the previous one, a difference indeed between this addition and the rest of the document. This difference might not unreasonably be attributed to a difference in the time of writing between this part of the text and all others. That is to say, it may well have been the last addition that was made to Draft B, since it was the only example of an insertion in an insertion within the text of Draft B, and differed radically from the rest of the document.

It is only in this later (and possibly final) addition that Locke first discussed the distinction that will come to be known as that between primary and secondary qualities. If, as seems likely, this addition was made after the bulk of the document was completed, it means that Locke's discussion of the issue was both temporally and logically consequent to his argumentation about, and acceptance of, mechanism. This new insertion came directly after Locke's discussion of the ideas we have of both material and spiritual things. These ideas were just collections of external and internal sensations. Locke later returned to the text to add the following:

> Nor after all the acquaintance & familiarity which we imagin we have with matter, & the many qualitys men assure them selves they perceive & know in bodys, will it perhaps upon examination be found that they have any more or clearer primary Ideas belonging to body then they have belonging to spirit, for seting aside Extension and Cohæsion of parts, all other qualitys we observe in, or Ideas we receive from body as destinguishd from spirit ... are probably but the results & modifications of these, for impenetrability or a power or receiveing & communicateing motion by impulse or protrusion is a necessary consequence of extension & cohæring of parts: figure also is but the termination or modification of extension in the severall masses of such cohereing parts. & all other sensible qualitys in bodys as heate cold colours smels tasts & all the objects of sense & the Ideas thereof produced in us are probably in the bodys wherein we imagin they reside noe thing but different bulke & figure & in us those appeareances or sensations of them are noe thing but the effects of various impulses made upon our organs by particles or little masses of bodys of different sise figure & motion (Draft B, §94, p.209).

This is a complex and important passage, so we need to unpack its meaning carefully. It is clear that the argument was meant to separate the "primary Ideas" we have of body from what were, presumably, their inferior counterparts. It is also clear that Locke took "Extension and Cohæsion of parts" to be the primary ideas we have of bodies. The question this poses, is how the primary ideas differ from the other ideas we have of external objects? The answer can be found in a comparison with the primary ideas we have of spirit "viz perception or **knowledg** or thinkeing and a power of voluntary motion ... from these two flow all those operations of our mindes within" (Draft B, §94, pp.209-210). It seems that in both matter and spirit, the primary ideas were the ones that were in some way responsible for all the other ideas. This is why Locke said that "all

other qualities we observe in, or Ideas we receive from body … are probably but the results & modifications of these". That is to say, they were the results and modifications of "Extension and Cohæsion of parts". The primary ideas for Locke were those upon which all others depended.

Having established what these primary ideas were supposed to be, and what role they were supposed to play, we can examine in what way all the other ideas we have of body "flow" from these two. The other ideas seem to fall into two groups: those ideas that were conceptually dependent upon these primary ideas, and those that were in some sense causally dependent upon the primary ideas. The first group mentioned was the conceptually dependent group: impenetrability and a communication of motion by impulse were a "necessary consequence" of these two primary ideas. The idea of figure was just the idea of the boundary of the extended cohering parts. By identifying what he took to be the conceptual antecedents of the group Locke tried to identify the two primary ideas, i.e. those ideas from which the other ideas we have of body "flow". So, Locke had a set of related ideas: extension, cohesion of parts, figure, impenetrability and the communication of motion by impulse, the latter three being derived from the former two.

In addition to this, though, there was a second set of dependent ideas: "heate cold smels tasts". According to Locke these ideas had a different status from those we have just been discussing. We imagine that these ideas are in the bodies themselves, but Locke thought that this was not so; rather, he thought that they were "probably ... noething but the different bulke & figure & in us those appearances or sensations of them are noe thing but the effects of various impulses made upon our organs by particles or little masses of bodys of different sise figure & motion". It should be clearly noted here that the relation of this set of ideas to the primary ones was not one of conceptual consequence. Locke said that it is only probable, not certain or necessary, that the causes of these ideas were nothing but "bulke & figure" in the objects themselves. He also thought that the relation between the things the primary ideas are ideas of and this second set of ideas produced in us, was a causal one: the appearances in our minds of this second set of ideas were nothing but the *effects* of the impact of tiny particles. These particles were to be characterised solely in terms of the primary ideas we can have of them. These ideas in the second set were the causal effects of the action of bodies, the bodies themselves being characterised in terms of the primary ideas and their conceptual derivatives. Locke was also clear that this second set of ideas, when referred

to the objects themselves, were nothing but modifications of bodies and were to be characterised solely in terms of the two primary ideas and their conceptual consequences. So there was nothing like our ideas of this second set in the objects themselves: there were just little particles of matter, which are described solely in terms of the primary ideas of body.

We may well ask why it is that Locke felt entitled to distinguish ideas in this fashion. Why put smells, tastes and colours in one group, and bulk, figure and motion in another? Recalling Locke's previous comments about the causal efficacy of motion and impact, the conclusion should be obvious. He had already stated that the *only* way he conceived bodies to produce any effect was by motion and impact. The only features of bodies that were relevant to this causal process were the motion, figure, size and number of the objects involved. The other ideas we have of body did not contain anything like the motion and impact of solid bodies. Nonetheless, all the ideas that we have can only conceivably the effects of these qualities; so, given Locke's prior restrictions on causation, they can only be brought about by the qualities of bodies that relate to motion and impact. Thus, ideas of things not transparently related to the motion of solid bodies in impact must, nonetheless, be conceived of as mere effects of such impacts. This is so, according to Locke, because there was no other way in which we can conceive/imagine any effect to follow from any cause in the natural world. To assert that there is anything in bodies like colour as it is perceived by us, which causes that ideas we have of it, is to postulate some non-mechanical causal process. But Locke already ruled out such a conceivable/imaginable possibility, given the ideas that we have of causal efficacy. Consequently, all the ideas that we have can only be conceived/imagined to have been caused in us by the motion and impact of bodies.

The identification on Locke's part of the two primary ideas we have of body amongst those which are concerned with mechanical interaction was an attempt by Locke to find the most basic ideas we have of body in a manner akin to the Cartesian project of exclusion. It is evident that Locke was identifying the primary ideas by a process of ratiocination, all based upon the premise that we can only imagine or conceive bodies to affect each other causally by motion and impact. Locke's basic premise, that we can't think of casual processes except in mechanical terms, was derived from experience. From this premise, he reasoned that there were two main categories of the ideas that we have of bodies: those ideas that are of the mechanical interactions, and those that are not. Given his premise, he inferred that the latter must be

conceived/imagined to be the effects of the former. And within the former group he identified those which he took to be the most basic "primary Ideas". He could then state that all the ideas of the mechanical aspects of bodies were derived from these, and that all other ideas were mere effects of the things that the primary ideas are ideas of, i.e. the mechanical affectations of body. There was no other way that the ideas could have been produced. Locke's conclusion was the end-product of a complex series of ratiocinations, all based on one empirical premise. It should be clear also, from the highly Cartesian tone in which Locke wrote his argument, and the surrounding discussion of Cartesian issues, that Locke's position was a response to Descartes. When Descartes attempted to identify the essence of body, Locke disagreed with him, as Locke believed that we had no knowledge of the essences. However, when Locke came to account for the ideas that we have of bodies, he presented his thought as a replacement of the Cartesian scheme: in spite of the fact that we can't know the essence of matter, we can infer that some ideas are more important then others, because we can derive all others from these two primary ideas. It is significant that the main difference between Locke and Descartes, regarding their respective ideas of body, was that Locke posits extension and some other factor. Clearly he felt that the Cartesian insistence on extension alone was insufficient to account for the phenomena. Locke wanted to incorporate some sort of mechanical impact into his account. This may explain the remarks that Locke had made earlier about the Cartesian theory: his thought was that the Cartesians had not taken into account ideas of smells tastes, and the like, which "had included in them or had annexed to them noe Idea of Extension at all" (Draft B, §23, p.129). It seems that Locke's main objection to Descartes' theory was that it did not properly take into account the central role of impact and solidity. Locke's argument, therefore, can be seen not as a outright rejection of Descartes' mechanistic theory, but rather as a correction of it. Nonetheless, this was not an attempt to pry into the essences of things, the knowledge of which Locke took to be as far away as ever:

> The essence of Spirit is unknowne to us & soe is the essence of body equaly unknowne to us (Draft B, §94, p.210).

It was only after Locke had discussed the primary ideas of bodies that he turned to consider his descriptions of the bodies themselves. Given his previous work, he would once more be referring to solidity, extension etc., but this time it would be in regard to the things themselves. So, immediately after his assertion regarding our

knowledge of the essences of substances, he pointed out what we can claim to know in bodies themselves:

> Two primary qualitys or propertys of body. viz Extension & cohæsion of parts we perfectly know & have destinct cleare Ideas of ... we have also the knowledg of severall qualitys inhærent in bodys & have the cleare destinc Ideas of them. which qualitys are but the various modifications of the Extension of Cohæring parts & their motion (Draft B, §94, p.210).

Locke also outlined the two "primary qualitys or propertys of spirit" (Ibid.). Now that Locke was talking of the things themselves, which cause the ideas in us, it is no surprise to see him refer to the "qualitys" of bodies. His reference to "propertys", however, is a little more mysterious. Indeed, Locke referred to the "qualitys or propertys" of things on a number of occasions in Draft B. (See, for example, §72, p,176, §60, p.163 and, more ambiguously, §73, p.179.) What did this mean?

Locke's use of the word "quality" was developed from the Aristotelian theory of the categories, the main difference between the two being that Locke referred solely to the things themselves, rather then our perceptions of them. Regarding "propertys", however, he made no such pronouncements. Properties came from a different part of Aristotle's work: the predicables. Properties were those things that flowed from a species' essence, i.e. genus plus differentia. In Draft B, this word was used in a traditional Aristotelean sense. For example, in Section 44, Locke referred to demonstrations made about an equilateral triangle, as regarding that triangle's "propertys" (Draft B, §44, p.210). Also, when considering sprit, Locke talked of the "many species of spirits as much separate one from another by destinct propertys" (Draft B, §81, p.189). In this Draft of the *Essay*, Locke was using the word in its traditional way. What, then, are we to make of this reference to the two "primary qualitys or propertys of body"?

It might seem that he had just made a slight technical error in his confusion of the two terms, but it may be that the "or" here was not meant to imply synonymy between the two terms. Rather, I think Locke used these terms as possible alternative descriptions of extension and cohesion of parts. The fact that Locke used these two terms as alternative descriptions, points out the difficulties he found in the idea we have of material substance. This can be seen if we apply one or other of the Aristotelian-derived schemes to the idea we have of material substance. On the one hand, we ask what material substance is like, and say that it is extended and coherent. This application will apply also to Locke's own use of the word "quality": we can simply say that there is something in the substance that causes in us the idea we have of extension and cohesion

of parts. Alternatively, we could call these things properties of material substance, i.e. things that flow from that substance's essence; indeed, extension and the cohesion of parts are as good a pair of candidates as we have come across. However, such a point must remain undecided, as we have no knowledge of the essence of material substance. Thus, we cannot say whether the extension of bodies and the cohesion of their parts are mere qualities of material substance *or* are properties of it. Using the phrasing "qualitys or propertys" could then be seen to highlight once more how little we know of the constitution of natural bodies. This would be entirely consonant with the tone of the passage where we have

> but some few superficial Ideas of things discoverd to us only by **Sensation** or **Reflection**. we have no knowledg beyond that much lesse of the essence of things being destitute of facultys to atteine it (Draft B, §94, p.211).

Locke's phrase "qualitys or propertys" used the Aristotelean framework to bring out the fact that we have no notion of the essence of substance. Extension and cohesion of parts might be qualities of bodies, they might be properties: we just can't say. In this way his assertion about which ideas depend on which others in our thoughts about body in no way conflicts with his more general denial of the knowledge of the essence of substance. It is in this extremely subtle and complex way that Locke introduced the distinction between the primary "qualitys or propertys" of bodies and the other qualities. Locke's conclusion was the product of closely reasoned argument based upon considerations of conceivability. It was more complex than is commonly supposed.

However, Locke was not uncritical in his acceptance of the corpuscular theory. He had already allowed that there may be more to the world than he can form a conception of, and went on to note that some aspects of the theory are difficult to grasp:

> the notion of body is cumberd with some difficultys very hard to and perhaps impossible to be explaind or understood. for I would fain have instanced in any thing in our notion of spirit more perplexd or nearer a contradiction, then the very notion of body includes in it, the divisibility of body in infinitum of any thing extended involveing us whether we grant or deny it in consequences impossible to be explicated or consistent (Draft B, §94, p.211).

Locke was happy to assert that the corpuscular theory was by no means problem-free, despite the fact that it was the only conceivable theory, nor was his attitude unexpected given his adherence to Sydenhamian tenets. Indeed, it was the re-iteration of one of these central themes that ends this final addition to §94. Locke noted that:

> when soever we would proceed beyond those simple Ideas we have from Sensation & reflection (which we can in our whole extent of knowledg & imagination only extend enlarge repeat & joyn togeather) & peirce farther into the nature of things we fall presently into darknesse & obscurity. perplexedness & difficultys & can discover noe thing farther but our owne shortsightednesse & ignorance (Draft B, §94, pp.211-212).

Locke did not feel there was any incompatibility between this assertion regarding our knowledge of bodies, and the division of the qualities of bodies into two different types. Nor, when we come to a consideration of Locke's natural philosophy, should we.

Science

We can see that Locke had made great progress towards the thinking of the *Essay*: the corpuscular theory had been given a philosophical grounding, and one of its consequences, the primary and secondary quality distinction (albeit in nascent form), was drawn out. One of the areas where progress had not been made, however, was in the descriptions of the essences of particular things. In one respect Draft B was a great improvement on Draft A, in that in Draft B the essences of things were not universals or scholastic species, but were the products of the human understanding. This was exactly what the Locke of the *Essay* will call a substance's nominal essence:

> the *nominal Essence* of *Gold*, is that complex *Idea* the word *Gold* stands for, let it be, for instance, a Body yellow, of a certain weight, malleable, fusible and fixed (III.vi.2.).

In the *Essay*, the nominal essence was contrasted with the real essence:

> the *real Essence* is the constitution of the insensible parts of that Body, on which those Qualities, and all the other Properties of *Gold* depend. How far these two are different, though they are both called *Essence*, is obvious, at first sight, to discover (Ibid.).

This contrast was never drawn in Draft B. Whilst Locke had acquired, at this point, all the philosophical material he needed in order to be able to describe the real essence in terms of the corpuscular substructure, it had not apparently occurred to him to do so. It is clear in Draft B that the qualities we perceive in bodies, and their mutual interactions, were to be explained solely in terms of corpuscular impacts, so it would have been perfectly possible for him to describe what it would be like for us, if we had ideas of the mechanisms responsible for the effects we see at the everyday level. Locke did not do this in Draft B and the reason for this could perhaps be his scepticism about our ability to discover the internal fabric of bodies. The benefit of describing a set of ideas that we could never acquire was perhaps not apparent to Locke at this stage. Possibly this is why he did not think it necessary to outline anything comparable to real essences in Draft B.

This, of course, had the consequence that our characterisation of what will count as a scientific knowledge of bodies in Draft B will differ from that of the *Essay*. In the *Essay*, the ideal form of knowledge of bodies was a knowledge of the real essence of a particular substance. From this knowledge, we could deduce the properties of bodies. However, in the *Essay*, the scepticism about our ability to penetrate into bodies still held, so

> *we have very imperfect* Ideas *of Substances*; and the real Essences, on which depend their Properties and Operations, are unknown to us. We cannot discover so much as that *size, figure*, and *texture* of their minute and active Parts, which is really in them; much less the different Motions and Impulses made in and upon them by Bodies from without, upon which depends, and by which is formed the greatest and most remarkable part of those Qualities we observe in them, and of which our complex *Ideas* of them are made up (IV.vi.12).

It is because of this deficiency in our perceptual faculties that natural philosophy would never be a science:

> therefore I am apt to doubt that, how far soever humane Industry may advance useful and *experimental* Philosophy *in physical Things, scientifical* will still be out of our reach: because we want perfect and adequate *Ideas* of those very Bodies, which are nearest to us, and most under our Command (IV.iii.26).

As there was no explicit formulation of the "real essence" of a body in Draft B, nor a description of the science of body in these terms, the science in Draft B only concerned our everyday complex ideas. Accordingly, what made up a scientific knowledge of bodies in Draft B was based purely on the collections of simple ideas that were caused in us by those bodies. This meant that the conception of a scientific knowledge of bodies was roughly the same as that which had appeared in Draft A, and indeed the relevant passages in Draft B were largely taken from this earlier source. The first significant mention Locke made of the subject in Draft B was in Section 61, as part of his discussion on the ideas we have of substances. Prior to correction, this passage was closely related to a similar Section in Draft A:

> *Substances* For he knows most of any particular substance who knows most of those particular simple Ideas, or rather qualitys which are causes of these simple Ideas which doe exist in it, among which are to be recond its active powers & passive capacitys (Draft B, §61, p.163)

> Now concerning these substances or collections of simple Ideas, he knows most of any one in particular who knows the most of the sensible qualitys that are in it or the powers of it which are either active as an ability or aptnesse to produce certaine sensible qualitys in some other subject or else passive (Draft A, §2, p.8).

Locke felt that saying you "know" most of a substance was not quite the right way to characterise the complex ideas we have of that substance. Knowledge, even at this early stage for Locke was not just of ideas, but the perception of the relations between ideas, as when "We have a certaine knowledg that one Idea is not an other" (Draft B, §34, p.142). Thus, he felt that he should alter the wording of this passage to keep his thought consistent, and so talked of the perfection of our idea of that substance:

> *Substances* For he hath the perfectest Idea most of any particular substance, who hath gatherd & put togeather most of those simple Ideas, or rather qualitys which are the causes of these simple Ideas which doe exist in it, among which are to be recond its active powers & passive capacitys (Draft B, §61, p.163).

We can see here that the thought of Draft B on this point was very close to that of Draft A, and the most perfect idea of any substance was not an idea of the substance's internal constitution, but was merely a fuller enumeration of its qualities.

More repetition of Draft A's thought occurs in Section 67 of Draft B, where Locke noted that

> when any man hath made a perfect collection of all the simple ideas which are united togeather in any one subject v.g that which he calls gold he hath a perfect Idea of that thing, & an enumeration of those simple Ideas is a perfect definition of that word (Draft B, §67, p.171 cf. Draft A, §1, p.2).

This whole passage was taken from Section 1 of Draft A, some of Locke's earliest thought on human understanding, and was only slightly modified in Draft B. Indeed, Locke's definition of what it was to have a scientific knowledge of bodies in Draft B was merely a re-organised and slightly expanded version of the same thought in Section 7 of Draft A:

> He that frames in his minde a Complex Idea of all those simple Ideas which are in any sort of things, hath a perfect notion of that sort of things, but of this I must forbeare an instance till I can finde one. And such a man may speake properly, define perfectly & scientifically & by defineing give a perfect account of the nature of that sort of things (Draft B, §93d, p.202 cf. Draft A, §7, p.17).

The only significant change here from the Draft A version was that Locke was concerned in Draft B with sorts of things rather than individuals, and this makes sense, given the fact that any science of bodies will not be concerned with individual substances but rather with substances of a certain type. What would be the practical use of having a perfect knowledge of one particular substance, for example, all the qualities inherent in an individual ring on my finger?

The science of bodies in Draft B dealt with the sensible qualities of bodies, not with the internal constitution of those objects. This meant that in order to have a good scientific knowledge, the way to proceed was not to loosely apply names to things the ideas of which we had not properly investigated; what was needed was a careful examination of the qualities of substances, and this examination

> requires a laborious & exact scrutiny into the nature of the things & a searching out all their qualitys & propertys which being collected into one complex Idea is a true

> description of that thing, & the seting downe the particular simple Ideas makeing up that complex Idea is the definition of the name of that thing (Draft B, §72, p.176).

Locke thought that such an endeavour was not an easy one, as "a tolerable history of things is not to be made without long time & great industry" (Draft B, §85, p.192), and indeed, this was something of an underestimation on his part, there being, as previously pointed out, no *a priori* limit to the number of powers a substance can have. But the problems with Locke's endeavour were not only theoretical, as Locke noted that the inquiries which were being made in this direction often ran up against severe practical difficulties. We could attempt to rank and sort things by looking at the ideas they produce in us, but

> it is yet certain that many of those Individuals which are ranked into one sort, & soe cald by one common name & received as being of one species have yet qualitys as far differing from others of that species & name, as they have from other things from which they are accounted to differ specifically. This as it is easily observed by all people that have to doe with natural bodys soe the chymists especially are often by sad experience convinced of it, when they in vain seeke for the same qualitys in one parcell of sulphur antimony or vitriall which, they have found in others, which bodys being deemd of the same species & soe cald by the same common name, doe yet upon severe ways of examination betray qualitys soe contrary one to an other, as to frustrate the expectation & labour of the most wary chymist (Draft B, §83, p.191).

Here we see some of Locke's earlier experience of chemistry put to good use.

It is no wonder that Locke thought only a little progress had been made in his own time towards a comprehensive natural philosophy. But that Locke did not make the move from characterising science in terms of the real, rather than the nominal essence, should not be seen as a serious flaw in his early philosophical thought compared to that of the *Essay*. This is due to the fact that the methodology of natural philosophical enquiry in the *Essay* was virtually identical to that proposed in both of the early drafts of the *Essay* and Sydenham's work. It is true that in the *Essay* "scientific" knowledge pertained to the real essence, but since Locke's early scepticism about the possibility of prying into the fabric of bodies still held in 1689, the nominal essence was all we had to deal with and so it had to suffice for all our knowledge of the workings of nature. The same method of natural histories, with all their drawbacks, would be proposed in the *Essay* too, as the only way in which we can be acquainted with bodies. The only lack in Draft B was the description of what real essences were, and how they would help us, if only we could perceive them.

In conclusion, then, we can see that in terms of natural philosophy, Locke made a great step forward in Draft B. He clearly drew the distinction between qualities and

ideas, and incorporated it into his thoughts about substances. He also outlined the standard by which natural philosophical theories should be judged: such hypotheses must be couched in terms of the ideas that we have through sensation or reflection. By this standard hylemorphism was rejected, although some of its some of its terms were taken over and given new meanings; species, for example, were just collections of our ideas, and what was essential to any species was merely the ideas that make up this collection. By this standard also corpuscularianism was accepted, as Locke thought this was the only conceivable/imaginable theory. In addition, one of its consequences was endorsed, namely the primary and secondary quality distinction. Locke had not yet explicitly drawn the distinction between real and nominal essence, but at least he now had the resources to do so. Finally, he was still wedded to his methodology of natural histories despite their considerable theoretical and practical disadvantages.

An Elucidation

Here is not the place to begin an exposition of the subsequent development of Locke's natural philosophical thought. I do feel, nonetheless, that some hints at the direction that Locke's arguments will take are in order, to illustrate the way in which he expressed the positions we have been considering in the later development of the *Essay*. In this regard, Locke scholars are fortunate to have another Draft of the *Essay*, from 1685, available for study. This Draft (BL MS Film 57; the original is in the Pierpoint Morgan Library, New York) known as Draft C, whilst much closer to the *Essay* than its predecessors, differs significantly from it, especially in terms of the exposition of natural-philosophical arguments. Consequently, some remarks about this Draft should shed some light on the argumentation of Draft B, as well as providing a bridge to the final published version of the *Essay*. It must be noted, however, that these brief remarks will in no way comprise an in-depth discussion of all the issues that Draft C raises.

In spite of the fact that Draft C contained only the first two Books that will later make up the *Essay*, it still had much argumentation regarding natural philosophy and in some cases better reflected the evolution of Locke's thought than did the *Essay* itself. This was so because Draft C contained an early statement of one of Draft B's main natural philosophical theses, namely, that we can only conceive bodies to operate by motion and impulse. In Draft C, Book II, Chapter VI, "Of Ideas of both Sensation and Reflection", Locke came to consider the idea that we have of power:

> The Idea of power I conceive we come by thus y^{e} alterations w^{ch} we every moment observe in our selves or other things makes us take notice of y^{e} begining & ceasing to exist of severall substances & of severall qualitys in those substances & severall Ideas in our mindes w^{ch} changes since we cannot observe to be produced by nothing nor can conceive possible to be brought to passe without y^{e} operation of some cause y^{t} is able to produce such a change y^{e} Consideration of any thing as able to make any substance quality or Idea to Exist or cease to Exist is y^{e} Idea of its <u>power</u>. y^{e} way or efficacy whereby it is donne we call <u>Action</u> as y^{e} alteration in y^{e} subject wherein it is made we call <u>Passion</u> (Draft C, II.vi.10).

The scholastic active/passive distinction still lived on in Draft C. In Draft B the only efficacy that was attributed to body was due to motion. So too in Draft C:

> Motion & thinkeing are y^{e} two only <u>actions</u> y^{t} we can conceive the one belonging to body & y^{e} other to y^{e} soule & tis only by these ways y^{t} we can conceive them to exert their powers (Draft C, II.vi.11).

The continuity with Draft B is clear. In Draft B this was not greatly elucidated, but by 1685, Locke had spelt out the role of impulse in the communication of motion, since

> The proper action then of body is only Impulse whereby it causes any alteration in another (Draft C, II.vi.12).

Locke was also clear, that this idea was not entirely transparent, though the problems are limited, and did not effect his overall conclusion:

> Observeing then y^{t} bodys by impulse or y^{e} strikeing of their solid parts make alterations one in another we come by an Idea of power but not soe cleare & destinct an one as we have from y^{e} operations of our owne mindes (Draft C, II.vi.13).

This made clear why Locke thought that impulse was causally efficacious was that we observe it to be the case – we have *experience* of bodies hitting each other, and consequently making changes in each other. We have an *idea* of this causal efficacy. Locke then spelt this out even more clearly, and contrasted this case, where we have ideas, with another, where no such idea was forthcoming. This contrast is interesting because of its highly non-Newtonian flavour. Locke said:

> For all y^{e} Action we conceive in body being only impulse when it meets wth another body in y^{e} way of its motion we have no cleare Idea that body is able to begin or produce any motion but only to receive it when Com⟨m⟩unicated for if two bodys be placed neare one another in rest we have noe cleare Idea of a power in one to move y^{e} other all y^{e} power we can conceive int it is y^{t} it is capeable to receive motio⟨n⟩ from another body & com⟨m⟩unicate it wholy or in part to another body in rest for all y^{e} power y^{t} is in bodys is but y^{e} tranfering not produceing of motion (Draft C, II.vi.14).

We cannot conceive that bodies at rest should cause each other to move because we have no idea of this, whereas we can conceive bodies to act by impulse because we do have such experience. This is quite consistent with the interpretation of Draft B that has been presented. Locke had some problems with our conception of impulse, and took body to be passive in respect of the communication of motion, but this in no way detracted from his general line: bodies could only conceivably act upon one another by impulse. In 1685 he was still wedded to the position stated first in 1671, and provided an elucidation of why we could only conceive bodies to act by impulse.

In Draft B, it was only after the assertion about the powers of bodies was made that Locke came to consider the primary ideas that we have of body, and only after that did he come to consider the "primary qualitys or propertys of body" (Draft B, §94, p.210). In Draft C, things were re-arranged, and a consideration of the primary and secondary quality distinction followed on immediately after the Chapter containing the

notes on power that we have just considered. The switch in position of the work on the qualities of bodies was due to the structure of Draft C. Book II of this document dealt with the origin and nature of our ideas, first covering simple ideas, then complex ones. In so far as the primary and secondary quality distinction was relevant to our simple ideas, Locke evidently felt that it was best placed early on in the text of Book II: indeed, the Chapter was entitled "Some farther considerations of our Simple Ideas" (Draft C, II.vii). Thus, placing the distinction here was misleading as regards the development of Locke's thought, and as the Chapter omitted a consideration of the primary ideas of body, it was misleading regarding the structure of the argument itself.

However, let us follow the structure of Locke's argument, rather than its presentation in Draft C, and turn to consider the primary ideas that we have of body. The first mention of the primary ideas came in Chapter 25 of Book II, "Of Power" (Draft C's numbering). In Draft B, the primary ideas of body were those upon which all the other depended and from which they could be derived. At the end of the chapter on power in Draft C, a list of primary ideas was presented for both body and spirit:

> Solidity
> Extension
> Mobility or a capacity of being moved are y^e^ primary Ideas belonging to body
> Perception &
> Power of Moveing
> The primary Ideas belonging to y^e^ minde to w^ch^ if we add
> Existence
> Duration &
> Number
> w^ch^ belong both to y^e^ one & y^e^ other we have perhaps all y^e^ Original Ideas on w^ch^ the rest depend for by these I imagin might be explaind y^e^ nature of colours sounds tasts smells & all other Ideas we have if we had but facultys acute enough to perceive y^e^ severaly modified Extensions & Motions of those minute bodies w^ch^ produce these sensations in us (Draft C, II.xxv.51).

Locke took the primary ideas to be those that the other ideas were dependent or consequent upon; he said as much himself. The role of the primary ideas did not change in the move from Draft B to Draft C. Locke then continued by saying:

> when we consider it a litle farther then y^t^ bare Idea in our mindes we cannot conceive those different sensations in us can be produced by or depend on any thing but y^e^ bulke figure number & motion of y^e^ bodys y^t^ imediately affect us (Ibid.).

This was an explicit statement that the ideas of both primary and secondary qualities had to be conceived of as being produced by the primary qualities of bodies because we cannot conceive it to be any other way. This was just a consequence that flowed from his

assertion that the efficacy in bodies can be conceived to be nothing but motion and impact (Draft C, II.vi.11-14). It ought not surprise us.

These points were re-iterated in the chapter on substance, where Locke once more tried isolate the ideas on which all the others conceptually and causally depended:

> The Ideas then we have peculiar to body are solid parts & a power of Com⟨m⟩unicating Motion by impulse.
> The Idea of Solid parts includes y^e^ Idea of y^t^ Extension w^ch^ belongs to body w^ch^ is y^e^ Idea of distance between y^e^ Extreames of solid & seperable parts (Draft C, II.xxvii.21).

And once more

> Our primary Idea of body is to me as I have said y^e^ union or Cohæsion of solid parts from w^ch^ as I suppose all other Ideas belonging to body do derive them selves & are but modifications of (Draft C, II.xxvii.22).

The style of argumentation was just the same as that in Draft B. Where Draft C differed slightly from its predecessor was in the choice of the primary ideas. In Draft B, these were "Extension & Cohæsion of parts" (Draft B, §94, p.209). As a basis for the explication of motion and impact, these candidates had significant drawbacks. Not least of these was that you can derive neither motion nor impact from extension or cohesion, either alone or together. (In spite of Locke's insistence in Draft B.) All that the cohesion of parts implied was that a defined region retained a fixed boundary through any sort of motion: a cohesion of parts only entails that each part of a region retains its position relative to all other parts of that region. However, this is not incompatible with two or more such regions overlapping. There is nothing that prevents this, unless there is some solidity or a power of exclusion in the region described. Draft B's primary ideas lacked this pre-requisite, so Draft B's characterisation was inadequate. In Draft C Locke had not settled upon what the primary ideas were, the candidates being solid parts, a power of communicating motion by impulse, cohesion of solid parts, solidity, extension and mobility. However, this grouping did share a lot of common features, and was converging towards a more satisfactory account of which ideas were derivable from which others. Even so, whilst the content may have changed slightly, the structure and role of the argument remained the same.

These assertions about body were made while Locke insisted that we had "noe notion of y^e^ Substance of body" (Draft C, II.i.5-7 cf. Draft B, §19, pp.129-130):

> The reason why we have not y^e^ like cleare adequate Ideas of y^e^ essences of na⟨tur⟩al bodys seemes to me to be because we have not senses accute enough to discover their essence or real constitution, w^ch^ we may rationaly conclude to consist in a certain

> modification of y^e original qualitys of bodys viz, figure, bulke, situation, & motion of their p^{ts} whereof all their other qualitys are but Consequences (Draft C, II.xxxii.18).

Could we have any more clear an assertion that his distinction between primary and secondary qualities was based upon a process of reasoning? Was not this reasoning based upon his declaration about the causal powers of bodies? If the answers were not clear enough already, we need but turn to the chapter of Draft C that dealt with this issue, "Some farther considerations of our Simple Ideas" (Draft C, II.vii).

In the preceding chapter of Draft C Locke asserted that the casual efficacy of bodies consisted solely in motion and impact. So, at the very beginning of the chapter concerning primary and secondary qualities, the reader was aware that only those factors relevant to motion and impact can be conceived of as responsible for all natural phenomena. The chapter began with the consideration that positive ideas can come from privative causes (Draft C, II.vii.1-7 cf. II.viii.1-6), and was largely based upon previous work from Draft B (Draft B, §58, p.161). Locke then went on to distinguish between ideas and qualities (Draft C, II.vii.8-10 cf. II.viii.7-8). He then continued:

> Concerning those qualitys we may I thinke observe those Original ones in bodys y^t produce simple Ideas in us viz Solidity & Extension Motion or rest & Number And y^e Extension of bodys being finite every body must needs have Extremitys y^e relation of w^{ch} Extremitys on all sides one to another being y^t w^{ch} we call <u>figure</u> (Draft C, II.vii.11).

Here we can see Locke engaged in a process not unlike that involving primary ideas, where he derived one idea from another, once more illustrating the close connection between the primary ideas and primary qualities. The next Section detailed the relationships of these primary qualities to body: they were

> wholy inseperable from it & such as in all y^e alterations & changes it suffers: all y^e force can be used upon it, it constantly keepes (Draft C, II.vii.12 cf. II.viii.9).

Locke quickly went on to state his central premise:

> The next thing to be considerd is how bodys operate one upon another & y^t is manifestly by impulse & nothing else. It being impossible to conceive y^t body should operate on w^t it does not touch (w^{ch} is all one as to imagin it can operate where it is not) or when it does touch operate any other way then by com⟨m⟩unicating its motion (Draft C, II.vii.13 cf. II.viii.11).

Here, "imagine" and "conceive" are used as synonyms. This general principle stated, Locke attempted to show how bodies could produce ideas in us by this impulse:

> If then bodys cannot operate at a distance & external objects be not united to our mindes when they produce Ideas in it & yet we perceive those originall qualitys in such of them as singly fall under our senses tis Evident y^{t} some motion must be thence continued by our nerves or animal spirits (some parts of our bodys) to our brains y^{e} seat of sensation there to produce in our mindes y^{e} particular Ideas we have of them And since y^{e} Extension figure. Number & motion of bodys of an observable bignesse may be perceived at a distance by y^{e} sight tis evident some singly imperceptible bodies must come from them to y^{e} Eyes & thereby convey to y^{e} brain some motion w^{ch} produces those Ideas we have of them in us (Draft C, II.vii.14 cf. II.viii.12).

These truths were evident only because we cannot conceive bodies to operate in any other way: the claims were but consequences of the more general principle. Thus far, Locke had only given an account of the production of the ideas of primary qualities. Secondary qualities had not yet been mentioned. In the next Section, however, Locke made a supposition, and drew a comparison:

> let us suppose at present y^{t} y^{e} different motions & figures bulke & nu⟨m⟩ber of such particles affecting y^{e} severall organs of our senses produce in us those different sensations w^{ch} we have from y^{e} Colours & smells of bodys … It being noe more impossible to conceive y^{t} God should annex such Ideas to such motions wth w^{ch} they have noe similitude then y^{t} he should annex y^{e} Idea of pain to y^{e} motion of a peice of steele deviding our flesh wth w^{ch} y^{t} Idea hath noe resemblance (Draft C, II.vii.15 cf. II.viii.13).

Here was but one possible account of how some ideas might be produced in us, and not one that we need necessarily sign up to. Until, that is, we remember that motion and impact are the only conceivable causes of any effect in the natural world:

> What I have s^{d} concerning Colours & Smells may be understood also of tasts & sounds & all other Ideas of bodys produced in us by y^{e} texture of & motion of particles whose single bulks are not sensible. And since bodys doe produce in us Ideas y^{t} containe in them noe perception of bulke figure, motion or number of parts as Ideas of warmth, blewnesse or sweetnesse w^{ch} yet tis plain they cannot doe but by y^{e} various Combinations of those primary qualitys however we perceive them not I call y^{e} powers to produce these Ideas in us <u>Secondary Qualitys</u> (Draft C, II.vii.16 cf. II.viii.14).

Locke's reasoning is manifest. Despite the fact that ideas of secondary qualities are not of primary qualities, they *must be* caused by the primary qualities of the body. The assumptions made about the annexation of certain ideas to certain motions *must be conceived to be true*. In Draft C, the distinction between primary and secondary qualities was derived from Locke's assertion about the causal efficacy of motion that was put forward for the first time by Locke in 1671. This distinction followed from a process of reasoning based upon what we are able to conceive or imagine.

This argument being concluded, the distinction made and the point firmly put, Locke then went on "to draw this observation y^{t} ye Ideas of ye <u>primary Qualitys</u> of

bodys are resemblances of them" and that the ideas of secondary qualities were not (Draft C, II.vii.17 cf. II.viii.15). Locke then gave particular examples of his general conclusion, to illustrate his point; all the time insisting that the secondary qualities in a body were nothing but powers to produce ideas in us by virtue of "ye bulke figure & motion of its parts (for other ways it cannot operate)" (Draft C, II.vii.20. These example re-appeared in the final version of the *Essay* as II.viii.16-21.) Locke then ended his discussion by apologising for his long engagement in "physicall enquirys" (Draft C, II.vii.24 cf. II.viii.22; II.viii.23-26 do not have any precursors in Draft C.)

The arguments in Draft B were elucidated and expanded upon in Draft C of the *Essay*, but they were not substantially changed. Some light has also been shed on the nature and grounds of the distinction between primary and secondary qualities as presented in the published *Essay*.

Conclusion

1632-1671

Robert Boyle's work had no direct or significant influence upon Locke in this period. This is not to assert that Locke's position in 1671 was non-corpuscularian – by the end of Draft B, Locke and Boyle were in agreement on this point. Nor is it averred that the doctrine later put forward in the final version of the *Essay* was unlike Boyle's. By 1689 Locke had been a corpuscularian for some time. Nonetheless, Locke's views were not derived from or based on those of Robert Boyle. During 1666, the year when *The Origine of Formes and Qualities* was published, John Locke was anything but a committed mechanist. In fact, he was an adherent of Chymical doctrine. *Respirationis Usus* put forward hypotheses that were contrary to Boyle's published opinions. It offered a world-view closely related to that of Thomas Willis and relied upon many Helmontian considerations. If this were not sufficient evidence of non-mechanical views, *Morbus* plainly is. Locke went out of his way to excoriate the mechanist's attempts to account for biological phenomena. Locke even used examples from Boyle's work to illustrate how impoverished he took mechanism to be. In 1666 it was Locke's view that Archei were responsible for the health and disease in a body. Even in those cases where Archei were not involved, there was no explicit commitment to mechanical explanations. In *Morbus*, there was a strong adherence to Helmontian theory. Those whose work was not based on any serious survey of the MSS and who held that 1666 was "when the co-operation between ⟨Locke and Boyle⟩ was at its closest" (*John Locke* p.13), and that "the most important influence of all ⟨on Locke⟩ was Boyle" (*op cit.* p.12) could hardly be more mistaken. There is nothing in the available MS material to suggest that Locke and Boyle collaborated together at this point in the development of corpuscular theory. Regarding the terms and doctrines of the primary and secondary quality distinction some authors, Aaron for example, have maintained that

> Locke borrowed the terms from ⟨Boyle⟩ - although since Boyle published ⟨*The Origine of Formes and Qualities*⟩ when the co-operation between him and Locke was at its height, they might very well have been suggested by Locke himself or have been already in use in the scientific circles at Oxford to which both Locke and Boyle belonged. The whole theory might have been worked out in conjunction by Boyle, Locke, and the others (*op cit.* pp.122-123).

Such extravagant speculations, aside from being completely groundless, are plainly false. Even when Locke did come to work out something that would later become the

distinction we know as that between primary and secondary qualities, he did not actually use the words "secondary quality". Indeed, he did not at first talk even of "qualities": he examined the "primary Ideas" of body. The phrase "secondary quality" was first introduced at some point after 1671, as a part of Locke's own arguments. There are many similarities between the two men's work, but one is not the cause of the other. It is true that Locke and Boyle arrived at the similar destinations: both were corpuscularians. However, they arrived at the same locale by very different routes. Locke does not owe a great intellectual debt to Boyle. It is astonishing that so many people have maintained the contrary. There is no evidence from that period for this conclusion and much against it.

It is equally astounding that the central role played by Sydenham in the development of Locke's thought has been largely ignored. It was from Sydenham that Locke acquired his scepticism about our ability to pry into the internal structure of nature. Just prior to his meeting Sydenham, Locke had been quite happy to make pronouncements about this or that account of nature's workings. Immediately after making this man's acquaintance, Locke said no such knowledge was attainable. Before meeting Sydenham he was doctrinaire, after he was agnostic. There could be little more transparent. This agnosticism was also exhibited in both the early Drafts of the *Essay*. It was in Sydenham that we find the first expression of what would later become known as a "Lockean" thesis.

Sydenham was the one who enjoined Locke to rely upon experience, in order to have true knowledge of the world. It is difficult to know when Locke first became an "empiricist", but the encounter with this renowned physician is sure to have moved Locke several paces further down that road. Prior to his meeting with Sydenham, Locke had admitted the existence of entities which he conceded he could not understand:

> How these small & insensible ferments, this portent Archeus works I confesse I cannot satisfactorily comprehend, though y^{e} effects are evident (BM Add MS 32554 f.121r).

It is not easy to reconcile this position with a thorough-going concept empiricism. Nor did Locke find it so. When later coming to think about our understanding of the external world, and its causal powers, Locke refused to countenance those things that he did not have ideas of (Draft B, §150, p.262).

It is in the work with Sydenham that we first find the kernel of the argument that Locke will use to justify his acceptance of the corpuscular hypothesis. In *Anatomia*, Locke had criticised both Helmontian and Aristotelean views because they posited theories and entities that were "out of the reach of the senses" (PRO 30/24/47/2 f.36v).

The criticism put forward in Draft B was an elaboration of this, along the lines of Locke's own theory of ideas. Using his account of experience, Locke noted that such theories as employ terms that we have no ideas of are meaningless. Thus, as a minimal criterion of theory acceptability, we must only use theories that employ the ideas we actually have. It was Sydenham that bid Locke only rely upon experience when coming to acquire knowledge of the world. It was this doctor that encouraged Locke to renounce any theory about aetiology. Locke expanded upon these considerations and extended the embargo from our knowledge to our theories. Scrutinising Locke's opinions before and after his encounter with Sydenham, it is difficult to imagine what his philosophy would have looked like had he not met this controversial physician.

For Locke, mechanism was the only theory that lived up to this criterion of conceivability, and so it was this theory alone that was acceptable. This restriction and its reliance upon what was thinkable is highly rationalistic and very reminiscent of Descartes. As too were Locke's distinctions between the qualities of bodies. There was a great deal of the Cartesian project that just did not interest Locke. He did not regard himself as a metaphysician and generally steered clear of such recondite matters. However, we have documentary evidence that Locke was very interested in the Cartesian conception of body. He took a number of notes on this topic – indeed, the only note in Locke's common-place books from the *Meditations* concerns this point. Furthermore, Locke's first note on the work of Descartes dealt with this question, and Locke continually returned to this issue throughout the writing of the *Essay*. It is in the course of criticising Cartesian positions on the nature of body that Locke first outlined a distinction between the qualities of bodies. However, it should be noted that Locke based this upon a previously made distinction between the *ideas* we have of bodies. Locke was attempting to provide an alternative account to that presented by Descartes. The aim in both cases was to use reasoning as a tool to pick out the fundamental parts of our ideas of material objects. Locke used a different method, and had a different first premise, but the aim and over-arching principle was the same. Crucially, it was only after the distinction between the ideas was made that Locke moved on to talk of the qualities. It was this work that lead to the distinction between primary and secondary qualities. Thus, the clash with Descartes led to formulation of Locke's particular version of the primary and secondary quality distinction. The argument Locke advanced, whilst based upon particular matters of fact, relied heavily upon considerations about conceivability: Locke was presenting a quasi-rationalist argument. This is evident from the text. It is also

clear that Locke's scepticism about our ability to understand the natural world was not incompatible with his commitment to mechanism. Locke consistently maintained that we could obtain no knowledge of causation at the micro-level, but asserted that this realm could only be conceived to be mechanical. The former Locke took to be a fact about the world we live in, the latter a fact about our conceptual abilities. Though dealing with the same subject matter, these two restrictions were orthogonal: that we may only conceive the world to be one way does not imply that it is that way, and that the world is one way does not imply that we must conceive it to be so.

Locke's commitment to mechanism had a very complicated history, with several different sources. Part of the arguments in Draft B came from work that Locke undertook with Sydenham. Part came from Locke's interest in the Cartesian conception of body. Mostly, though, Locke's argument was just that: *Locke's*. He put various pieces of work together to create an altogether new position that was entirely of his own devising. Locke was responsible for Locke's views, not Boyle, or anyone else, for that matter.

It is equally evident that Locke's account of substance did not depend upon any particular ontology. The account was first given in Draft A, at which point Locke had not yet provided the arguments for mechanism. He was still agnostic about our ability to pry into nature and did not want to sign up to any one theory. Consequently, when Locke began his account of substance in the first Section of Draft A, he was not committed to any particular theory about the nature of the world. This account of substance was later used (subject to minor alterations regarding the correct use of the word "quality") in Draft B. The account was not one based upon a particular ontology – it was concerned only with the internal structuring of our experience. It is not legitimate to infer anything about Locke's ontology from his views on substance. Locke did not do so, and neither should we. His corpuscularianism and account of substance were developed separately and were only contingently related. The one did not imply the other.

1672-1704

Turning to the later consequences of Locke's early arguments, it is evident that they gave rise to the positions later put forward in the *Essay*. It is not possible to trace the subsequent evolution of Locke's reasoning throughout his career: such an exercise would take us well beyond the scope of the current investigation. Indeed, it would take a volume at least equal in size to the present, in order to do any sort of justice to the many tenets advocated in Locke's later work. Moreover, the intelligent reader will be able to extrapolate from the current conclusions and trace their rise and influence in the mature Lockean philosophy. But some brief remarks are in order, if only to give a framework around which a more accurate understanding of Locke's work can be built.

We have already noted that Locke's account of substance was independent of any ontological commitments. Looking ahead to later versions of the *Essay*, it is worth remarking that Locke's account was similarly separate from the notion of "real essence". This latter notion did not appear in either of the first two Drafts of the *Essay*. Given this fact alone, we can see that Locke did not develop the notions of "substance" and "real essence" as correlates to one another, or that they were two sides of the same conceptual coin. It is plain that the two notions were closely connected in the *Essay*, but not in the way that is commonly supposed. If we look at Locke's notion of material substance, we can see that it is our supposition of a connection between the causes of our ideas. This supposition was internal to, and a product of, the understanding:

> when we talk or think of any particular sort of corporeal Substances, as *Horse*, *Stone*, *etc.* though the *Idea*, we have of either of them, be but the Complication, or Collection of those several simple *Ideas* of sensible Qualities, which we use to find united in the thing called *Horse* or *Stone*, yet because we cannot conceive, how they should subsist alone, nor one in another, we suppose them existing in, and supported by some common subject; *which Support we denote by the name Substance*, though it be certain, we have no clear, or distinct *Idea* of that *thing* we suppose a Support (II.xxiii.4).

"Substance" in general was just a projection of unity by the mind onto the causes of our ideas. The real essence, on the other hand, was the actual external cause of the union of qualities. The real essence

> may be taken for the very being of any thing, whereby it is, what it is. And thus the real internal, but generally in Substances, unknown Constitution of Things, whereon their discoverable Qualities depend, may be called their *Essence*. This is the proper original signification of the Word, as is evident from the formation of it; *Essentia*, in its primary notation signifying properly *Being* (III.iii.15).

Substance is internal, real essence is external. The terms are related in the same way as "idea" and "quality" – the one in the understanding, the other external to it. (This is a gross simplification, as there is no content to the idea of substance in the same was as there is content to the idea of red, for example. Moreover, the one is not considered to be the cause of the other.) "Substance" was the name given to the idea we form in order to have experience of objects. "Real essence", or "internal constitution" was the name given to the actual cause of the union in the objects themselves, whatever this may be.

This notion of real essence was a convenient innovation on Locke's part so as to enable talk of the radical constitution of bodies in shorthand form. He was now able to state clearly that we don't know the internal structure of bodies by saying that we have no knowledge of an object's real essence. And in this particular, Locke was quite uncompromising. Throughout his later career, he repeatedly affirmed that we did not have any knowledge of the make-up of bodies, nor were we ever going to have any. Locke mentioned this lack on our part in writing the *Two Treatises of Government circa* 1680. At one point Locke was attempting to illustrate that parents do not own their children because they have only an indirect part in their production: no-one actually knows in what life consists or how it is produced. To illustrate his point, Locke returned to the medical teaching of his mentor:

> Anatomists, after their whole Lives and Studies, spent in Dissections, and diligent examining the Bodies of Men, confess their Ignorance in the Structure and Use of many parts of Mans Body, and in the Operation wherein Life consists in the whole (TT I.vi.52)

This ignorance prevented anyone from claiming that they literally put their children together by their own hand and so claiming the children were their property, in the Lockean schema. Nor did Locke suppose that anyone would ever perform such an act of Frankensteinian creation:

> Is there any one so bold, that does thus far Arrogate to himself the Incomprehensible Works of the Almighty (TT I.vi.53).

Here points made in *Anatomia* were supported by the considerations advanced in *De Arte Medica*: we do not know the structure of the world because God's creation was incomprehensible to us. Locke clearly retained the convictions he had adopted from Sydenham. Nor was his contention altered in the *Essay* itself. Here Locke spent a long time pointing out just how little we know of the structure of the world:

> There is not so contemptible a Plant or Animal, that does not confound the most inlarged Understanding. Though the familiar use of Things about us, take off our Wonder; yet it cures not our Ignorance. When we come to examine the Stones, we tread on; or the Iron, we daily handle, we presently find, we know not their Make; and can give no reason, of the different Qualities we find in them, 'Tis evident the internal constitution whereon the Properties depend, is unknown to us (III.vi.9).

The position was the same as that advanced in the *Two Treatises*, the Drafts and the work with Sydenham. The reason why this was so, was similarly grounded:

> The Workmanship of the All-wise, and Powerful God, in the great Fabrick of the Universe, and every part thereof, further exceeds the Capacity and Comprehension of the most inquisitive and intelligent Man (Ibid.).

This was a genuinely held belief on Locke's part, that had a long-standing history in his thought. It was not some mere passing exaggeration or exuberant outburst. On the contrary, it was a point that is central to his project. At the very beginning of the *Essay* Locke had made it clear that his aim was to measure the abilities of our understandings, so that we could be fully aware of our capacity to know. This exercise would also appraise us of what we were ignorant of:

> Were the Capacities of our Understanding well considered, the Extent of our Knowledge once discovered, and the Horizon found, which sets the Bounds between the enlightened and dark Parts of Things; between what is, and what is not comprehensible by us, Men would perhaps with less scruple acquiesce in the avow'd Ignorance of the one, and imploy their Thoughts and Discourse, with more advantage in the other (I.i.7).

In stating that we have no knowledge of the true nature of God's creation, Locke was not presenting an arbitrary restriction which was inconsistent with his overall project. Instead, he was fulfilling one of his all-embracing aims. This provides a new way of understanding many of the more intricate arguments in the *Essay*. For example, the arguments in II.xxiii regarding microscopes take on a new aspect when, in II.xxiii.12, Locke brought in considerations of God's purposes to show that we do not have faculties able to penetrate into the real essences of things. It was Locke's view that "*Our Faculties of Discerning ⟨are⟩ suited to our State*" (Ibid.) and that God wisely made it so.

It is also notable that, some years later, when referring to medicine, Locke advanced exactly the same opinions. In 1693, when corresponding with Thomas Molyneux, Locke put forward sentiments that were virtually identical to those that he had advanced some quarter of a century earlier. It is clear that he did not easily forget the teachings of his erstwhile mentor. I will quote at length to give the tenor of the remarks:

> I wonder that, after the pattern Dr. Sydenham has set them of a better way, men should return again to that romance way of physick. But I see it is easier and more natural for men to build castles in the air of their own, than to survey well those that are to be found standing. Nicely to observe the history of diseases in all their changes and circumstances, is a work of time, accurateness, attention, and judgement; and wherein if men, thro' prepossession or oscitancy mistake, they may be convinced of their error by unerring nature and matter of fact, which leaves less room for the subtlety and dispute of words, which serves very much instead of knowledge in the learned world, where methinks wit and invention has much the preference to truth. Upon such grounds as are the establish'd history of diseases hypotheses might with less danger be erected, which I think are so far useful, as they serve as an art of memory to direct the physician in particular cases, but not to be rely'd on as foundations of reasoning, or verities to be contended for; they being, I think I may say all of them, suppositions taken up gratis, and will so remain, till we can discover how the natural functions of the body are perform'd, and by what alteration of the humours or defects in the parts they are hinder'd or disorder'd. To which purpose I fear the Galenists four humours, or the chymists sal, sulphur, and mercury, or the late prevailing invention of acid and alcali, or whatever hereafter shall be substituted to these with new applause, will upon examination be found to be but so many learned empty sounds, with no precise determinate signification. What we know of the works of nature, especially in the constitution of health, and the operations of our own bodies, is only by the sensible effects, but not by any certainty we can have of the tools she uses, or the ways she works by (CJL 1593).

Sydenham had a decisive and continued influence on Locke's thinking many years after the men had worked closely together. Locke's thoroughgoing scepticism about our ability to pry into the workings of nature was derived from his work in medicine.

Locke also retained and modified his conceivability argument for the adoption of corpuscular theory. However, in the many subsequent modifications and corrections in the re-writing of the *Essay*, much of the argumentation became disjointed and difficult to discern. Nonetheless, the fundamentals were the same. Locke remained firm in his conviction that "We have by daily experience clear evidence of Motion … produced by impulse" (II.xxiii.28). He was equally sure that "two Bodies, placed by one another at rest, will never afford us the *Idea* of a power in the one to move the other" (II.xxxiii.28 cf. Draft C, II.vi.14). Locke pointed out still

> *The primary* Ideas *we have peculiar to Body*, as contradistinguished to Spirit, *are the cohesion of solid*, and consequently separable *parts*, *and a power of communicating Motion by impulse*. These, I think, are the original Ideas proper and peculiar to Body; for Figure is but the consequence of finite Extension (II.xxiii.17 cf. Draft B, §94, p.209).

After some discussion, Locke then went on to detail the "Two primary Qualities, or Properties of Body *viz*. Solid coherent parts, and impulse" (II.xxiii.30) and the fact that

> We have also the *Ideas* of several Qualities inherent in Bodies, and have the clear distinct *Ideas* of them: which Qualities, are but the various modifications of the Extension of cohering solid Parts, and their Motion (Ibid. cf. Draft B, §94, p.210).

It is not easy to see how these points are connected, when reading the *Essay* alone, since they are parts of different Sections with no evident links between them. It is only when the history of the *Essay* is taken into account that the connections become clearer and the argument more apparent. This is also the case surrounding the role played by Locke's derivation of the primary ideas – the points made are spread across several pieces of text in diverse places. We can see in some places the thought that some ideas are necessary consequences of others:

> Indeed, some of the primary Qualities have a necessary dependence, and a visible connection one with another, as Figure necessarily supposes Extension, receiving or communicating Motion by Impulse, supposes Solidity (IV.iii.14).

However, Locke had been more clear in the Chapter on Power, where he re-iterated the arguments put forward in the comparable parts of Draft C. He wants to give

> A view of our *original Ideas*, from whence all the rest are derived, and of which they are made up; which if I would consider, as a Philosopher, and examine on what Causes they depend, and of what they are made, I believe they all might be reduced to these very few primary, and original ones. *viz.*
> *Extension*,
> *Solidity*,
> *Mobility*, or a Power of being moved (II.xxi.73 cf. Draft C, II.xxv.51).

Locke then, as before, listed the primary ideas belonging to spirit, and those that belong to both, and then continued by stating that these are

> perhaps, all the Original *Ideas* on which the rest depend. For by these, I imagine, might be explained the nature of Colours, Sounds, Tastes, Smells, and all other *Ideas* we have, if we had but Faculties acute enough to perceive the severally modified Extensions, and Motions, of these minute Bodies, which produce those several Sensations in us (Ibid.).

Locke then said, in line with his general position, that he did not want to become engaged in a discussion of natural philosophical matters, but was still quite sure that

> when we go beyond the bare *Ideas* in our Minds, and would enquire into their Causes, we cannot conceive any thing else, to be in any sensible Object, whereby it produces different *Ideas* in us, but by the different Bulk, Figure, Number, Texture, and Motion of its insensible Parts. (Ibid.).

It was here alone, at the end of a discussion relating to free-will and determinism, that we find a clear statement of the Lockean position (although we do not have a clear articulation of the premise upon which it is based). It is little wonder that such points have passed largely unnoticed. Yet with rather more accurate hindsight, we can see the

clear continuity of argument with the earlier Drafts. The role played by the primary ideas was central.

Unfortunately, this point was further obscured by the fact that the main discussion of the relations between ideas and their causes was taken from its original context and, as in Draft C, given its own Chapter entitled "*Some further Considerations concerning our simple* Ideas" (II.viii cf. Draft C, II.vii). And even here, further changes in the presentation render the argument more difficult to comprehend. The description of Secondary Qualities (Draft C, II.vii.15-16) that had been consequent to the thoughts about power and impulse are now brought forward (II.viii.10). This was perhaps to make the contrast with the primary qualities clearer, but it badly mangled the line of argument. Yet, despite this, the argument Locke proffered remained more or less the same. Locke relied once more upon the thought that "*Bodies operate* one upon another … manifestly *by impulse*" (II.viii.11 cf. Draft C, II.vii.13). The same consequences followed as those outlined above. This means that the argument for the primary and secondary quality distinction, as presented in the *Essay Concerning Human Understanding* was based upon considerations of conceivability. But here, as in the earlier work, Locke was clear that this conceivability places no constraint on the reality of the situation – we may only be able to think of things in one way, but that does not mean that things are that way. Locke said that secondary qualities depend

> upon the primary Qualities of their minute and insensible parts, or if not upon them, upon something more remote from our Comprehension, 'tis impossible we should know (IV.iii.11).

This applied also to the general recommendation of the corpuscular theory:

> I have here instanced in the corpuscularian Hypothesis, as that which is thought to go farthest in an intelligible Explication of the Qualities of Bodies; and I fear the Weakness of humane Understanding is scarce able to substitute another, which will afford us a fuller and clearer discovery of the necessary Connexion, and *Co-existence*, of the Powers, which are to be observed united in several sorts of them (IV.iii.16).

Clearly this is only the very briefest sketch of the arguments as presented in the *Essay*. A very great deal of work remains to be done to understand thoroughly all the arguments and subtle changes of position that went into the later versions of the *Essay*. Even then, we still have to consider the criticisms of others and the modifications of position in the several different published editions of the book. In short, whilst a lot of work has been completed, even more remains to be undertaken.

This conclusion has outlined how some of this task might be accomplished. But the thesis itself, the work on Locke's early development and the origin of his opinions, the clearing away of out-dated notions, and their replacement with more plausible alternatives – all these provide Locke scholars with new tools to aid a greater comprehension of the reasoning in the *Essay*. I have attempted to provide a firm foundation upon which a greater understanding of John Locke's philosophy can be built.

Appendix I

Key to transcriptions

Garamond	=	Locke's handwriting
Century Schoolbook	=	Sydenham's handwriting
italics	=	Interlineal/Marginal insertion in the text
/f.32r/	=	Italics and backslashes indicate the foliation of the subsequent text
[word]	=	Deletion from text
[...]	=	Indecipherable deletion
⟨word⟩	=	Editorial insertion
{...}	=	Unreadable word or part of word
bold italics	=	Insertion in an insertion
w[ei]*o*rd	=	'ei' was written first, but was overwritten by 'o'
[this [silly] word]	=	'silly' was deleted individually before the rest of the text was deleted

All of the underlining in the subsequent texts is Locke's own, as are all of the round brackets.

Respirationis usus

Respirationis Usus, as its title suggest, was concerned to outline the purpose of respiration. The document as preserved for us in the Public Record Office (PRO 30/24/47/2 ff.71-74) is made of two pieces of paper folded in half, one inserted in the other to make a small quire of four leaves. As has been pointed out by John Milton ("Locke at Oxford" in *Locke's Philosophy Content and Context* p.33n) the present binding of the papers in the Shaftesbury collection has the disadvantage of having the middle piece of paper bound in back-to-front. This means that the only published transcript of this paper (Kenneth Dewhurst, "Locke's Essay on Respiration", *Bulletin of the History of Medicine*, 34 (1960) pp.257-73), in following the text as it has been bound, not as it was written, has the serious problem of totally obscuring the structure of the article as intended by Locke. In order to counteract this problem this transcription has been re-arranged in line with the suggestion made by Dr. Milton. The correct foliation is: 71r, 71v, 73r, 73v, 72r, 72v, 74r, 74v.

Dewhurst's transcription has another more serious problem: it is quite inaccurate. Many words and phrases that were not easily accommodated to his incorrect structure are omitted or very badly rendered. It should be treated with extreme caution.

The piece is entirely in Locke's own hand and, as we have seen, most likely dates from May to November 1666. It was written quite hastily, with many corrections and is clearly a draft rather than a completed work. This presents numerous difficulties of transcription. I cannot claim that the following text is anything like a definitive version: my Latin will not suffice. Nonetheless, it is included as a very rough first approximation to a final version, and as something that will encourage further research into this aspect of Locke's philosophy.

/f.71r/

Respirationis usus.[142]

/f.71v/

An chymia remedia Galenicis Anteferenda? Aff

Detur medecina universalis ? [Aff] Neg

———

A Contraria contrariis curentur. Neg.

Haec quod tanquam totius medecinae practicae fundamentum *et veterum consensu et rerum usu stabilitum* contraria scilicet contrariis curari, abunde ab autoribus iactatum fuit

—

contraria contrariis curari adeo notum et omnium ore iactatum axioma ut nihil notius adeo ut hactenus tanquam totius medecinae practicae fundamentum et veterum consensu et rerum usu stabilitum, ab universa paene asclepiadū familia receptum fuerit. verum enim vero illud nec veteris medecinae *fuisse* dogma nec nāāē [na] institutum, et[143] vera methodus medendi ex sequentibus patebit. Hac de re ardens fuit bellum inter chymicos aliosque qui Galenici dici amant. similia a similibus curari contendunt illi ex veterum placitis non minus quam re ipsa, natura quae morbo adversatur &c

/f.73r/

An primarius respirationis usus sit refrigeratio cordis Neg.

Nusquam magis nos latet fugitque natura quam ubi [se] palam [ostendere] *prodire* et cuivis [ob] [in amplexus] *obviam facilemque sed* tradere videtur aura illa vitalis quam [continuo labore] [haurimus et reddimus] a primordio vitae ad ultimum ejus tremitum[144] continuo labore haurimus et reddimus [tan] [tantum] nobis *solum* illudere videtur internis sese prae cordiis ingerit sed [solum] *tantum* sit elabatur et eos in[145] in quos prima ruit fallit amplexus · eademque subtilitate et mentis et oculorum fugit aciem, [aerem] [illud] *aetherem*

[142] This appears at the top left hand portion of the page. The rest of the page is blank.
[143] Possible deletion.
[144] Doubtful transcription.
[145] Last two words doubtful.

illum circumfluum [quibus undique[146]] quocum tantum nobis commercium est *quo vivimus et oli*{…}[147] tamquam ignotum et ingratem hospitem admittimus intro statim ejiciendum nec quis sit quidv agat vel quorsum veniat [scissitari dignamur]. *indagare possumus aut omnino intelligimus* sic quod purum hausimus spissum nebulosumque mox [exhalamus] efflamus *[aether] aereme* nobisque quibus [secutum] caecutianus suffundimus nubes. spiritusque ille qui in sonos vocemque formatus docuit aliarum rerum naturam et usus hactenus[148] tenuit suos, huic est quod tantis in tenebris ardent illae qua incalescimus flamma vitalis dubitatumque hactenus est inter provectiores naturae mystas an crebor noster anhelitus nativos vel incendunt vel cohiberet ignes. licet accuratius omnia perpendenti vix videlitur providam naturā, ad extinguendam flammam tantos pulmonum fabricasse folles 1°

1° Quia in eo maxime laborare videtur natura, ut vestalis illa vitae nostrae foveatur [calor] ignis, [ut] tam diu[149] n. vivimus quam diu[150] ardemus, et eodem qd nos cersict[151] nutrimur incendio. et sane nāā male prodiga esset [naa] *materfamilias* si tantos in nobis extruit focos ut continuo */f.73v/* sibi necesse foret frigida transpirare ne incenderentur aeres[152]. hinc fit in corpore digestionum coctionumque arlinac[153], hinc tam varia viscerum fermenta quae huc omnia conspirare videntur ut sit tandem aliquid qd accendi possit fomitemque habeat flamma vitalis cui usui prae omnibus respiratio inservire videtur, tanta n. aerem inter ignemque [i mo calorum] tanta intercedit necessitudo ut nullubi ignem reperias vel calorem ab internis principiis [cr]*na*scentem[154] unde aerem excluseris [qd] *sed* ut [penitus intelligatur] animalis caloris natura et inserviens respiratio melius intelligatur paulo altius res rejectenda est. Vita animalium in continua spirituum subtilem generatione et fluxu consistere apud omnes iam in confesse est. Istis spiritus cordis sive calore sive[155] fermentatione generari praevia ingestorum in stomacho intestinis mesenterio aliisque officinis digestione constat. verum interroget quis quid ad hoc aer et respiratio dicam breviter? inutilem prorsus esse totum hunc apparatum, et alia viscera frustra mutuas tradere operas, et alimenta elaborare, nisi ultimo accedat aeris mistura et [fermentum]. continuo affluxu perennos nutriat focos cum enim [in] eo in cardine versatur vita

146 Doubtful transcription.
147 Possibly "obimus"
148 Possible deletion.
149 Possibly "dici".
150 Possibly "dici".
151 Very doubtful transcription.
152 Doubtful transcription.
153 Doubtful transcription.
154 Doubtful transcription.
155 Previous two "sive" possibly "sine"

animalis, ut [spirituum vitalium] continuus constansque fiat provectus spirituum animalium, hoc es{.}ut sanguinis partes in materiam subtilem et volatilem exaltentur [in qua *ipsa* vitae n̄aa̅ formalis ratio et] quae *[exhalet]* cum per arterias nervosque undique diffusa corpori motum sensum et calorem imperti*at*[verit][156] in quo ipsa vitae nostrae ratio formalis vigorque totus consistere videtur, posquam inquam scaenam suam peregerit *haec sanguinis effluvia exebita*[157] tandem transpiret, et in auras evolet succedentibus. spiritibus locum praeben*tia*[s] et ita [tandem] [tota] sanguinis massa repetitis per cor *et pulmones* circuitionibus flammae vitali maam praebeat et tota tandem *volatilis facta* nulla relicta faece in spirituum maam transmutata per [dibi.] διαπνοην difflatur et [ex] evanescat, quod nunquam fieri possit sine aeris */f.72r/* commercio *qui in* mysteriis [enim][158] n̄aa̅ vel levitur[159] initiatus, et in distillationibus chymicis [vel] mediocriter versat̄us̄ fierit sciat necesse est, necessarium sit aeiris [fermentum ad] interventus ad res [vel] *et* fermentandas, [vel] *et* volatizandas quamque impossibile *sit* in vasis clausis unde excluditur *amovetur aeris communis* aeris [aflu] affluxus *concreta*[160] per se satis volatilia et flammis opertuna, vehementissima *licet* ignis tortura volatilia reddere [solent] quaeque in aperto aere facile *[combusta]* deflagrant et combusta [total] tota [evolant et] in flammas aurasque evolant, eadem visceribus vitreis inclusa, et [ignis] [igne] summis ignis gradibus [pet] vexata, vix in carbones nec ultra possis reducere. maxima parte, in ossam fixam sive caput mortuum degenerantur. *sic carbo. fuligo* Quid autum sit in aere qd corpor[a]*um partes* ita *agitet* [volatizet] subtiliet volatilizet *tandemque* accendatque, [nam] *probabile n: est* aerem esse quae *[…]* corpora consumit et ardere faceat non ignem, qui nil aliud esse videtur quam partium minitorum maxima agitatio dum aer earum compagem laxat distringitque. Quid [alia] *in quam* illud in aere solvens[161] sit si quid in tanta obscuritate conjicere licet, n̄ae̅ spiritum quondam introrsum summe volatilem, [qui] *non in opte [vocatur] suspica[n]**ren**tur [nonnulli] observarent salem petrae* corporum sulphureorum et inflammabilium [videtur] esse menstruum appropriatum. praesertim cum constat saline[162] animalium volatiles sanguinis puta et urinae terrae *radiis solaribus o̅ exposita* confermentata nitrum progignere. proindique silem hisce sales volatiles ex quavis terrae globa radiis suis

156 Possibly "mixtertuit"
157 Possibly "exelita"
158 Deleted – perhaps not deliberately.
159 Doubtful transcription.
160 The word "concreta" appears above "satis volatilia", but there is a caret before the word "per", there is also a deleted caret under the gap in "se satis"
161 Doubtful transcription.
162 Doubtful transcription, possibly "salire".

biceta extraere exaltere et aeri imimscere[163] quos ad vitam nostram *cui seround*[164] [necessarios] sanguinemque nostrum volatizandum necessarios una cum aere haurimus et imbibimus, unde in corde accenditur continuo vitae igniculus Sic igitur sese sit[165] habet, vita nostra consistit in [contin] perpetua spirituum generatione et effluxu, i.e. [partium] massae sanguiniae volatizatione volatizatio fit fermentatione et quasi accensione in corde, nulla autem huiusmodi *fit* accensio sive fermentatio [vel] *sive* quicquid aliud vocare libet nisi exe aeris, concludimus igitur aerem potius[166] efficientem fomitumque esse caloris cordis potius quam refrigerium Quod insuper[167] quotidiane experimento abunde constat */f.72v/* Si quis in mineralium fodinas adire · velit et frequentes illic hypothymias syncopes et nisi [cite su] oportune subveniatur p̲ conclaucatos tandem [intritus] *exitus*, sciet [hiis] non frigiditatem aeris quo calor cordis temperetur defuisse operariis sed pabulum illud vitae qd una cum aere inspirari debuit. nisi n. p̲ tubos, [quorum orivi] novus continuo *recensque* derivetur aer et quasi circulatio fiat difficiunt et delinquunt qui in fundo putei demerguntur, [per canales] *[in puteorum lateribus]* [enim debiles ad id] [extractos] [tubos aerios assi] *quam maxime* cavent sibi *ne* ut deferatur [novi] continuo novi [recentisque] et illibati aeris haustus p̲ canales in puteorum lateribus ad id extruatos quorum orificia flanti vento obversa excipiunt aerem flatibus impulsum deducuntque ad operarios qd si hujus canalis foramen obtures vel modo a vento avertas [ita ut aeris] *[venti]* [circulatio cesset eundumque stagnetque aer internus sentiunt statim] quod saepe p̲er lusum iocumque [fit, inter] *inter[…]* {…} *is*{…} {…}*nequam* fieri solet, ita ut aer stagnet cessatque illius circulatio, demersi alte fossores *aeris [defectum] vitium* allico sentiunt quorum statim immutatur pulsus [diffici] labascunt artus deficiunt vires tremit cor et *tandem* hypothymia et mors irrepit nisi [novi aeris afflu] aurae vitalis novus affluxus statim suppeditetur, quae omnia non ex male aucto cordis incendio et [….] *in debito* aeris temperamento enim[168] constat, qd haec symptomata saepissime eveniunt ubi aer in fodinis longe frigidior sit quam qui eodem tempore in superficie terrae solis *ardenibus*[169] radiis[170] et aestuante syrio incalesiet, quod vero pabuli [aeri] aeri defectus quo [calor] [sanguinis] [incendi] *calor cordis foveri* et sanguinis massa fermentescere debet, cordis igniculum quasi subtracto fomite paulatim extinguit huic patet, qd lucernarum [illic] illis in tenebris ardentium fflammae

[163] Possibly "mimiscere" or "miniscere".
[164] The preceeding two words are very doubtful
[165] Doubtful transcription.
[166] This word is a possible deletion.
[167] Above "in" is a number "2".
[168] Doubtful, could be "orivi".
[169] Possibly "ardentibus"
[170] Possibly deleted.

pari passu, quo hominum illic degentium vires languescunt, ipsae inquam flammae extenuantur marascunt et tandem penitus emoriuntur, quas nimio aeris calore extingui nemo dixerit. Idem saepe evenit in hominum conventibus [arde] in [domicilio] aedificio quovis ante conclusis, ubi non raro debiliores et rarioris texturae homines de*li*quium patiuntur. [exhausto n. in clausis aeris per tot pulmen] aeris n inclusi [aeris] fermente a tot aridis[171] pulmonibus magna ex parte exhausto cum debilioribus et qui aliunde[172] transperant cujusmodi sunt */f.74r/* [ari[173]] *rarioris* habitus corpora, non affatim suppeditur aeris illud [fer] fermentum, cordis flamma accendi ultra non potest. aer n. hunc temporis menstruo tinctura aliqua saturato simile videtur. id enim in omnibus solventibus observare [est] licet [illa] nempe, qd ultra certam proportionem corpora sibi injecta non solvunt evehunt[174] aut nisi militunt, quicquid n. postra injicias intactum prorsus *et immutatum* ad fundum subsidet. pari sane ratione confertissima hominum turba in eundem locum conclusa ubi minus liberum est cum aere externo comercium aerem inclusum frequenti anhelitu saturat, adeo ut postea *exaltandae* solvendae sanguinis massae minus idonea, ad accendendam cordis flammulam vix sufficiat.

multa alia sunt quae huic opinioni stabiliendae apprime conducunt, qd nempe animalia vix aliqua [nuda] *arte* tam cito extinguuntur quam impedita respiratione sic si [canis] animalis cuiusdam nervos ad diaphragma pratensos respirationique maxime inservientes *praecidas* animal dicto citius quasi de caelo tactum interit. quique glaciali poli[175] vicini frigore saepe calore nunquam extinguuntur, semper tamen respirant nemo[176] [cohibito anhelitu] *intermissa respiratione* calidior evadit. *hypocausta* ranae et serpentium omne genus tactui {..}tis frigidum et [ad incendio] *nimio calore* satis totum nunquam respirare desinit, piscesque quibus a natura [toto oceano] ne incendio deflagrent, toto Oceano satis cautum est, sine aeris {…}oficio vivere tamen non possunt, haec et plurima alia huc spectantia {..}curatius perpendere et fusius explicare huius loci et temporisque ratio non patitur {…..} priusquam manum de tabula [d]*i*ceat dubium aliquod [amovere] in limine obvium {…}overe, sc. si respirationis usus non sit cordis refrigorium, qui fit quod aucto {..}terno calore augeatur et respiratio?

171 Possibly "acidis".
172 Possibly "abunde".
173 Possibly "raro".
174 Doubtful transcription.
175 Very doubtful transciption.
176 Doubtful transcription.

Huic obiectioni pro varietate[177] causarum varie respondendum est, [dib] duplice de causa solent homines nimium[178] incalescere. vel febri vel exercitio [Si exercitium laborque calorem accendat]

1º Labor [omnis] *[plerumque] corporeus* exercitiumque quae homines incalescunt, fit plurimorum musculorum alterno motu. [mu] musculi vero dum motum peragunt tenduntur et indurescunt proindeque vicinas comprimunt vinas adeoque sanguinem */f.74v/* ad cordis [focos ventriculos] *thalamos* cursu [magis ce] praeter consuetudinem [magis celeri] *rapido* propellunt qui in cordis ventriculos illapsus naturali cordis contractione *ejicitur*,[179] [quod cur n.] *(hoc n. viscus* quovis tepido liquore injecto syringis nister statim ejaculatur, unde constat ex [quovis] *omni* exercitio sanguinis circulationem celeriorem fieri et eo magis quo motus [universo] plures exercet corporis musculos uti in cursu *lucta* et similibus. [Circulatione sanguinis] Sanguinis igitur motus circularis ita auctus necesse est augeri simul respirationem non ad refrigerium, sed primo ut properanti sanguini detur liber cemmeatus et per pulmones transitus, nisi n: per repetitam aeris admissionem attollerentur *dercuturque dictum*[180] pulmones, vasa flaccidis pulmonibus compressa cursum sanguinis a dextro ad sinistrum cordis ventriculum impedirent. 2 º ut pro quantitate sanguinis cor et pulmones transeuntis debita fermenti aeri suppenditantur quantitas ne [sanguis] cruor sine isto fermento crudus cadaverosus et ad nutritionem [per] vitaeque parum idoneus [a corde demitteru] ad cerebrum aliasque functionum officinas demitteretur. In febrium vero ardoribus cur aucta sit respiratio ex supra dictis ratio partim peti potest, cui etsi alia ad [hoc] hoc argumentum spectantia adduci possunt *quae explicatio[nem]* ***rem*** *[…] […] dissertationem pestu larent*[181] *et de febrium natura παρεκβασ(ιζ)*[182] sufficient hoc unum addere), qd cum in febribus impedita uti videtur transpirationem deflagrantis sanguinis exuviae per [poros] cutis perulos satis commode difflari et ex cernine[183] possunt, aucta respiratio hanc suppleat defectum, *huic forte incommodo vicaria opera subveniat*[184] et effluviis istis nim{…}a *mole*{..} per pulmones praebeat exitum. huc demum[185] tota res redit, quacunque decausa acce*le*ratur sanguinis

177 Possibly "venitate".
178 Doubtful transcription.
179 No caret for this word: it appears above "contractione".
180 Very doubtful transcription.
181 The preceeding twowords are very doubtful.
182 This appears to be a reference to Simon Paulli's Parekbasis *seu digressio causa febrium* (Frankfurt 1660), which Locke owned a copy of (H&L 2237), and which he read *circa* 1662-4. This was pointed out to me by Dr John Milton.
183 Very doubtful transcription.
184 Doubtful transcription.
185 Doubtful transcription.

circulatio necesse est [neccese] pari passu festinare respirationem ne nimia cruoris inundatione [obstructis] *occlusis* pulmonum alveolis obruatur dexter cordis ventriculus, hoc solum inter calorem febrilem, et edscitium inter*est*[esse] [videtur], quod hic a [motu] musculorum voluntas ille a praeternaturali cordis irritati motu incipere videtur. adeoque respirationem auctam non ad incendium cohibendum, sed ex necessitate *festinantis sanguinis* ortam, qua omnes partes sibi invicem laborantibus mutua amicitia *et tacita inspiratione* subvenire ad totius conservationem nituntur

pui haec paucula breviter addam.1º [186]

2º quod etsi forsan in febribus soluta sanguinis compages ad effervescendum nimis sit idonea, in ista tamen dyscrasi [esse] *quamvis* plurimi [gene] exhalent vapores pauci tamen generantur spiritus aeconomiae corporis apte inservientes, necesse itaque est ut aucta respiratio [quantum sup] aeri fermentum administrat que[187] ut quantum fieri potest in tanta vitum perturbatione mansueti et rectae indolis spiritus generentur. 3º. respiratio augetur quia, motus ille spirituum anomalis *qui forsan vera est febris cu*{…} qui in febribus cor agitat idem etiam diafragma et pulmones crebriore vibratione concutiat unde mala respiratio

[186] From here to the end is written in a different style.
[187] Possible deletion.

Morbus

This extended piece is an entry in a medical common-place book preserved for us in the British Library (BM Add MS 32554). The volume is dated the "25º Feb: 1659", but this is almost certainly the year we would call 1660, as Locke was still using the old Calendrical system at this point. The book remained in use for some time and the last entry that can be dated with certainty comes from the end of April 1667.[1] *Morbus* is almost certainly one of the last made in the book, as it over-runs even the index that Locke compiled, and extends to the last leaf of the manuscript. As we have seen it was most likely written between September 1666 and May 1667.

The entry is in Locke's hand throughout and its unique approach coupled with the want of any contradictory evidence points to the conclusion that Locke was the author of this work. The keyword "*Morbus*" appears in the margin at the head of the entry and of each subsequent new page, although such repetitions are not included in the following transcription. Locke did not finish this piece, though it is not clear why. There is no record of his ever having attempted any further revisions of this draft or any other speculations in the same vein.

Patrick Romanell (*John Locke and Medicine* (Buffalo N.Y. 1984) pp.209-7) has transcribed this piece previously and this transcription is reasonably accurate. John Milton has provided a few corrections of Romanell's work, in a transcription distributed at the 1997 *British Society for the History of Philosophy* John Locke conference. However, in correcting some of Romanell's inaccuracies, Milton has introduced some of his own. I have not noted the various errors these authors have made, but have simply tried to produce a definitive text.

[1] BM Add MS 32554 f.36v cf. BL MS Film 79 p.32.

/f.118v/ I suppose another & more rationall theory of deseases might be establishd upon other principles, then those either of ye Galenests or Paracelsians, for Considering yt in ye greate world some things are producd by seminall principles, & some other by bare mistion of ye parts, to wch might be added the circumstantiall assistances of heat & cold &c, by seminall principles or ferments I meane some small [par] & subtile parcelles of matter wch are apt [tr] to transmute far greater portions of matter into a new nature & new qualitys, wch change could not be brought about by any other knowne means, soe yt this change seems wholy to depend on ye operation or activity of this seminall principle, & not upon ye difference of ye matter its self yt is changd, soe severall seeds set in the same plot of earth, change ye [common] moisture of ye earth wch is ye common nourishmt of them all into far */f.119r/* different plants which, differ both in their qualitys & effects, wch I thinke is not donne by bare streineing ye nourishmt through their pores wch in different plants are of different shapes & sizes, for then it would be hard to conceive how such very destinct parts of ye same plant, wch sufficiently shew their difference both in shape size taste smell &c as is in ye fruit leaves knots flowers seeds pith bark &c of plants. wch can hardly *be* supposd to be made by parts yt had noe other difference then what proceeded from ye pores of ye root & stake. & therefor could hardly be various enough. but besides this, ye conversion of ye same water into divers plants of different kindes as mint & marjoramme &c, cannot be effectd by barely straineing it through ye different pores of those plants, but must be wrought by some more powerfull way, then bare streineing is able to produce in soe simple & homogeneous a body, & I beleive all the streineing in ye world would scarce make ye parts of water produce ye smell of either of those plants. besides there are in branches of mint put into a bottle of water some parts generatd out of ye water & nourishd by it wch cannot possibly be donne by streineing such as are the little roots, yt sprout out at ye bottom */f.121r/* .By this seminall ferment ye liquid parts of an egge are turnd into a chicke, wch how it can be donne by streineing where hard & consistend parts are producd [in a] out of soft & liquid I cannot conceive, Soe grafs of severall [trees] kinds grafted on ye same stocke by their seminall ferments, turne ye common juice of ye crab into fruits of [d]*f*ar differing sorts. How these small & insensible ferments, this potent Archeus works I confesse I cannot satisfactorily comprehend, though ye effects are evident but yet I believe 'twould be worth considering, to finde what deseases spring from these ferments, such as I believe are contagions, evident sufficiently in the itch where upon bare contact of ye outward parts of ye body [these ferments] the ferments of that troublesome desease insinuateing them

selves into ye body produce those scabs wch [after] by Galenists are imputd to cholerick humours, though it may be observd that in many deseases of this nature, ye particular constitution of ye body doth not make ye 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] soyle, though in some they[2] */f.126r/* thrive much better & others starve & dwindle. soe sanguine complexions are observd most easily to admit ye seminall principles of ye plague easily melancholy tempers more difficultly. & in all these seminall deseases ye fault seems noe otherwise to be in ye bloud & humours then as they are more or less disposd to receive & nourish this seminall principle, wch did it not insinuate into them [the body were] & corrupt them by its heterogenious & hostile ferment, the body would continue still in its ordinary health [soe]. for in some eating ulcers we cannot rationally conceive yt, those corrosive particles wch with soe much speed & vigor destroy not only ye flesh, but bones too ye hardest part of ye body, if they [made] were generatd in ye bloud by any corruption originally inhaerent in yt, & if ye bloud were in its owne [natu] masse soe depravated, as. to be corrosive enough to eate into ye very bones, in one part of ye body, it could not soe harmelessly circulate through others, fare more delicate & tender, atleast if there be some [corrosives] *liquors* yt will corrode harder things, but innoxiculy imbrace others of a finer texture, yet I cannot see if ulcers were oweing to ye sharpnesse */f.127r/* & depravation of ye bloud, why […] bloud should at ye same time corrode one legge soe cruelly and at ye same time soe courteously nourish ye other, ye same masse of bloud indifferently circulateing in both unlesse there were some seminal ferment yt in its passage corrupted it in ye one, whilst undisturbd it pasd through the other. the method therefor of cureing these deseases I suppose would be to finde out remedys to destroy these particular ferments, & to fortifye ye parts agt their operation. [Other desease] Other deseases I suppose may probably be conceivd to be producd by a [pa] bare mistion of two unfitt ingredient, as when acid & volatile salts are mixd, there presently is producd an ebullition, & then ye two differing salts coagulate into a 3d substance far enough different from either of ye ingredients. wch I suppose not to be donne by any seminall principle, ye difference of this and ye other operation [bein] of seminall principles being this, yt seminall principles from a very small & almost insensible begining, et mole minima, doe turne the [obj] subjects they worke upon into their owne natur */f.127v/* make them obey their motion, & quite alter the natur of those bodys wch are fit to receive

[2] "they" is a catchword.

their impression, [& usually work] or else in others produce scare any effect at all but lie dormant & insensible, & their operations usually are uniforme in different bodys their products much y^e same, & progresse from slow & secreat begining, increase & get strength by continuance. But in y^e other where y^e effect is producd by y^e mistion & union of differt bodys y^e contrary appears, as *y^t* there must be a sensible & proportionate quantity of both ingredients one prevailes not over the other but both together usually produces a third, w^{ch} partakes of y^e nature of neither, nor is fit to produce y^e like where as in seminall productions, the [masse] seminall principle increases & propagats its self [is of y^e same] *operates alike in* in all bodys, or else not at all; ffor it is easy to observe the difference there is (as to way of production) betweene y^e ebullition of y^e bloud y^t is causd by too much drinkeing of wine, & y^t producd by y^e biteing of some venemos beast, where though y^e power as to */f.128r/* heat may be very much the same y^e y^e way of production & method of cureing is very different

Anatomia

This text, endorsed by Locke "Anatomia ·68", is preserved at the Public record Office amongst the Shaftesbury Papers (PRO 30/24/47/2 ff.31-8). It cannot be more precisely dated to any point in 1668.

The main body of text was in Locke's hand, but the first sentence was written by Sydenham. However, the fact that this sentence spilled over into the margin would suggest that Sydenham's writing was a later contribution. The authorship of this piece, as well as that of *De Arte Medica*, has been disputed. Indeed, the piece has confidently been assigned to both Locke and Sydenham. However, on the balance of probabilities, the style and structure of the writing suggest that Locke was the author as well as the scribe of the piece.

Anatomia has been transcribed once before by Kenneth Dewhurst (*Dr. Thomas Sydenham (1624-1689)* (London 1966) pp.85-93). However, this transcription is not entirely accurate and takes some minor liberties with the text. Additionally, Dewhurst does not record any of Locke's deletions, or indicate what parts of the text are insertions. I have attempted to make up for Dewhurst's omissions in the text that is reproduced below.

/*f.31r*/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.*

Anatomie noe question is absolutely necessary to a Chirurgien & to a physitian who would direct a [ch] Surgion in incision trepaning & severall other operacons. It often too directs the physitians hand in the right application of topicall remedys & his judgmt in the prognostique of wounds, humors & severall other organicall diseases. It may too in many cases satisfie a physitian in the effects he finds [in]*p*roducd by his method or medecins & though it give him not a full account of the causes or their ways of operacon yet may [serve him in the frameing a probable hypothesis,] *give him some light in the observations he shall make in the history [& ideas of diseases] of diseases, & the ideas he shall frame of them.* wch though not perhaps true in its self yet [may serve] will be a great help to his memory & guid to his practise, [but] & not least *it* will be always thought an advantage for a physitian to know as much of the subject he has to deale with as is possible But that anatomie is like to afford any great improvemts [in]*to* the practise of physic or assist a man in the findeing out & establishing a true method I have reason to doubt: ·All that anatomie can doe is only to shew us the grosse & sensible parts of the body, or the vapid & dead juices. all wch 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 [eff]*de*fects of a part whose organica{...} constitution & that texture whereby it operates he cannot possibly know is alike hard as to make a part wch he knows not how is made. now it is certaine & beyond controversy that nature perform all her operations in the body by parts soe minute. & in sensible that I thinke noe body will ever hope or pretend even by the assistance of glasses or any other invention to come to a sight of them, & to tell us what organicall texture or what kinde of ferment [separates any [part] of the juices in any of the viscera] (for whether it be donne by one or both of these ways is yet a question & like to be soe alway notwithstanding all the endeavours /*f.31v*/[1] of the most accurate dissections) separates any part of the juices in any of the viscera· or tell us of what figures the particles of those juices are or if this could be donne (wch yet is never like to

[1] "[of the most]" appears at the very top of the page, perhaps over-written by illegible word, perhaps deleted. "of the most …" is repeated after leaving a border at the top of the page.

be) would it at all contribute to the cure of the diseases of those very parts wch we soe perfectly knew for suppose any one should have so sharp a knife & sight as to discover the secret & effective composure of any part, could he make an ocular demonstration that the pores of the parenchyma of the liver or kidneys were either round or square & that the parts of urin & gall seperatd in these parts were in size & figure answerable to those pores, I aske how this would at all direct him in the cure either of the jaundice or stopage of urin [how knows] what would this advantage his method or guid him to fit medecins. how knows he here by that rhubarb or pellitory have in them fit wedges to divide the [bld] bloud in to such parts as may be seperable urin in the one or gall in the other [how shall he here by be] or any other particles in them fitted to open those passages. how regulate his dose, to mix his simples & to prescribe all in a due method, all this is [effect] only from history & the advantage of a [seriou] diligent observation of *these* diseases, of their begining progresse & ways of cure. wch a physitian may as well doe without [the] a scrupulos enquiry into the anatomy of the parts as a gardener, may by his art & observation be able to ripen meliorali{...} & preserve his fruit without examining, what kindes of juices fibres pores &c are to be found in the roots barke or body of the tree. An undeniable instance of this we have in the illiterate Indians, who by enquirys suitable to wise [but un] though unlearnd men· had found out the ways of cureing many diseases, wch [by] *exceeded* {...}*he skill of* the best read Drs that came out of Europ now far better versd in */f.32r/* anatomy then those skillfull Indians who were soe far from makeing any dissections that they had not soe much as knives. [Soe] & yet the Christians chose to trust them selves in their hands & found help from those, when their owne Drs left them as incurable. No question but the dissector may know well the sensible parts of the organs for generation in man or woman by wch the pox is conveyd from one to an other, but can he hence discover to me what kinde of venom it is that produces [sh] such horrid effects in the body why it corrodes this or pains that part of the body · can he [tell me] his knife discover the re[p]æptacles wch the nose soe easily affords more then other parts, or will all his knowledg in the parts of the body point out one fit remedy for it If therefor anatomie shew us neither the causes nor cures of *of most diseases,* diseases, I thinke it is not very likely to bring any great advantages for removeing the pains & maladys of mankind. Tis true it pretends to teach us the use of the parts, but this if it doth at all it [very] *doth* imperfectly & after a grosse manner. [for] to evince this let us but consider the spleen & enquire what discoverys anatomy hath made in the use of that part & after all I feare we shall finde that we know little or noething of what

office it is & what it contributes to the health or oeconomy of the body, all the assigned uses of it being at best but uncertain & uselesse guesses wch may appeare in this little alteration hath beene observd [...] in those animals whose spleens have beene taken out & they livd long after it, now this proceeds not from [any] the exceeding curious fabrique & undiscoverable organs & tooles of this part above any of the rest that we are soe much at a losse in the functions of this viscus, but only from a[n] [all] mistaken opinion of our owne knowledg, & a conceit that we are better acquainted with the operation of other parts then indeed we are, ffor haveing observed in some of the viscera a separation of */f.32v/* some liquor or other, & that by certain vessels for that [use] purpose certain new juices are brought out of the part wch were noe where conveyd in by them selves, we presently conclude we know the use of the part, wch is true that in grosse & as to some effect we doe, as that gall is separatd in the liver urin in the kidneys, seed in the testicles &c but how the parte performes its duty by what engines it divides precipitats, ferments separates or what else you please to call it we know noe more in the [one then in the] liver than in the spleene nor will anatomy ever instruct us by shewing that gall comes from the liver how it is to be assisted in its defects or correctd in its errors when it does not this aright soe that he that does but know the size & situation of the liver & has seene but some of its large vessels their entrance in & comeing out of the substance of it, is like to know as much of its operation as he that shall excarnifie it & spend whole years in traceing the meanders of its vessels. tis noe doubt we see gall and urin [from] comeing from the liver & kidneys, & know these to be the effects of those parts but are not hereby one jott nearer the cause nor manner of their operation & he that upon this account shall imagine that he knows the use of the liver better then the spleen in order to his cureing of diseases may upon as good grounds perswade him self that he has discoverd how nature makes minerall waters in the bowels of the earth better then he does how she makes iron or lead because he sees the one [come] *flow* out but the other lyes hid within, whereas upon examination it will be found that the workmanship of nature is alike obscure in both. soe that I thinke it is cleare that after all our porings & mangling the parts of animals we know noething but the grosse parts, see not the tooles & contrivances by wch nature works· & are as far off from the discoverys we aime at as ever. soe that he that knows but the *naturall* shape size situation & colour of any part is as well furnishd for the knowing of its diseases & their cure as he that */f.33r/* as he that can describe all the minute & sensible parts of it can tell how many veins & arterys it has & how distributed, count every fibre & describe all the qualitys of the [parenchy]

parenchyma, since he knows all this & yet not to perceive how it performes its office is indeed to take pains for some thing more difficult but not a jot more usefull then that other lesse accurate knowledg *in anatomie* I mentioned [in], the laborious anatomist I will not deny knows more but not more to the purpose for if he cannot come to discover those litle differences wch [make] preserve health or make a disease if he cannot possibly see how nature prepares those juices wch serve [for their use] *in·* their fit places & proportions for the use & preservation of the body. he may perhaps be the better anatomist by multiplyd dissections but not a better physitian, for poreing & gazeing on the parts wch we [cut] *dissect* without perceiveing the very precise way of their workeing is but still a superficiall knowledg, & though we cut into the inside we see but the outside of things & make but a new superficies for our selves to stare at for could the intent lookeing upon any part teach us to cure its defects the Ladys would have more reason to goe to the painter then physitian for removall of frecles & scabs sore eyes & sallow cheeks from their faces But to make it yet clearer *that* when we pretend to discover {...} anatomy the use of any part it is only of those parts where we see something separated, & then all the knowledg we have is but that such a juice is there separated. wch is but a very scanty & uselesse [observation] *discovery*, & that wch in a very few days may be perfectly attained in all the parts of the body. Let us consider the lungs */f.33v/* a part of that constant [use] *necessity* that we cannot live a minute without its exercise & yet there [is] *being* [s]*n*oe sensible a separation of anything in this [...] viscus, we are still at a perfect losse in its use, (not to say any thing that though anatomy had taught us its use yet it would not doe us much service towards the cure of its diseases.) & whether respiration serve to coole the bloud, or give vent to its vapours, or to adde a fermt to it, or to pound & mix its minute particles or whether any thing else is in dispute amongst the learned from whose [disputes] controversys about it are like to arise rather more doubts then any cleare determination of the point & all that anatomie has donne in this case as well as severall others. is. but to offer new conjectures & fresh matter for endlesse disputations. Tis certain therefor that in parts where noe separation is made the [ph] anatomist is forced to confesse his ignorance & but very doubtingly to [p] assigne the use of the part, not that he has any more perfect or usefull knowledg of those parts where he finds a separation, tis true he affirmes it is the [use] *businesse* of the liver to separate the gall *& the pancreas a juic of an other kinde [w^th^ yet]* ***of w^ch^ we have yet noe name*** *we know as well with all its uses as the gall & others y^t^ we have names for.* & tis probable he is in the right but this does him noe more service than the *bare* knowing that it is the businesse of a watchmaker to

make a watch. will instruct any one the better to make, or mend it when [it goes not right] out of order soe that I thinke I may without injury to any body say that as to the true use of parts & their manner of operation anatomy has hitherto */f.34r/* made very slender discoverys, nor does it gives very much hopes of any greater improvements ·haveing already baffled the indeavours of soe many learned ingenious *industrious* & able men not [because] for want of any skill or sagacity in them but because the matters they handled would not bare it [they being to small] the tooles where with nature works & the [ef] changes she produces in those particles being too small & too subtile for the observation of our senses for when we goe about to discover the curious artifice of nature & take a view of the instrumts by wch she works, we may with as much reason expect to have a sight of those very spirits by wch we hope to see them, for I beleive they are as far from the reach of our senses as the other

⟨Locke here leaves a one line gap in the MS.⟩

Let us next see how anatomie performs its undertakings in [the juices] detecting the [juices] *humors* & discovering to us their natures & uses & here I thinke we shall finde it performes as little as in the other part, & that for the same reasons, for though upon dissections we finde severall juices where they are lodged & wch way they tend, yet what part they beare in the oeconomy of the body what ferments [alterations] *strÿnings*, mixtures & other changes they receive in the severall part through wch they passe we cannot at all [finde] discover. for whereever almost the anatomist makes his trialls [...] either the juises he observes must be *extravasated &* dead & out of the regimen of the life & spirits of the body or else the animall dead [...], & soe the parts wh alter these juices looses */f.34v/* [its] *their* operation, & wch soever of these two happen the humor he is examining will be of a far different nature & consideration [then] from what it is, when it has its due motion & activity in a living animal. all therefor that the anatomist can doe is to shew us the sensible qualitys & motions of severall of the juices of the body but how litle this can possibly conduce to hypothesis or cureing of diseases or preserveing the health & easing the maladys of mankind [may] will easily appeare to a man who considers first that [very few] *many* of these humors can *not* be knowne in a liveing man for whatever alterations may happen in the chyle Lympha succus pancreaticus, gall & what ever other humors be in the body not immediately vented in some outward part excepting the bloud, [...] & how ever these alterations may concerne the present state of health or sicknesse of any man, yet even the sensible qualitys of those either naturall or depraved juices cannot be known to the physitian when he is considering the condition

of his patient or the way to his recovery. Secondly that those [wch] juices that may come within the observation of the physitian [are liable to very much chang] as ye spittle seed uri{...} bloud &c are liable to very great alterations in their sensible qualitys without discovering any difference of health or sicknesse in the [patient] *man* & he would be thought a very indiscreet man that upon every change he should find in his urin or spittle should betake himself to a physitian /*f.35r*/ physitian to rectifie the disorders of his body, the vanity & quacking of uromantia hath beene sufficiently exploded by the learned & sober part of rationall physitians But thirdly grant that these excreta doe give the physitian any insight *into* either the constitution of the body or the condition of the disease what thanks is there due to anatomie for it, he that in a feavor or any other malady is able to make [any] advantage from his inspection into the urin, & by that takes any indication, & chooses time for purgeing bleeding or [any other] the giving any medicin, [is no] doth not this one jot the better for knowing the structure of the veins ureters bladder &c, but by acquainting himself with the nature & history of the disease. & whether the stones be only a complication of vessels without parenchyma or [a mixture] *glandules consisting* of vessels & parenchyma will be of very litle consideration, [in]*w*hen a man findes the ex[oc]*cre*tion & colour of the seed praeter$\overline{\text{naa}}$l in a virulent gonorrhaea. & he that knows all the [con] texture & constitution of that part is as far from knowing the cause of ye yellownesse or acrimony of the seed at that time as he that has never seen [soe much as] *any more of* a testicle, than a *dish* lambstones fried & served up to a table. The bloud noe question is the great genius of the body & that wch is most concernd in the *nourishm*/ health & sicknesse of the man, (for as for the succus nervosus [though I or any body else may sup] whatever others may thinke of it, tis certain the /*f.35v*/ anatomist of all men if he be true to his principles [ought] *should* not [to] suppose it, since he ought not to believe any thing but what he sees, & when he makes it visible others [are bound to] *may then* believe it too) the bloud I say that is soe much concernd almost in every disease is lyable to examination without the help of [anatomie] *dissectiones* & he that has but anatomie enough to know a veine & skill enough to use a lancet or [that] stands by a surgeon that does has if he be a good physitian & an observeing man more information from the bloud, & light into the disease then ever he could gaine by riping up all the veins & arteries traceing their branchis & meanders in never soe many dead carcases. But, ffouerthly granting all this that the *accurate* anatomist knew more of the sensible qualitys of the juices of the body & the [alter] kinds of [its] *their* variations [&] *then* an other physitian, I thinke he would [g]*a*fter all that know very little more of the

causes of diseases then a less accurate dissector, for after all the [finde] fine discourses of the tast smell colour & consistence of the juices in the body & the changes he [...] supposes to be the cause of this or that disorder in the body, it is certainly some thing more subtile & fine then what our senses can take cognisance of that is the *cause of the* disease, [&] they are the invisible & insensible spts that governe preserve & disorder the oeconomie of the body, [to shew] this cannot be doubted by any who will allow them selves to to consider how little different the bloud as to all its sensible qualitys *is* in severall feavers wch are certainly distempers that doe affect /*f.36r*/ & reside in masse of bloud, from the bloud in an healthy man, [or what differ,] who is able by seeing the blood to divine whether it be an intermittent or a continu[all]*ed* fever whether a dysenterie or haemoptoe the patient is sick of· & what sensible falt does often appeare in that bloud [wch] in wch nāā does sometimes expell the cause of a disease & give present ease by a [chr] criticall haemorrhagia, wherein the bloud very often lookes as florid & as well conditioned, as any that flows in the veins of the most healthy man liveing tis some thing therefor beyond [yellow] florid or black, some thing besides acid sweet or salin that [influ] causes diseases & appears to us only in the sad effects we feele of it wch may be very violent & horrid though the cause be very small in bulke & insensible in its parts, what strange disorders will the bite of a viper cause in the body of the strongest man, when [perhaps] all that he injects into ye wounded flesh is not the tenth nay perhaps not the [10] 1/100th part of a grain, & he that shall remember how many [thousand] men ⟨an ounce⟩ of vitrum antimon [by] *without wasting its self* will vomit infused in wine wherein it makes noe sensible alteration will have little incouragment to seeke for the cause of diseases, in the sensible difference of the humors · Some men that have made anatomicall enquiries into the stomach, tell us the menstrūū wch there causes appetite & digestion is acid, others that it is more of kin to sal armoniak, (for the naturall temper of that juice wch lies at the threshold & very entrance of the body & is but the first praeparative to those other more refind & exalted that are afterwards to be /*f.36v*/ produced is not yet agreed on after so many thousand dissections) be it [one or tother or] acid or salin or of what other sensible quality it will, the appetite [seemes not bar] nor digestion seems not to depend upon the sensible constitution of that menstruum, when it often happens that one who sits to table with a good stomach looses it utterly upon the receit of [good] suddain bad news or any thing that violently stirs up al{...} any passion, *& has noe longer any appetite* though noe body can thinke that the juice in the stomach is by such [news] *an accident* made lesse acid then it was before. Ther is some

thing therefor in the body & the juices too [sm] curious & [sub] fine for us to discerne wch performes the offices in the severall parts governs the health & produces the various motions in the body intus-mens agitat molem, & upon whose unconceivable alterations depends our health or sicknesse· hence a fright wch [aff] causes *some diseases as* epilepsies [&]*h*ystericall fits, & fatuity *often* cures others as agues & as some report the gout its self & tis probable in these cases twould puzzle the quickest sighted anatomist assisted too by the best microscope to find any *sensible* alteration made either in the juices or solid parts of the body. Therefor this hidden δημιουργὸξ was soe much out of the reach of the senses yea & apprehension of the ancients that not knowing what to [call it] conceive it, they *went above the clouds for a name* cald it φμσιν αναλογον τῶ τῶν ἀστρων ατοιχήῳ, an expression however obscure & insignificant more like to give us a usefull notion of the thing, then the anatomist to shew us this archeus [as Helmont pleases to call it] *by w^th^ name Helmont has as clearely & intelligibly explained it to us as Aristotle by his description.* . But to put it beyond doubt that anatomie is never like to shew us the minute organs of the parts */f.37r/* or subtile particles of the juices on wch depend all its operations & our health, it will suffice *but* to mention a mite or rather a little [ani] creature by the help of microscopes lately discovered in *some kinde of* sand, an animall soe small, that it is not to be discernd by the naked eye & yet has life & motion to the preservation of wch there must necessarily be supposed a mouth stomach & guts, heart veins & arterys & juices in them [to omit liver brains eyes] *adde to these brains* nerves muscles & bones without all wch it is hard *to* conceive life & motion & all these to omitt, [the rest of those parts] eyes ears liver spleen &c to be conteind in a [p]*i*nsensible particle of matter let the anatomist take this animalculum, or a mite (neither of wch I suppose he will thinke to be a finer peice of worke manship then the body of a man or to produce more refind spirits,) & when he can but shew the parts in one of these *insects* I shall beleive he will be able to shew the very operations of those parts in [the other] *a man* & till he dos that he does very litle towards the discovery of the cause & cure of diseases. [for let me adde] Tis certaine therefor notwithstanding all our anatomicall scrutinys we are still ignorant & like to be soe of the true [formall &] essential causes of diseases, their manner of production, formalities, & ways of ceaseing [& are like to be soe], & must be much more in the darke [...] to their cures upon such hypothesis for supposeing it were the acidum amarum & acre of the great Hippocrates *or the sal sulphur & mercury, the volatile & the fixd of the chymists* that made disorders in the body & we could come to know wch of these in excesse it was that *[in excesse]* producd this malady & where */f.37v/* it was

lodged supposeing v.g. that too much acidity in the bloud *or other juices* caused the gout a fever or epilepsie what indication would this give a practicall physitian in the cure of [of] either of these diseases tis true twill presently be suggested he must mortifie this acidity, but will he be thence inabled to choose fit remedies & a due method of their application, will he conclude that perle corall or egshells because they take away the acidity in vinegar will be certain & effectuall remedies in the removall of these maladies. he that shall proceed in such [hypothesis] *grounds* as these may indeed constitute fine doctrines & lay plausible hypotheses but will not have much to brag of his cures. for the alterations that both our food & physick receives in our mouths stomachs guts glandules *&c* are soe many & soe unintelligible to us before they come to the places we designe them, that they are quite another thing [& worke *[otherways]* then we phansy] *then we imagine* & worke not as we phansie but as nature pleases & we may as well expect that the juice of worm·wood should retaine its greenesse or bitternesse in the venae lacteae as [its other qua] any other medicin its native qualitys till it come to the masse of bloud, for that it is not any sensible qualities by wch medecins work their effects on our bodys [is an] & soe cannot by those criterions be chosen & adaptd to our hypothesis (all our knowledge of their efficacy being [the effect of experience &] *to be acknowledged* rather */f.38r/* [to the ex{...}] [the of] old womens experience then learned mens theories ·) appears in that wormwood & colcynthis are of different uses in physick. that sugar in some stomachs turns to acidity & milk the most universall & innocent food in the world is to some men as bad as poison. the anatomist will hardly be inabled to [...] tell us therefor what changes any *particular* medecin either makes or receives in the body till he can inform us by what artifice *& in what shops in the bodys of animals*, nature makes [out of the juice] volatil salts out of the juice of plants wch appear not to have any such substance in them

Anatomia

68[2]

/f.38v/

Anatomia

·68

Various

Ab^{t} the year 1670[3]

Locke numbered Folios 32r to 37r from 3 to 13, apart from 34r which was numbered "76".

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[2] "Anatomia 68" is upside down at the bottom of the page.

[3] All these words appear upside down on the bottom right hand side of the page. "Various Ab^{t} the year 1670" is not in Locke's handwriting.

De Arte Medica

This work, endorsed by Locke as "De Arte Med{…} 1669", like *Anatomia*, is preserved for us at the Public Record Office amongst the Shaftesbury Papers (PRO 30/24/47/2 ff.47-56). It is not possible to date the piece any more accurately within this twelve month period.

The text is in Locke's hand alone and this, along with all the other evidence leads to the conclusion that Locke was the author of the piece. Locke used pieces of paper folded in two to write upon, and placed these on top of, rather than inside of one another. He wrote only upon the right-hand pages, leaving the left-hand pages blank for any insertions that he would add in later revisions. On a number of occasions in *De Arte Medica*, notes are made on the left-hand pages, but no point for insertion is indicated in the text. Where this occurs, the unmarked pieces of text are recorded in the footnotes; where there is a marker in the text for a note on a left-hand page, the note is incorporated into the main body of the text.

The text has been transcribed on a number of occasions with varying degrees of inaccuracy.[1] It is hoped that the version below will prove a considerable improvement upon those previously given and cannot itself be substantially improved upon.

[1] Fox Bourne in his *The Life of John Locke* (London 1876) Vol. I pp.222-227, A.G. Gibson *The Physician's Art* (Oxford 1933) pp.13-26 and Kenneth Dewhurst *Dr. Thomas Sydenham (1624-1689)* (London 1966) pp.79-84.

/f.47r/

De Arte Med{...} 1669

Ars. Medica

1669

/f.49r/ Length of life with freedome from infirmity & pain as much as the constitution of our fraile composure is capable of is of soe great [consideracon] *concernm^t* to man kinde, that there can scarce be found any greater undertakeing then the profession to cure diseases. nor is there any art that soe well deserves all the care & industry & observacon of its professors to improve it & bring it to perfection, wch I doubt not but [the] in many parts [of it] *& to a great degree* it is capable of. he that shall goe about to doe this shall noe question deserve the thanks of mankinde for soe good an intention, as the reduceing those rules & methods to a certainty on the practise whereof the ease & recovery of sicke men depends but whoever shall thinke to compass it alone will [inga] finde him self ingaged in a business too [grand] large for *any* one mans comprehension & too great for his owne single endeavours. My intention therefor [is in com] is to propose some few things to the consideracon of the Learned men of this soe usefull a faculty & to excite their mutuall assistance to perfect the art & establish a setled certaine practise in the cure of [diseases] *sicknesses,* that soe the large catalogue of yet incurable diseases & the frequent sad events of [others] the rest being [must be] every day lessend, [the diffidence & disesteeme *disrepute* of the art its self [migh] & then might cease wch hath very much spread its self might cease] *the diffidence w^ch some sober men upon se*{...} *consideracon seeme to have of the art its self and the disrepute w^ch others industriously labour* {...} *bring upon the practise of physick being by the dayly growing successe of the physicians removed,* {...} *[act] industrious & learned practitioners*[2] & practitioners of physick with more confidence & satisfaction attend their calling when they could be noe longer upbraided with thosse [common] *confessed* opprobria medicorum *w^ch every day yeild to the efficacy of their medecins or well orderd methods*. If this were once set about it would not perhaps be found soe impossible a designe as is at first sight imagind. & the great improvemt some parts[3] */f.50r/* of medecin have received

[2] f.47v - this is an interpolated addition.

[3] */f.49v/* Verum ego hanc vim esse intelligo in praeceptis omnibus non ut ea secuti oratores eloquentiae laudem sint adepti, sed quae sua sponte homines eloquentes facerent ea quosdam observasse atque in artem redigisse non eloquentiam ex artificio sed artificium ex eloquentia natum Cic. de oratore. l i. c. b. ⟨An unmarked piece of text that was not properly interpolated into the document. It translates as: "But to my thinking the virtue in all rules is, not that orators by following them have won a reputation for

within this few years give me confidence to beleive, [there remains yet a great deale to be] that it is yet capable of great additions & that in a way some thing different from what hitherto [appeares] *seems* to have beene *generally* followed [if we examine the writings of [most] those] by most of those who have beene soe kinde as to propagate the knowledg of physick, & leave the rules of practise to posteryty, as will appeare to any one who shall carefully peruse their wrightings, wherein yet they have very much obleiged posteryty, [& wherein yet] & they are not to be blamed that they did that wch is very [naturall to man] agreeable to the nature of [h]mans understanding, wch not contenting its self to observe the operacon of nature & the event of things, is very inquisitive after their cause & [is] very restlesse & unquiet till in those things wch it is conversant about, it has framed to its self some hypothesis & laid a foundation whereon to establish all its reasonings. If therefor th*e*[is] Learned men of former ages imploid a great part of their time & thoughts in searching out the *hidden & [forma]* causes of distempers, were curious in imagining the secret workemanship of nature & the severall unperceptible tooles wherwith she wrought, & puting all these phansies togeather fashioned to them selves systems & hypotheses, ·is noe more to be wondered *at* or [blamed] censured, then that they accommodated them selves to the fashion *of*[&] their times and countrys· & soe far complied with their most naturall inclinations, as to desire to have some basis to rest their thoughts upon & some grounds to guide them in the practise of their art, their being busy & subtile in [imag] disputeing upon [certain] alloud principles was but to be imploid in the way of fame & reputacon & the learning [of that] valued in that age. [I] & that their practise extended noe farther then thier *sacred* principles they beleived in would permit is noe more to be admird then that we finde noe */f.51r/* fair & lasting fabriques left to us by our ancestors upon narrow & unsound foundations · I would not be thought here to censure the learned authors of former times, or disowne the advantages they have left to posterity. to them we owe a great number of excellent observacons & severall [learned] *ingenious* discourses, & there is not any one rule of practise [left] founded upon unbiassed observacon wch I doe not receive & submitt to with veneracon & acknowledgmt: yet I thinke I may confidently affirme, that those [th] [long & elaborate discourses of the ancients about the humours] .[h] hypothesis wch tied the [disease] long & elaborate discourses of the ancientts & sufferd not their enquirys to extend them selves any farther then how the phenomena of

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eloquence, but that certain persons have noted and reduced to an art the doings of men who were naturally eloquent; eloquence is not the offspring of the art, but the art of eloquence".〉

diseases might be explaind by these doctrines & the rules of practise [might be] accommodated to [those] *the received* principles has at last but confined & narrowed mens thoughts, amused their understanding with fine but uselesse [notions] speculations, & diverted their enquirys from the true & advantageous knowledg of things. the notions that [by this way of proceeding] have been raised into mens heads by remote speculative principles though true are much like the *curious* imagery men sometimes see in the clouds wch they are pleased to call the heavens, wch though they are for the most part phantasticall & at best but the accidentall [composure] *contexture* of a mist yet doe really hinder the sight & shorten the prospect, & though those painted aparitions are raisde by the sun & seeme the genuin ofspring of the great fountain of light. yet they are really noething but darknesse & a cloud. & whosoever shall travell with his eye fixed on these tis ten to one goes out of his way. he that in physick shall lay downe [princip] [...] fundamentall maximes & from thence drawing consequence & raising dispute shall reduce it into the regular f⟨r⟩ame of a science has indeed done some thing to enlarge the art of talkeing & perhaps */f.52r/* Laid a foundation for endlesse disputs, but if he [requires] hopes [that] to bring men by such a system to the knowledg of [diseases] the infirmities [of mens] bodys, the constitution nature signes changes & history of diseases with the safe & direct way of their cure, takes much what a like course with him that should walke up & downe in a thick wood overgrowne with briers & thornes with a designe to take a view & draw a map of the country. these speculative theorems doe as little advantage the physick as food of men. & he that thinkes he came to be skild in diseases by studying the doctrine of the humors, [or that he owes the cure of feavours to the *[inexplicable]* notions of [p]*o*bstructions & putrefaction] that the notions of obstructions & putrefaction assists him in the cure of feavers, or that [he] [owes the knowledg] by the acquaintance he has with sulphur & mercury he was lead into this usefull discovery, that what medecines & regimen are as certainely [cure] *kill* [...] the *latter* end of some feavers as they [kill] *cure* in others, may as rationaly beleive that his [...] Cooke owes his skill in rosting & boyling to his study of the elemts & that his speculations about fire & water have taught him that the same [boileing] seething liquors that boiles the egg hard makes the hen tender. the begining & improvemt, of useful arts, & the assistances of human life ·have all sprung from industry & observ$\overline{\text{acon}}$ [useful] *true* knowledg grew first in the wor⟨l⟩d, by experience & rationall [opera$\overline{\text{cons}}$] *[tryalls] operacons* & had this method beene continued [for] & all mens thoughts beene imploid to adde their owne tryalls to the observa$\overline{\text{con}}$ of others noe question physick as well as many

other arts, had been in a far better condicon then now it is {...} but proud man, not content with that knowledg he was capable of & was useful to him, would needs [prie] *penetrate* into the hidden causes of things lay downe principles & establish maximes to him self about the[4] */f.53r/* operacons of nature, & then vainely expect, that Nature or in truth god him self should proceede according to those laws his maximes had prescribed him. where*as* his narrow weake facultys could reach noe farther then the observacon & memory of some few effects produced by visible & externall causes but in away utterly out of the reach of his apprehension, it being perhaps noe absurdity to thinke that this great [...] & curious fabrique of the world the workemanship of the almighty cannot be perfectly [understood by any thing els] comprehended by any understandg but his that made it, but man still affecting some thing of a deity labourd to make his imaginacon supply what his observacon failed him in, & when he could not discover the principles & causes & methods of natures workmanship, he would needs fashion all those [to him self,] *out of his owne thought* & make a world to him self· framed & governd by [him se] his owne intelligence. this vanity spread its self into [all the] *many of* usefull parts of naturall philosophy, & by how much the more it seemd subtile sublime or learned by soe much the more it [was] *proved* pernicious *& hurtful* by hindering the [improvemt of [use] advantageous arts·] growth of [usefu] practicall knowledg. thus the most acute & ingenious part of men being by custom and [vanity] *education* ingagd in empty speculations, the improvemt of usefull arts was lefte to the meaner sort of [men] *people* who had weaker parts & lesse opportunitys to doe it, & [th] were therfor branded with the disgrasefull name of mechaniques, hence it came to passe that *y^e^ world was fild with books & disputes* bookes multiplied without */f.54r/* the increase of knowledg: the ages successively grew more learned without being wiser or happyer or if the conveniencys of humane life [happend] *chanced* to be promoted by any new invention, [it was] men were not led to such happy discoverys by the conduct of philosophicall speculations, but chance or well designed experiments [shewed] *taught* them *to* those who imploid their *time &* thoughts about the works of nature more then the maxims of the schooles. of this the plowman [gardiner corb] *tanners smiths bakers* dier painter &c are witnesses. the great inventions of [guns &] powder & the load stone wch have alterd the whole affairs of man kinde are undeniable [inta] instances. [soe yt had both read & writ whole volumes of

[4] */f.52v/* & thus man by desire to know more than was fit a second time lost the little remainder of knowledg y^t^ was left him. ⟨An unmarked piece of text that was not interpolated into the document.⟩

generation & corruption of nutrimt & concoction, knew little how to order their children their cable or their Kitchens. the country man & the cooke were in usefull parts of]

Soe that those who had read & writt whole volumes of generation & corruption knew not the way to preserve or propagate the meanest species of creatures he that could dispute learnedly of nutrition concoction & assimulation was beholding yet to the cooke & the good housewife, for a wholesome & savoury meale, & who ever desired to have faire gardens & fruitfull fields, had more reason to consult [with] the experience of the dull plowman & unread gardener then [with] the profound philosopher or acute disputant. Let *not* any one be offended that I ranke the cooke & the ffarmer *[in naturall philosophy]* with the Scholler & philosopher, for speakeing here of the knowledg of naturall bodys, the end & benefit whereof can be noe other then the advantages, & conveniencys of human life, [whatsoever *speculations &* philosophy teach not a man to doe something for the common benefit of man kinde *[...]* deserves not the name of knowledg, or soe much as the wast time of our idle howers to be spent about *it*,] *all speculations in this subject however curious or refined or seemeing profound & solid, if they teach not their followers to doe something either better or in a shorter & easier way then otherwise they could, or else leade them to the discovery of some new & usefull invention, deserve not the name of knowledg. or soe much as the wast time of our idle howers to be throwne away upon such empty [uselesse]* ***idle*** *phylosophy*.[5] they that are [busy &] studiously busy in the culti */f.55r/* vateing *&* *adorning* such drie barren notionions, are vigorously imploid to little purpose & might [...] with as much reason have retaind [the {...} babys they] now they are men the [puppet] babys they made when they were children, as exchanged them for those empty impracticable notions [wch]*y*^{t} are [p]*b*ut the puppets of mens phansys & imaginations wch however dressed up, are after 40 years dandleing *are* but puppets still, [that have neither use] *utterly void of* strength use [nor efficacy] *or activity* [or productions] but not to expatiat into the large feild of *$\overline{naa}$ll* phylosophy where perhaps the foundation of the mischeif was first laid, I shall according to my designe confine my self at present to that [pa] branch of it wch immeadiatly concerns the health of men. & in physick shall consider

The present state of the faculty of medecine as it now stands [at present] in reference to Diseases & their cure

The [deg] severall degrees & steps whereby it grew to that heigth it is at present [at] *arrived to* wch I suppose are these following 1 Experience. 2 Method founded upon phylosophy & Hypothesis 3 Botaniques. 4 Chymistry. 5 Anatomy. In all wch I shall

[5] */f.53v/* - this is an interpolated addition.

indeavour to shew how much each *hath* contributed to the [perfecting] advanceing the art of physick, & wherein they came short of perfecting it

What yet [is to be donne] may be further donne towards the more speedy & certain cure of diseases. i.e. by what means & method the practise of physick may be brought nearer to perfection

Diseases as they lye under the regimen of physick, & receive more or lesse check from the applicacons & methods of that art as it now stands, may fitly be divided into 4 sorts

Such as are [constantly] *[almost]* almost perfectly under the controule of medecin, & doe [almost] *for the most part* constantly yeild to the [sph] skillfull physitians hand guided by the [rule] established rules of his art, & wherein he can [most commonly upon] at first sight, (as far as is fit with submission to providence & the great disposer of mens lives) [...] undertake the cure with assureance of a happy event. for it is not to be hoped *y^t y^e meanest disease should always obey the skill of the ablest physitian* nor would such a vanity be tolerable in weake ignorant men to [undertake presume] pretend to be the dispensers of health [& liberty] *& life* [wch]*y^t* are[6] */f.56r/* the free gifts of almighty god & wch though his hand uncontroulably takes away or bestows where he pleases, yet he most commonly does it by the intervention of fit secondary means; & therefor I doubt not but a physitian in some cases may [as] with as little presumption assure a sick man of recovery, as a mother undertake to cure the hunger of her childe wch is a disease too, [wch] *but yet this* he doth not by any power or authority of his owne over the nature of things, but by a right applicacon of those remedys wch were ordeined for the produceing such effects, medecins rightly orderd being as certaine to recover some infirme bodys as [food] *rabits & chicken* well dressed to nourish others that are healthy, though perhaps some constitutions may be found with whome that kinde even of wholesome diet will not at all agree. But yet whoever has brought the cure of any disease neare such a certainty, as is the nourishmt of a healthy man by any one kinde of holesome meat, may be allowd to be confident in his undertaking [such a mal] that species of distemper & in that part to have perfected the art of physick, though perhaps *in* some stubborne & irregular cases his well [established] *constituted* method should faile him, & the disease frustrate the usuall successe of his indeavours· & to such a degree of perfection as this I thinke I may confidently affirme the art of physick is arrived in many diseases wch [most] seldom stand out agt the skill*full*[of] attempts of good practitioners. Nor let the malice of prejudiced persons suggest here, that [t] these confident promises of [recovery] *health* are

[6] */f.55v/* Novum Organ 1 i ɔ 31 · 32 ⟨Not in Locke's handwriting, and written in pencil.⟩

not to be relied but only in such diseases wch of them selves leave us, wherein nature commonly workes the cure without the assistance of art & it may be with reason suspected the patient owed his recovery more to the vigor of his owne constitution then the apothecarys drugs, some diseases like some weeds[7]

Locke numbered Folio 47v as "0". From Folio 49r onwards Locke numbered each page 1 to 16: Folios 47 and 48 formed the front and back of a booklet in which the other folios were originally enclosed. These were not formed into quires, but were stacked up one upon the other.

Apart from Locke's page numbers, Folios 48r&v, 50v, 51v, 54v & 56v are all blank.

[7] "Nor .... weeds" is in a different ink.

Appendix II

Locke's Notebook 'Adversaria 4'

BL MS Locke f.25 is one of the most vexatious of Locke's surviving MSS. On the face of it, dating would appear to be quite straightforward. The whole MS is filled with chemical recipes and records of chemical experiments (as well as some notes on reading). Some of these were dated as coming from 1666 (p.39, for example). Scholars, on this basis, have assumed that the whole notebook dates entirely from this period.[200] There were some notes that are dated as coming from 1667 (p.136) and some notes detailed the reading that Locke undertook, after he had finished his chemical experimentation. This would seem to suggest an overall dating of *circa* 1666-1667. However, there are good reasons for doubting this conclusion.

Firstly, the notebook was part of a series of "Adversaria". These have been identified and dated by John Milton (LA and JLMN, see also Meynell's "Locke's Medical Notebook 'Adversaria 3'" TLN 25 (1994) pp.85-86). It is interesting to note that these Adversaria appear, from the evidence available, to form a chronologically ordered sequence in terms of their numbering and date of first use. Adversaria 2 (BM Add MS 32554) was first used at the beginning of 1660 (JLMN p.144). Adversaria 3 (BL MS Locke f.19) was first used in 1662 (JLMN pp.144-145). Adversaria 5 (BL MS Locke d.9) was first used *circa* 1664 (JLMN pp.146-147). Adversaria 6 is missing,[201] but Adversaria 7 (BL MS Locke f.17) was first used circa 1674 (LA p.69). As can be seen, the Adversaria do seem to have been numbered by their date of first use, and show a clear sequence. Since BL MS Locke f.25 was one of the notebooks in this series (It was labelled "Adversaria 4" and subtitled "Pharmacopæa", on the inside front cover), it would seem likely that the date of its first use fits neatly into this pattern. However, in assigning a date of 1666 to this notebook, scholars have created a serious anomaly in this otherwise orderly sequence. A much more consistent date of first usage would fall between the first uses of Adversaria 3 and 5: to retain the chronological ordering of the sequence, BL MS Locke f.25 would have been started between 1662 and 1664. So using this ordering we would suppose Adversaria 4 to have been first used *circa* 1663. It is highly counter-intuitive to suppose that Locke would begin Adversaria 3 in 1662, then in 1664 begin the next notebook in the series, and christen this Adversaria 5, only to go

[200] JLMN pp.151-152 and Meynell "Locke, Boyle and Peter Stahl" in *Notes and Records of the Royal Society of London* 49 (1995) pp.185-192.
[201] This is, of course, to discount the possibility that "Adversaria 1661" (BL MS Film 77) is the notebook Adversaria 6.

back to the title "Adversaria 4" two years later in 1666. In itself, this would seem to provide ample evidence that a re-assessment of Adversaria 4's dating is in order.

But this is not the only evidence that casts doubt upon the usual dating. As John Milton has argued at length ("The Date and Significance of two of Locke's Early Manuscripts" TLN 19 (1988) pp.47-89) we can date certain entries in Locke's MSS by looking at the sequences in which the entries were made, and by cross-referencing them with notes in Locke's other notebooks, whose date we know more precisely. Using this sort of evidence we can identify at least 3 places where a dating of 1666 will not fully suffice. The first of these occurs on BL MS Locke f.25 p.201 and was a reference to Johann Zwelfer's *Pharmacopoeia Augustana reformata, et eius mantissa* (Goudae 1653). There is good reason to suppose that this was being read *circa* 1665, as the same book was mentioned in another of Locke's common-place books, next to a note on Hooke's *Micrographia* (London 1665), which Locke made very soon after the book's publication (BL MS Locke f.19 p.227). The same can be said regarding another entry in Adversaria 4, this time referring to Boyle's *Certain Physiological Essays* (London 1661) (BL MS Locke f.25 p.277). Locke certainly read this as soon as it was published (BL MS Locke f.14 pp.22, 23, 28, 54, 62, 68, 70, 92, 96, 98, 100 and 102). But it is highly unlikely that the entry in Adversaria 4 dates from this very early period. Nevertheless, there is some evidence to suggest that Locke re-read at least part of the book in 1665 (BL MS Locke d.9 p.72). More compelling evidence of an even earlier note can be found in an entry (BL MS Locke f.25 p.262) referring to another of Boyle's works, the *Usefulnesse of Experimental Naturall Philosophy* (Oxford 1663). Locke read this as soon as it was published (BL MS Locke f.14 pp.24, 25, 28, 31, 42, 46, 65, 68, 79, 93, 106, 112, 113, 140, 164 and 170, and BL MS Locke d.11 ff.283r-281v *rev*). For want of any contradictory evidence this suggests that the entry in Adversaria 4 was made *circa* 1663.

Evidence even more compelling, though somewhat more indirect, can be adduced by a careful study of the contents of the earliest parts in the notebook. But before this is undertaken, a few words are necessary about the structure of the notes' presentation. As has been said, the book dealt with the preparations of chemical remedies and was organised along the lines of Locke's system of common-placing. However the version employed in the majority of Adversaria 4 was a somewhat mutant strain of that usually utilised. This was in part the result of the unique content of the book. Not only were there directions for chemical experimentation, but there were also experimental reports on the practical execution of these directions. The first part of the book (pp.2-23) followed Locke's usual method of common-placing where he took two facing pages and had these two pages filled

with entries whose titles had the same first letter and first vowel.[202] When a new entry was to be made that didn't have a set of pages with the relevant heading, Locke went to the first pair of blank pages to start afresh. However, as Locke was now doing experiments, as well as just recording instructions, he often had to refer these practical results: in the earliest part of the MS, cross-references to these experimental outcomes were made as and when necessary. A note was made in the text of the directions, thus "(1)", and was given a page reference, like so, "v.p.23(1)" which appeared on page 3, and "v.p.3(1)" appeared on page 23 as a complement to the former. However, this meant that the experimental results were often many pages away from the instructions that originated them. Locke sometimes put the results according to his system of common-placing, as the above example illustrates. However, he often put the results out of the way at the far end of the notebook.[203] Locke did not find this satisfactory, so he modified his system. From pages 26 to 57a, he adopted a method where he took a blank pair of pages, and on the verso, or left-hand side, wrote the experimental instructions, and on the recto, or right-hand side, wrote any subsequent practical results. However, this was still not satisfactory, so a further modification was made: on pages 49 to 277,[204] the entries had the instructions on the right-hand side, and the occasional results were entered on the left-hand side.[205] It was in this final format that the entries were made, under the headings of first letter and subsequent first vowel, and pairs of pages with these same headings were linked together by cross-references, as was usual in Locke's common-placing. Often, the practical results on any one experiment failed to fill a page and space was left to be taken up by latter entries.

As Guy Meynell has pointed out (*op cit*. pp.185-188), there is a great deal of similarity between the early notes made by Locke in this notebook and notes given in various MS

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[202] See Milton's "The Date and Significance of two of Locke's Early Manuscripts" and Guy Meynell's "John Locke's Method of Common-placing, as seen in his Medical Notebooks, Bodleian MSS Locke d.9, f.21 and f.23" in *The Seventeenth Century* 8 (1993) pp.245-267.

[203] See, for example, the notes under the head "*Sal*" on pp.8-9 and 12-13 – these are linked to experimental reports on pp. 342, 343 and 346.

[204] The last entry which I can identify with certainty as having this format is one on "*Sanguinis Tinctura*" that appears on p.277, as a continuation of an entry on p.255. After this there are some further entries, but they appear once more to Locke's usual style of common-placing, i.e. beginning at the top left hand page and continuing to the top right hand. This is in spite of the fact that some of the entries that appear later on are continuations of those begun in this variant strain of common-placing that runs from pp.49-277.

[205] Most often, in the variant form of common-placing that takes up the majority of the notebook, experimental results are made by a series of what I shall call "tags". Locke recorded the instructions on the right hand page, but as he works through the experiments he added notes of the form "(1)" and "(2)" at various points in the margin. Then, at the top of the left-hand page these tag numbers were repeated with the various extra notes that Locke thought appropriate. This system can be seen on pp.56a-57a, and on pp.48-49. However, Locke also used another system on occasion. If a heading appeared half way down a page, Locke would sometimes add the experimental result half way down the facing page, so that they were exactly opposite each other. This can be seen on pp.198-199.

records of Peter Stahl's chemistry course.[206] For example, in BM MS Sloane 1624, entitled "Cursus Chymicus Patri Stahlis Germani" we can glean an idea of the overall structure of the course, where a heading such as "*De Sale*" was followed by sub-headings detailing different types of preparations "Decrepitatio Salis", "Destillatio Spiritus Salis", "Dephlegmatico Spiritus Salis, "Spiritus & Sulphur Salis" and "Oleum Salis" (BM MS Sloane 1624 p.2). Locke's notes shared this same structure, with a general heading followed by different variations on the same theme. Indeed, under the main heading "*Sal*" Locke gave the following variations: "Salis decrepitatis", "Salis phlegma", "Salis spiritus", "Salis oleum" and "Salis Sulphur" (BL MS Locke f.25 pp.8-9, 12-13). This is a remarkable resemblance, in spite of a minor difference of ordering. But not only this: Locke's notes were in some cases virtually identical to those given in the other MS sources for Stahl's course. Let us compare a representative sample of Locke's notes with other sources for Stahl's program of study. Taking first the instructions on how to prepare dried vipers, Locke noted:

> *Viperarum exiccatio* ⟨Take⟩ Viperas.n.6. abscissus capitibus & caudis remotis que intestinis omnibus praeter cor et hepar. put y^m in an earthern dish & drye y^m in an oven after bread is taken out pulverise y^e powder is of a gilvish colour (BL MS Locke f.25 p.273).

Now let us compare this to the recipe given in a course known to have been given by Stahl:

> *Exiccatio Viperaru(m)* ⟨Take⟩ Viperas no. xii cutt off their heads & tailes, flay them & take out their entrails, except the heart & liver, lay them on by the other in a large glazd dish, and sett them in an oven, preferably after the bread is drawn, to dry, but not too bee burnt at all. when that is done, beat then to powder and keep them for use (BM MS Sloane 1624 p.167).

The similarity is remarkable, and despite Locke's more hasty approach to note-taking, we can see a clear concurrence between the two texts. And once more:

> *Sal decrepitat(is)* Take bay salt, Indian Salt, or Sal Geminae, w^c is y^e best … fill with this salt a Gallen pipkin, set it in y^e hearth & make ignem rotae to y^e top of y^e pipkin, let it stay soe long till y^e pipkin begin to glow, then the salt will begin to crepitate, then cover y^e pipkin all over w^{th} colls, & soe let it stay till ye salt cease to crack, let y^e fire goe out of its self, collect y^e salt, w^{ch} is sal decrepitatis (BL MS Locke f.25 p.8).

Compare this with another record of Stahl's teaching:

> *Decrepitatis Salis* Take a Gallen Pipkin, fill it full of Bay Salt, or Spanish Salt, or Indian Salt, (or Sal Gemina which is a Polish Salt) which is in great peeces, that which is in great peeces you must beat fine then fill your Pipkin & sett it fire hearth, make Ignem Rotae for that pipkin be covered to the top. sett bricks on the outside to keepe up the Coals about ye pipkin let it stand covered till the salt makes noe more noise, which signifies yt all the Moisture is gone which heterogeneous, then let the fire goe out of its self and let all cool then breake the

[206] Meynell lists four MSS that are relevant to the present case. These give accounts of the course given by Stahl, and have the shelfmarks BM MSS Sloane 499, 1498, 1624 and 2771 (Meynell *op cit*. p.186, n.13)

> pipkin and save the salt, beat it & sift it in a searse sive, and keep it for use so this is Sal Decrepitiatus pulverisatus per oleo et spiritus salis, and other chymical uses (BM MS Sloane 2771 p.21).

There cannot be any doubt but that these different sets of notes had precisely the same origin: Locke's notes in BL MS Locke f.25 were those given to him by Peter Stahl.

Moreover, Stahl was mentioned by name on several occasions in the text of these early notes (BL MS Locke f.25 pp.84, 100, 136, 154, 173, 217 and 280).[207] There were also references to someone called "S", who appears to have run the experimentation, and a "he" who did the same.[208] Given the fact that the notes came from a course of chemical experimentation, that Stahl was referred to by name and that these notes are very similar to those found in other records of Stahl's course, we can conclude that Locke's notes were derived from his attendance at Peter Stahl's classes.

The next question is when these notes were taken. Meynell, seeing that there were many references to 1666 in the notebook, thought that the course must have been in 1666 too. Yet there is very good reason to doubt this. Stahl left Oxford in late 1664, and so could not possibly have given lectures there during 1666. This was vouched for by Anthony Wood (*Life and Times* p.475) and Meynell himself gave corroborating evidence (Meynell *op cit.* n.9).

But this is not a problem in the least, as we know that Locke sat a course with Stahl in 1663. The situation, then, is as follows: we have a notebook that was part of a series, whose position in that series would seem to place its first use *circa* 1663. Some of the notes in this book can be dated as prior to 1666, and one, at least, seems to come from 1663 itself. Additionally, a great deal of the notebook appears to detail a chemistry course very much like one we know Locke sat in 1663. The only reasonable conclusion to draw from this is that the notebook was first used in 1663 to record Locke's attendance at Stahl's course. This is quite consistent with all the evidence available.[209]

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[207] Meynell missed out the references on pp.217 and 280, and also gave a reference to p.319 – this latter reference is indeed to "Stal", but seems to me to be much later than all the others, not least because it is sandwiched between two references to *Harmonica macrocosmica* (Amsterdam 1661) by Andreas Cellarius, which other evidence shows Locke to have read *circa* 1667 (See, for example p.39, where an entry dated "Sept.24.66" was followed by a reference from Cellarius' book). Meynell additionally cited a reference on p.358 that I have not been able to trace.

[208] References to "S" can be found on BL MS Locke f.25 pp.33, 54, 96, 110 and 282. References to "he" or "him" can be found on pp. 51a, 66, 118, 124, 264 and 343.

[209] That there were very few notes from books in the period from 1663 to 1666 was a consequence of the contents of the notebook – it was used to record chemical experimentation. There would be very little need to use the book when Locke as not working on chemical matters, so the paucity of evidence of use in 1664 and 1665 is perfectly agreeable to the role Locke assigned to the book. It was only after Locke moved to London, when he was no longer carrying out chemical experimentation, that he seriously started to add notes from reading, as opposed to chemical recipes received from various personal acquaintances.

So, in conclusion, we can infer that BL MS Locke f.25 was in use from 1663 to 1667. It was first used to record Locke's attendance at Peter Stahl's chemistry course, and was latter used to detail the work with Blount and Thomas. After this, notes were made on various texts. It is also possible to conclude that not only were Anthony Wood's remarks about Locke unfair, they were, at least in part, untrue as well.

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Subsequent Publication

This thesis resulted in a number of publications. These included here for the convenience of the reader.

Walmsley, J.C. and Milton, J.R. "Locke's Notebook 'Adversaria 4' and his Early Training in Chemistry" in *The Locke Newsletter* 30 (1999) pp. 85-191.

Walmsley, J.C. "*Morbus*: Locke's Early Essay on Disease" in *Early Science and Medicine* 5 (2000) pp. 366-393.

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Readers are also advised of a correction to some of the claims made in this thesis with regard to the composition of Draft B in the following article:

Walmsley, J.C. "Locke, Mechanism and Draft B: A Correction" *The British Journal for the History of Philosophy* 14 (2006) pp. 331-335.