

MEDIEVAL  
AND  
EARLY MODERN SCIENCE

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LATE MEDIEVAL AND  
EARLY MODERN CORPUSCULAR  
MATTER THEORIES

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so to speak, as one seeks to understand how the various components of his corpuscular hypothesis fit together. His concern is not to expunge matter of powers and faculties, but rather to account for its law-like behaviour without attributing intelligence to matter. To that end, God fills the explanatory gap; it is his continual nomic intervention that ensures the formation and preservation of order in the universe and which obviates the need for thinking matter.

As for why the traditional view ever took hold in the interpretation of Boyle's natural philosophy, I have one tentative suggestion. There is no doubt that the passivity of matter was a pressing issue in eighteenth-century science. This has been well documented.<sup>89</sup> The issue arose in response to the unanswered questions deriving from Newton's physics. What is the nature of gravity and the other attractive and repulsive forces that his physics demands, and how can they be reconciled to his matter theory? Perhaps these post-Newtonian preoccupations have inadvertently been projected back onto the likes of Boyle. It may be that the eighteenth-century debate about the passivity of matter has been seen as continuous with the corpuscularianism that Newton inherited from Boyle. However, if the argument of this paper is correct, the line of continuity from Boyle into the next century is more accurately traced through Locke and the thinking matter debate, than in any post-Newtonian worries about the passivity of matter.<sup>90</sup>

THE USES OF MECHANISM:  
CORPUSCULARIANISM IN DRAFTS A  
AND B OF LOCKE'S ESSAY

LISA DOWNING

That corpuscularianism played a critical role in Locke's philosophical thought has perhaps now attained the status of a truism. In particular, it is universally acknowledged that the primary/secondary quality distinction and the conception of real essence found in the *Essay Concerning Human Understanding* cannot be understood apart from the corpuscularian science of Locke's time.<sup>1</sup> When Locke provides lists of the primary qualities of bodies,<sup>2</sup> the qualities that "are really in them whether we perceive them or no," those lists show strong resemblances to Robert Boyle's views about the "primary affections" of matter, as expressed in such influential programmatic works as *The Origin of Forms and Qualities*.<sup>3</sup> Moreover, Locke's conception of the real essences of bodies, the inner constitutions which serve as the causal sources of all their properties, typically appears to be a corpuscularian one.<sup>4</sup>

Nevertheless, the question of the nature of Locke's philosophical allegiance to corpuscularianism remains a controversial one.<sup>5</sup>

<sup>1</sup> Unless otherwise indicated, I shall use "corpuscularianism" more or less as Boyle did, as naming a doctrine general enough to accommodate both Cartesianism and (some forms of) atomism. Corpuscularianism can thus be roughly glossed as follows: all macroscopic bodily phenomena are ultimately to be explained in terms of the motions and impacts of submicroscopic particles, or corpuscles, each of which can be fully characterized in terms of a strictly limited range of (primary) properties: size, shape, motion (or mobility), and, perhaps, solidity or impenetrability.

<sup>2</sup> E.g. 2.8.9, 2.8.10. All references to the published *Essay* are to are to Nidditch's edition (Locke, *An Essay*), unless otherwise noted. References to the body of the *Essay* are given by book, chapter, and section numbers. Nidditch's text follows the fourth edition of *Essay* (1700); when I cite a passage, the reference will be the fourth edition text unless otherwise noted, but any philosophically significant variation among the editions will be noted.

<sup>3</sup> In Boyle, *The Works* [Birch], III, p. 35. Of course, as several scholars have emphasized, Boyle's more programmatic works, such as *The Origin of Forms and Qualities* and *About the Excellency and Grounds of the Mechanical Hypothesis*, are not especially representative of his approach in other contexts, which is considerably more flexible (Clericuzio, "A Redefinition"; Henry, "Occult Qualities").

<sup>4</sup> See e.g. 2.23.8, 2.31.6.

<sup>5</sup> For example, two particularly influential Locke scholars have taken opposing positions on this issue. Peter Alexander, in his *Ideas, Qualities, and Corpuscles*, has argued that Locke's *Essay* takes the truth of strict Boylean corpuscularianism as a

<sup>89</sup> See for instance Heimann e.a., "Newtonian Forces" and Yolton, *Thinking Matter*.

<sup>90</sup> I would like to thank the participants in the St Andrews symposium and Professors Michael Hunter and Ted Davis for their helpful comments.

And, indeed, there is reason for controversy: There are significant tensions in the *Essay* with respect to the role of corpuscularianism. Locke is easily read as simply fluctuating inconsistently between, on the one hand, treating corpuscularianism as an hypothesis in natural philosophy which lies outside the scope of his epistemological project (4.3.16) and, on the other, taking corpuscularianism as a starting point for philosophizing (as in 2.8). In this paper, I propose to approach this issue by exploiting an underutilized resource: the early drafts of Locke's *Essay Concerning Human Understanding*.<sup>6</sup> My intention here is to focus on the two earliest drafts, both dating from 1671, in order to identify the role that corpuscularianism played in Locke's first formulations of *Essay* doctrines.<sup>7</sup> I will argue that we see in these early drafts neither a blanket acceptance of corpuscularian doctrines on the authority of practicing natural philosophers, nor an attempt to provide a philosophical foundation for corpuscularianism, but rather a circumscribed employment of the corpuscularian hypothesis in order to support certain crucial philosophical points. We will see that corpuscularianism functions for Locke primarily as a resource for the articulation and defense of his empiricist and moderately skeptical epistemology. The result is a subtler understanding

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starting point, and that the *Essay* can be regarded as an attempt to confirm corpuscularianism by deducing philosophical consequences from it (Alexander, *Ideas, Qualities, and Corpuscles*, pp. 6–7). Michael Ayers, on the other hand, holds that Locke is not committed to Boyle's corpuscularian theory but that he adheres strictly to the considerably more abstract position that Ayers calls "mechanism," namely, "the view that the laws of physics can be explained, in principle if not by us, by being deduced from the attributes possessed essentially by all bodies qua bodies; i.e., from the nature or essence of the uniform substance, matter, of which all bodies are composed" (Ayers, "Mechanism"; see also Ayers, *Locke*). It seems to me that the position Ayers calls "mechanism" (or, in *Locke*, "pure ideal mechanism") is better called "essentialism," especially since the view in question leaves completely open the question of what the attributes of bodies are, and so does not require that they operate mechanically, i.e. by impulse.

<sup>6</sup> The relative scarcity of references to the drafts of the *Essay* in recent Locke scholarship is something of a mystery given the ready availability of Draft A and B in Nidditch and Rogers' authoritative transcription and Ruth Mattern's transcription of much of Draft C. In what follows, all references to Drafts A and B are to the Nidditch and Rogers' edition (Locke, *Drafts* [Nidditch e.a.]) and are given by section number and page number. References to Draft C are to Ruth Mattern's partial transcription (Mattern, "Locke on Power and Causation") and are given, as with the published *Essay*, by book, chapter, and section number.

<sup>7</sup> For an extended analysis of the role of corpuscularianism in the canonical fourth edition of the *Essay*, see Downing, "The Status of Mechanism."

of a uniquely influential instance of the relation between natural philosophy and metaphysics in the late seventeenth century.<sup>8</sup>

### 1. Versions of the Essay

The three extant drafts of the *Essay* are referred to as Drafts A, B, and C. Drafts A and B date from 1671, the year in which the *Essay* had its genesis in circumstances later described by Locke in a well-known passage from the "Epistle to the Reader" of the published *Essay*:

Were it fit to trouble thee with the History of this Essay, I should tell thee that five or six Friends meeting at my Chamber, and discoursing on a Subject very remote from this,<sup>9</sup> found themselves quickly at a stand, by the Difficulties that rose on every side. After we had puzzled our selves, without coming any nearer a Resolution of those Doubts which perplexed us, 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, which having been thus begun by Chance, was continued by Intreaty; written by incoherent parcels; and, after long intervals of neglect, resum'd again, as my Humour or Occasions permitted; and at last, in a retirement, where an Attendance on my Health gave me leisure, it was brought into that order, thou now seest it.<sup>10</sup>

Drafts A and B represent two distinct attempts by Locke to develop his "hasty and undigested thoughts" on this new subject, the extent of human understanding. The third extant draft, C, was written much later, in 1685 in Holland. This latter draft, unsurprisingly, approximates the structure and content of the published *Essay* much more

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<sup>8</sup> I use "metaphysics" here in the broad sense (according to which it prominently includes epistemology, as well as ontology) that d'Alembert does in his 1751 "Discours préliminaire" to Diderot's *Encyclopédie*, where he famously observes that Locke "created metaphysics, almost as Newton had created physics" (Alembert, *Preliminary Discourse* [Schwab], p. 83).

<sup>9</sup> The subject was "the principles of morality and revealed religion," according to James Tyrrell, one of the participants (Cranston, *John Locke*, pp. 140–141). Dewhurst (*John Locke*, p. 44), however, speculates that medicine "was probably the 'remote' subject which provoked these studies," on the basis of the hypothesis that half of those present were doctors.

<sup>10</sup> Locke, *An Essay*, 7.

closely, although with significant differences.<sup>11</sup> I will confine myself here to an analysis of the two earliest drafts.<sup>12</sup>

There is much more to be said about the background to the 1671 drafts than can be related here, but some relevant facts should be noted. Draft A was composed in the summer of that year, and B sometime later. Both were written in England (in London, Oxford, and Wimborn St. Giles) during the period when Locke was serving as personal physician to Lord Ashley (shortly to be the first Earl of Shaftesbury).<sup>13</sup> Furthermore, we know at this stage of his career that Locke was in a position to be influenced by his Oxford education,<sup>14</sup> by Boyle's laboratory research and his corpuscularianism,<sup>15</sup> by Sydenham's empiricism and skepticism,<sup>16</sup> and by his own philosoph-

<sup>11</sup> Although, unfortunately, Draft c includes only the first two books of the *Essay*; the second two were drafted in 1686, and those manuscripts are lost.

<sup>12</sup> For more on the history of the *Essay*, see the editors' introductions to the *Essay* and the Drafts (Locke, *An Essay*; Locke, *Drafts* [Nidditch e.a.]); see also Aaron, *John Locke and Cranston, John Locke*. A much-anticipated "History of the Writing of the *Essay*" is forthcoming in the second volume of the *Drafts*, edited by G. A. J. Rogers (Locke, *Drafts* [Nidditch e.a.], p. xiv).

<sup>13</sup> See Cranston, *John Locke*, p. 141.

<sup>14</sup> Important influences in natural philosophy in the course of Locke's studies included the iatrochemical tradition descended from Paracelsus and van Helmont, the eclectic atomist Daniel Sennert, the physiologist Thomas Willis, and the chemist Peter Stahl. See Dewhurst, *John Locke*, pp. 4, 6–7, 10; Cranston, *John Locke*, pp. 39, 74, 76.

<sup>15</sup> Boyle's laboratory became a center of experimental research in Oxford in the 1660's. In 1664–1665, Locke (along with Richard Lower, Robert Hooke, and others) pursued research there on respiration, among other issues (Dewhurst, *John Locke*, pp. 7–15). Locke and Boyle were close friends and regular correspondents from about 1663 until Boyle's death in 1691 (Cranston, *John Locke*, pp. 75–77). Boyle's very influential *The Origin of Forms and Qualities*, which provided a general defense of corpuscularianism, was published in 1666. On Boyle's influence on Locke see also Copenhagen, "The Occultist Tradition," pp. 490–491; Alexander, *Ideas, Qualities, and Corpuscles* and Rogers, "Boyle, Locke, and Reason." For documentation of their professional relations see Stewart, "Locke's Professional Contact." For more on the Oxford physiologists and Locke's role among them see Frank, *Harvey and the Oxford Physiologists*.

<sup>16</sup> Locke became associated with the physician Sydenham after moving to London in 1667, to oversee Lord Ashley's medical care. They pursued clinical work together and collaborated on several essays (Dewhurst, *John Locke*, pp. 32–41; Copenhagen, "The Occultist Tradition," p. 491). *De Arte Medica* (uncompleted and unpublished) is in Locke's handwriting. Dewhurst has argued that Sydenham was probably the author and Locke the secretary, but Meynell ("Locke as Author") has more recently produced convincing stylistic evidence for the thesis that the prose is Locke's. The essay praises observation and impugns speculative theorizing in medicine and in natural philosophy more generally, suggesting that our narrow, weak faculties require us to rely on observation and to abandon proud attempts to "penetrate into the

ical reading (prominently including both Descartes and Gassendi's critique thereof).<sup>17</sup> However, rather than beginning from assumptions about Locke's likely influences and philosophical orientation in 1671, I rather want to start simply from the drafts, to treat them as data, and so see what can be gleaned from a close reading of the texts themselves about the role that corpuscularianism plays in Locke's newly outlined philosophical doctrines.<sup>18</sup>

## 2. Draft A: Corpuscularianism as Useful Thought Experiment

The potential significance of the drafts of the *Essay* for a proper understanding of the role of corpuscularianism in Locke's thought is highlighted by the following two points: (1) The two Lockean topics most closely associated with corpuscularianism in the published *Essay*, the primary/secondary quality distinction and the notion of real essences, make no appearance in Locke's first draft of the *Essay*, although there are passages that to some extent foreshadow their development. Furthermore, Draft A does not deal in any direct or obvious way with natural philosophy. (2) Nevertheless, broadly corpuscularian or mechanist themes do occur in this early manuscript. This suggests that Draft A has the potential to lead us to a quite different understanding of the status of corpuscularianism in Locke's thought from the one that would be derived from a consideration

hidden causes of things" (Dewhurst, *John Locke*, pp. 79–84). For more on the Locke-Sydenham connection, see Duchesneau, *L'Empirisme de Locke*.

<sup>17</sup> See Cranston, *John Locke*, pp. 100–103. The issue of Gassendi's influence on the *Essay* has been much debated, see e.g. Kroll, "The Question"; F. Michael e.a., "The Theory of Ideas." Much of the evidence for a direct Gassendist influence on Locke dates from a later period. (He was acquainted with Gassendists in Paris during two periods from 1677–1679.) He had, however, by 1671 encountered Gassendi's critique of Descartes in the objections to the *Meditations*. Also, Locke's first commonplace book, dating from 1666 at the latest, cites Gassendi's *Syntagma* on the nature of space (Lennon, *The Battle of the Gods and Giants*, pp. 149–161). It is notable that Lennon, who is concerned to argue that Locke is a philosopher in the Gassendist tradition, concludes that the evidence for direct influence is thin and that "Locke himself may have been typical of his period in reading Descartes far more extensively and closely than he did Gassendi" (*Ibid.*, p. 156).

<sup>18</sup> For a nicely thorough account of Locke's background in natural philosophy through 1671, see Walmsley, *John Locke's Natural Philosophy*. A new hypothesis in the area of influences on Locke's Drafts has recently been proposed by Russell, "The Impact," who has laid the groundwork for an argument that Locke's turn to epistemology was influenced by acquaintance with the *Philosophus autodidactus*, an Arab text newly translated into Latin in 1671 by Edward Pococke.

of the published *Essay*. Furthermore, there is an obvious intrinsic interest in seeing how and to what extent Locke's early thought about the understanding is influenced by corpuscularianism. I turn now to a close examination of Locke's uses of corpuscularianism in Draft A.

The very first section of Draft A declares that we have no notion of the essence of matter, no more than we do of the essence of spirit. Of course this implies that, to the extent that corpuscularianism is regarded as an attempt to characterize the essence or nature of body/matter, it must be regarded as mere speculation. All we know of body, according to Locke, is a combination of powers "either of sustaining in its self several simple Ideas or else altering or producing other simple Ideas in other Beings."<sup>19</sup>

In a "memorandum" attached to the end of the draft, Locke elaborates this division into a distinction between "actual" qualities which produce simple ideas directly in us, and "potential" qualities or powers to alter the ideas produced by other bodies or to be so altered.<sup>20</sup> Locke's own example here is salt: its salty taste (its power—or the source of its power—to produce a gustatory idea of saltiness in us) is an actual quality of the salt, while its ability to be dissolved and its ability to cause iron to rust (both of which, Locke implies, must ultimately be cashed out in terms of changes in our ideas) count as potential qualities of the salt. There are many interesting features of this "memorandum," some of which foreshadow later developments. Locke's concern to distinguish ideas in the understanding from qualities in bodies is central to the *Essay*, and to 2.8 in particular. Further, the memorandum introduces an intriguing ambiguity as to whether qualities should be regarded as powers or as "constitutions" which ground powers. The category of potential qualities is a clear ancestor of Locke's later category of "secondary qualities mediately perceivable" (2.8.26) or "third sort" of qualities (2.8.10, 4<sup>th</sup> edition), often called "tertiary qualities" by commentators on the *Essay*, which are powers to (sensibly) affect other bodies or to be affected by them.<sup>21</sup> What is most important for our purposes, however, is that there is *no* suggestion here of any further

<sup>19</sup> Locke, *Drafts* [Nidditch e.a.], A 8, p. 20. This early doctrine of Locke's may help to explain his 2.8.8 claim that *all* the (observable) qualities of things are powers.

<sup>20</sup> *Ibid.*, A 45, "Memorandum," pp. 82–83.

<sup>21</sup> More specifically, the *Essay*'s "secondary qualities mediately perceivable" as described at 2.8.26 correspond to "active" potential powers, i.e. powers to alter the ideas produced by other bodies. On the other hand, the third category of ideas/qualities given at 2.23.9 corresponds to potential powers, both active and passive. On the distinction between active and passive potential powers see A 14, p. 29 and C 2.27.8.

division among the *actual* powers or qualities, no suggestion that some powers are more than mere powers, no apparent privileging of extension or solidity over color: in sum, no foreshadowing of any version of the primary/secondary quality distinction of the published *Essay*.

Nevertheless, a broadly corpuscularian or mechanistic conception of body is invoked by Locke in two contexts in Draft A. The first concerns our inability to gain knowledge of universal propositions about cause and effect. Here, Locke highlights our typical ignorance of the *modus operandi* of the cause and suggests that finer senses might remedy that ignorance:

And therefor I can have noe other certain 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 I see when I apply fire to gold it melts it; a load stone neare iron it moves it, that snow & salt put into a vessell of water in the inside hardens the water that touches it on the outside: but in many nay most of these I have noe knowledg of the *modus operandi*, the way how these effects are produced i.e how these simple Ideas viz *motion* in the iron, *fluidity* in the gold & *consistence* in the water are in those several subjects produced. because these alterations being made by particles soe small & minute that they come not within the observation of my senses I cannot get any 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 our understandings we are beholding to our senses. For had we but senses that could discover to us the particles of water their figure site [sic] 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 the water was frozen i.e hardend, 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 together to make a box or table which by tenants nails & pins we well enough perceive how it hangs together. And the motions of an animal would be as intelligible to us as those of a watch, But our senses faileing us in the discovery of those fine & insensible particles our understandings are unavoidably in the darke.<sup>22</sup>

This passage is the first available ancestor of Locke's microscopical eyes speculations of *Essay* 2.23.11–12. Locke's point here is to use the thought experiment of finer senses to illuminate the nature and source of our cognitive limitations as we are actually constituted, and to do so in a way that underlines the dependence of our knowledge

<sup>22</sup> Locke, *Drafts* [Nidditch e.a.], A 15, pp. 30–31.

on the senses. It is important, however, to be precise about how the thought experiment is constructed. What is appealed to here is not specifically Boylean corpuscularianism but something much more general: a broadly mechanistic paradigm according to which macroscopic behavior is caused by and explained in terms of the behavior of parts too small to be directly observed. While Locke clearly assumes that the shape and motion of particles would be relevant to a fuller causal explanation of observable changes, he does not commit himself to anything like a definitive short list of the real qualities of body. Furthermore, Locke does not suggest that finer senses would give us access to essences and provide us with a full and ultimate understanding of body. Rather, they would provide us with an understanding of particular bodies and processes that parallels our understanding of macroscopic processes and objects such as watches.

The second context in which Locke makes use of some form of mechanism is a passage wherein he invokes corpuscularianism as a *plausible* account of sensation in order to highlight the point that simple ideas are all equally positive, all on the same plane as it were, *whatever* the nature of their causes:

for though white or sweet & many other sensations in us be perhaps caused in us constantly by particles of certain figures which figures are a relative consideration when the parts thereof are compared one with another. yet the Idea of white or sweet &c being produced in me & retained in my memory without any relative consideration but as one simple positive Idea & when our senses are conversant about any object we take no notice of any relation between the thing & our senses we ought to consider them as positive things, the uncertain philosophical cause of such a sensation in me being not here enquired into but the Idea & sensible object that produces it. & the greatest part of mankind who never perplex their thoughts to examine wherein the nature of that thing which when they look on they call white & feel the same sensation in themselves as a philosopher doth, have perfectly the same Idea of white that any philosopher hath who thinks he hath found out the very essence nature or formality thereof or the way whereby it produces such a sensation in him.<sup>23</sup>

It is surprisingly difficult to say precisely what Locke means by the claim that all simple ideas are equally positive. Locke's clearest explanations of the thesis are negative: although the causes of our sensory idea may be relative or privative, this relativity or privateness is not

<sup>23</sup> *Ibid.*, A 17, pp. 32–33.

reflected in our ideas. E.g. although darkness may be an absence of light, our idea of black is as positive as our idea of white. One thing Locke means seems to be that all these ideas are on the same ontological level: they are alike simple ideas present to the mind. However, he also seems to intend something more, namely, that our ideas represent their objects positively: coldness seems as positive a quality to us as heat, a shadow seems as much of a *thing* as a man, albeit an unsteady and fleeting thing. Of course, this suggests that our ideas may often misrepresent their objects.

This is a crucial passage, for this section of Draft A is an ancestor of 2.8 in the published *Essay*, the chapter in which Locke begins, as here, by making this very point (that all ideas are equally positive, whatever their causes), and ends by elaborating the primary/secondary quality distinction in specifically corpuscularian terms. Locke's use of corpuscularianism in A is considerably more restricted, however. He describes the corpuscularian account of perception as something that is "perhaps" the case, and uses it to point out that distinctions among causes need not be reflected in distinctions among effects. In the case of our simple ideas, attention to experience is enough to reveal that they are all equally positive, while consideration of the corpuscularian example suggests that their causes may not be. Locke's aim is to focus attention on the ideas themselves, the things that the ordinary person knows as well as any philosopher. Indeed, he puts the question of the production of sensation and the ultimate nature of the bodily causes of ideas beyond the scope of his inquiry. The corpuscularian sketch of the origin of color is characterized as an "uncertain" hypothesis about color's "philosophical cause"; Locke concerns himself rather with "the Idea & sensible object that produces it."

Locke's reference here to "the sensible object" is intriguing. The sensible object, as distinct from the "uncertain philosophical cause" of a sensation, apparently does not require special investigation or theoretical knowledge to identify. The ready availability of these sensible objects to the ordinary person might suggest that we understand them on the model of Bishop Berkeley's ordinary objects, that is, as bundles of ideas.<sup>24</sup> I think this possibility can be dismissed, however, since (1) Locke describes the sensible object as *producing* the idea and (2) he nowhere in his corpus betrays any genuine attraction to this sort of idealism. The sensible object Locke has in mind must

<sup>24</sup> See, e.g., section 1 of Part 1 of the *Principles* in Berkeley, *The Works* [Luce e.a.], vol. II.

be the object as we are acquainted with it in sensory experience, the object as represented by our complex (sensory) idea of it. As other passages in A make clear (A 2, p. 9; A 8, p. 20), our complex idea of an object represents it as simply a combination of powers to produce or change simple ideas. For Locke's purposes, we may regard external objects as combinations of powers,<sup>25</sup> sensible qualities and active and passive capacities, without inquiring into the ultimate grounding of those powers, the "uncertain philosophical cause" of the ideas. Thus, Locke's use of corpuscularianism here as an illustrative hypothesis underlines, in effect, the fact that the question of the truth of corpuscularianism lies beyond the scope of his project.

To sum up, then, we find two uses of corpuscularianism in Draft A. In the first, a general sort of mechanism seems to be assumed in order to highlight our ignorance (of universal propositions about cause and effect in the physical realm) and to reinforce the empiricist moral of the dependence of our knowledge on the senses. In the second, corpuscularianism is employed for the purposes of illustration, in order to highlight the distinction between ideas and their causes, and to draw attention to the former, the primary object of Locke's investigation.

### 3. Draft B: Corpuscularianism and our Primary Ideas of Body

Draft B, written later in the same year as Draft A, is considerably longer and more crafted than the earlier draft. It includes an extended attack on innatism not found in Draft A, and treats "Book II" issues concerning the ingredients of knowledge in considerably more depth. Draft B is, however, obviously incomplete; the manuscript ends in mid-sentence and never reaches the point of fully addressing "Book IV" topics relating to the nature of knowledge itself, topics which are broached in Draft A. Nevertheless, with respect to issues of corpuscularianism and our knowledge of the corporeal world, Draft B is for the most part quite consonant with Draft A.

As in A, Locke puts knowledge of the essence of matter firmly beyond our reach, thus again implying that he does not suppose that the corpuscularians have identified the ultimate nature of body:

<sup>25</sup> Or, perhaps, the unknown something wherein the powers subsist. See Locke, *Drafts* [Nidditch e.a.], A 2, p. 7.

Hence it comes to passe that we have noe Ideas nor notion of the essence of matter, but it lies wholly in the darke. 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 qualities which we use to finde united in the thing cald horse or stone ...<sup>26</sup>

This point is further emphasized in Draft B with a new, specifically anti-Cartesian section:

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, & soe were forward to affirme that the essence of body must needs be extension because we could not imagin any sensible quality of any body without extension, whereas had these men considered their Ideas of tastes 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 affection of body as well as the rest discoverable by our senses which have noething at all to doe with the essences of things, & 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 inseparable from them then certainly *Unity* is the essence of every thing.<sup>27</sup>

This represents the opening salvo in Locke's campaign against Descartes' claim to have located the essence of matter in mere extension.<sup>28</sup> One of Locke's aims in this passage is clearly to exhibit difficulties for the specifics of the Cartesian argument: the examples of tastes, smells, etc. purportedly refute their argument by falsifying the premise that no sensible quality can be imagined without extension, while a consideration of unity provides a *reductio*. However, more significantly, he also exhibits a general skepticism about the ability of the senses, the imagination, or even conceptual considerations to identify the essential qualities of body.

Draft B also includes some uses of corpuscularianism which strongly resemble those of Draft A. As in A, Locke appeals to a broadly mechanistic paradigm in highlighting our ignorance of the *modus operandi* of causes (B 136–137, p. 256). Indeed, he provides here precisely the same examples, suggesting that with finer senses, we might understand how cold freezes water as well as we understand how a joiner assembles a table, and the motions of an animal would

<sup>26</sup> Locke, *Drafts* [Nidditch e.a.], B 19, pp. 129–130.

<sup>27</sup> *Ibid.*, B 29, p. 139.

<sup>28</sup> Although it is foreshadowed in Draft A (*Ibid.*, A 27, pp. 24–46).

be as intelligible as those of a watch. And, also as in A, Locke uses a corpuscularian model to reinforce the distinction between idea and cause, in order to restrict his enquiry to the former, rather than the latter (B 58, p. 161). In B (as in the published *Essay*) Locke refers to privative rather than relative causes, but the point is much the same as in A:<sup>29</sup> Simple ideas are alike positive regardless of their causes, and Locke's concern is with the ideas, which the ordinary person grasps just as well as the (natural) philosopher.

Locke is still more explicit about the restricted scope of his project in an earlier passage:

I shall not at present medle with the physicall consideration of the minde or trouble my self to examin (what is not necessary to my purpose) wherein the essence of it consists or by what motions of our spirits, or what alteration of our bodys we come to have any Ideas in our understanding & whether those Ideas be material or immateriall.<sup>30</sup>

Not only does he distance himself from potentially controversial issues about the essence of mind, but also from natural philosophical questions about the way in which perception is caused.

Thus far, we have seen elaborations of Draft A positions, but no dramatic shift. There is, however, one novel development in Draft B which requires a more extended examination. In section 94 we find Locke's first extended comparison of our ideas of body and spirit, a theme which recurs in each succeeding version of the *Essay*, in particular in 2.23.16–32 of the published *Essay*. The context in Draft B is a long interpolated addition to the manuscript, given the marginal heading "Substances." Interestingly, this discussion begins with a characterization of our idea of body which puts all its sensible qualities on a par:

we have as cleare a perception & notion of their [i.e. spirits'] essence as we have of the essence of body, by the complex Idea of colour'd extended hard & all other sensible qualitys which is all that we know of it.<sup>31</sup>

<sup>29</sup> This version, however, shows more clearly the influence of Descartes' discussion of material falsity in the Third Meditation and the Fourth Replies, a discussion which emphasizes the way in which our ideas may "represent non-things as things" (Descartes, *The Philosophical Writings of Descartes* [Cottingham e.a.], 2, p. 30) and so "provide subject matter for error" (*Ibid.*, 2, p. 162). See Descartes, *Oeuvres* [Adam e.a.], 7, pp. 43–44, CSM 2, p. 30, and Descartes, *Oeuvres* [Adam e.a.], 7, pp. 231–235; Descartes, *The Philosophical Writings of Descartes* [Cottingham e.a.], 2, pp. 162–164. Roger Woolhouse (*Locke*, pp. 150–152) has suggested that Locke may also be indebted to Boyle on this point.

<sup>30</sup> Locke, *Drafts* [Nidditch e.a.], B 2, p. 102.

<sup>31</sup> *Ibid.*, B 94, p. 209.

Locke suggests here that we think of body in terms of a complex of all the sensible quality types possessed by bodies: bodies have color, extension, (some degree of) hardness, and presumably also odor, taste, and temperature.

This passage is immediately followed, however, by a lengthy interpolation within the interpolation which singles out two ideas for special treatment—extension and cohesion—which are now described as "primary Ideas":

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 Cohesion of parts, all other qualitys we observe in, or Ideas we receive from body as destinguished from spirit (for we have some Ideas common to both as number) are probably but the results & modifications of these, for impenetrability or a power of receiveing & communicateing motion by impul[s]e or protrusion is a necessary consequence of extension & cohaereing of parts: figure also is but the termination or modification of extension in the severall masses of such cohereing parts. & all the 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 appearences 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 & motio[n].<sup>32</sup>

Locke proceeds to consider our ideas of spirit, and sums up his results as follows:

Soe that in short, the knowledg we have of Spirit compar'd with the knowledg we have of body stands thus. The essence of Spirit is unknowne to us & soe is the essence of body equally unknowne to us. Two primary qualitys or propertys of body. viz Extension & cohaesion of part[s] we perfectly know & have destinct cleare Ideas of. Soe likewise we know & have destinct cleare Ideas of two primary qualitys or propertys of spirit. viz. *Knowledg* & a power of moveing i e begining of motion. we have also the knowledg of severall qualitys inhaerent in bodys & have the cleare destinc Ideas of them. which qualitys are but the various modifications of the Extension of Cohaereing parts & their motion. we have likewise the Ideas of the severall modes of knowledg or perception. viz beleiveing doubting willing intending feareing hopeing &c all which are but the several modes of thinkeing.<sup>33</sup>

<sup>32</sup> *Ibid.*

<sup>33</sup> *Ibid.*, B 94, p. 210.



It is undeniable that some sort of mechanism is playing a role in Locke's thought here. He seems to suggest that sensible qualities<sup>34</sup> such as heat, cold, colors, smells, and tastes can be explained away in terms of the effects on perceivers of particles with different figures, sizes, and motions. It is thus tempting to assimilate this passage to later corpuscularian formulations of the primary/secondary quality distinction (2.7 of Draft c and 2.8 of the *Essay*) and to regard it, as Aaron does, as Locke's first articulation of the primary/secondary quality distinction.<sup>35</sup> There are reasons to resist a too hasty assimilation, however.<sup>36</sup>

First, textual continuities show that this part of section 94 of Draft B carries over into *Essay* 2.23 (and c 2.27), "Of the complex Ideas of Substances," rather than *Essay* 2.8 (and c 2.7), "Other Considerations concerning simple Ideas," which provides the canonical articulation of Locke's primary/secondary quality distinction. Indeed, as pointed out above, *Essay* 2.8 is descended from section 58, where Locke discusses the possibility of positive ideas from privative causes. Of course, this observation does not settle the question of what views are in fact presented in B 94, but it suggests that we might wish to examine that question with some care. Furthermore, it is clear that the distinction articulated in B 94, which we might call the distinction between primary and non-primary ideas, cannot simply be *identical* to the *Essay* distinction between primary and secondary qualities, even if we allow for a "translation" between idea-talk and quality-talk. They cannot be so identified because it is central to Locke's conception of the primary ideas of body that there be exactly as many as there are primary ideas of spirit, i.e. two.<sup>37</sup> When *Essay* 2.8 (and c 2.7) provides lists of primary qualities, however, the number is always considerably greater than two (usually between four and six). Thus, we ought to take a closer look at the context of B 94, in order to evaluate Locke's notion of "primary ideas" on its own terms.

<sup>34</sup> It is important to note that the term "secondary quality" does not occur in Draft B.

<sup>35</sup> Aaron, *John Locke*, p. 52. See Walmsley, *John Locke's Natural Philosophy* for another interpretation which regards this discussion as Locke's first formulation of a version of the primary/secondary quality distinction.

<sup>36</sup> I agree here with Martha Brandt Bolton's contention ("The Origins") that Locke's primary/secondary quality distinction does not occur in the early drafts of Locke's *Essay*, although I do so on the basis of different arguments.

<sup>37</sup> Interestingly, Locke's lists of the primary ideas of spirit are considerably more constant than his lists of the primary ideas of bodies. He always gives exactly two primary idea of spirit, and they are always some version of thought and will, with the latter typically characterized as a power of putting bodies into (new) motion.

The aim of establishing a strict parallelism between our conceptions of body and spirit clearly drives Locke's introduction of corpuscularianism in section 94. "Probably," Locke tells us, the other sensory qualities of bodies (impenetrability, figure, heat, cold, colors, smells, tastes) are but the "results and modifications" of extension and cohesion. This allows him to single out extension and cohesion as primary ideas, paralleling our two primary ideas of spirit: thinking and a power of voluntary motion. In both cases, other qualities can be regarded as modifications of the basic qualities; color can be regarded as a modification of extension<sup>38</sup> and hoping as a modification of thinking.

The nature of the analogy that Locke is asserting here is in fact less than transparent. The difficulty is indicated by Locke's use of the phrase "*results and modifications*" (my emphasis) in describing the relation between extension and cohesion and the other qualities of bodies. The problem is this: hoping is a mode of thinking in the sense that hoping is a determination of thinking; to hope is to think in a particular way. While this may also describe the relation between being circular and being extended, it does not seem to map onto a corpuscularian account of the relation between being green and being extended, if being green is supposed to causally result from having a certain arrangement of parts. If, on the other hand, being green just *is* having a certain arrangement of parts, then greenness can be a modification of extension just as circularity is. The most plausible hypothesis is that, in 1671, Locke had neither clearly identified these two alternatives nor chosen between them.

Nevertheless, Locke's intended use of the comparison is quite clear: he treats the equality of number of primary ideas/qualities as *prima facie* evidence that we are in an epistemically equivalent situation with respect to body and spirit. Locke's target here is a materialist who would assert that no intelligible notion of spirit or incorporeal substance is available and that we must, therefore, confine our ontology to the material realm. There is little doubt that Locke had in mind Thomas Hobbes, who was notorious for arguing that "*substance incorporeal* are words which, when they are joined together, destroy one another, as if a man should say an *incorporeal body*," and

<sup>38</sup> Or, somewhat more problematically, as a modification "of the Extension of Cohæring parts & their motion," where it looks like motion ought rightly to be treated as a third primary idea.

“the proper signification of *spirit* in common speech, is either a subtle, fluid, and invisible body, or a ghost, or other idol or phantasm of the imagination.”<sup>39</sup>

Against this Hobbist position, Locke holds that our ideas of body and spirit are absolutely on a par; they are equally clear, and hence we have no grounds for denying the existence of spirit on that basis. Indeed, this is one of the main points behind Locke’s reiteration, in both A and B, of the claim that we are ignorant of the essences of both mind and body; because we know the essence of neither, we can no more deny the existence of one than the other.<sup>40</sup>

In arguing against Hobbes that our ideas of matter and spirit are equally intelligible, Locke follows Henry More. More dedicated a section of his *The Immortality of the Soul* to the contention “That the Notion of Spirit is altogether as intelligible as that of Body”<sup>41</sup> The structure of More’s defense is very much like Locke’s in that he characterizes each of body and spirit as a substance with two defining properties. More’s conception of body, however, differs notably from Locke’s. More defines body as a substance *impenetrable* and *discerpible* (i.e. divisible), whereas Locke specifically argues in Draft B that impenetrability is not a basic or primary idea of body, rather, it is a *consequence* of the primary ideas of extension and cohesion of parts.<sup>42</sup> While both More and Locke hold that the same notion of substance is applicable to both body and spirit, Locke maintains that it is the notion of an unknown something, while More thinks that it can be characterized as extension plus activity. Moreover, More’s reservations about the intelligibility of our notions of matter and spirit do not seem to have exercised much influence on Locke. Maintaining perfect parity between matter and spirit, More suggests at 1.3.2 that the way in which matter keeps out other parts of matter (impenetrability) and the way in which the parts of spirit hold fast together (indiscerpibility) are both difficult to conceive. He implies, further, at 1.6.5 that the imaginability of smallest particles and points might be called into question,

<sup>39</sup> Hobbes, *Leviathan* [Curley], p. 262.

<sup>40</sup> See Locke, *Drafts* [Nidditch e.a.], A 1, p. 2, B 19, p. 129.

<sup>41</sup> More, *The Immortality of the Soul*, 1.3.2. My references are by book, chapter, and section number.

<sup>42</sup> Interestingly, this is a position that Locke abandons in later versions of the *Essay*, where he emphasizes solidity (which he says others can call impenetrability if they wish), demotes extension, and makes *the cohesion of solid parts* one of the two primary ideas of body (the other being *impulse*).

but notes that this tells equally against spirit and matter.<sup>43</sup> Although Locke did eventually develop worries about the ultimate intelligibility of our primary ideas of body and spirit, only the strict parallelism he observes even in those reservations seems specifically Morean.<sup>44</sup>

Locke’s account of primary ideas in this section raises a number of difficulties. The most pressing, however, for our purposes, is this one: it is somewhat unclear just how a corpuscularian hypothesis, which is twice described as “probably” the case, can single out two of our ideas of bodies as actually and definitively primary. I suggest the following reading: By seeing that a natural account is (purportedly) available which reduces all other qualities to the qualities of extension and cohesion, we see that those qualities are central to our conception of body, just as thought and will are to our conception of mind. What is shown is that extension and cohesion have a sort of conceptual priority for us, not necessarily a priority in nature. It is thus surprising that Locke states that the various sensible qualities “are” but the modifications of the extension of cohering parts and their motions, with no qualifying “probably.” This is the strongest apparent statement of corpuscularian commitment in Draft B, but, given its context, it seems to be an overstatement. What Locke means to assert here is merely that we naturally and easily regard sensible qualities as such modifications.

This interpretation is further supported by three observations:

1. Locke speaks here of primary *ideas*, thus signaling that his concern, in keeping with his overall project, is with our conceptions of things, not with the things themselves.
2. Locke, on this interpretation, does not claim to settle the question of the correct ultimate characterization of bodies and spirits, which fits with his repeated insistence that our faculties do not permit us to gain access to the essence of either.

<sup>43</sup> Locke does observe at B 94 p. 201 that any difficulties found in the notion of spirit are matched by the perplexities that follow from a consideration of the question of whether bodies are infinitely divisible. This might be related to More’s worry about smallest particles, which he notes in the midst of defending the claim that matter must consist of parts indiscerpible, that is, there are smallest material particles which are not mathematical points and the discerpibility of matter is not infinite.

<sup>44</sup> Locke argues in Draft C and later versions that cohesion (paralleling thought) eludes comprehension, and in the published *Essay* raises concerns about impulse (paralleling will) as well.

3. This interpretation respects the parallelism Locke sees between body and spirit. Locke holds that the dependence of corporeal qualities on extension and cohesion parallels the dependence of spiritual qualities on thinking and willing. But Locke is not asserting that the ultimate causal source of all spiritual qualities is simply thinking, willing substance. He could not be, since he was willing to entertain the possibility that it is matter that thinks and therefore hopes and fears, a willingness he exhibits even in Draft B,<sup>45</sup> and asserts more strongly in later versions of the *Essay*. He is therefore not asserting that the ultimate causal source of all corporeal qualities is extended cohering substance; in both cases he is pointing to a sort of conceptual dependence.

Along with the conceptual priority assigned to extension and cohesion, Draft B includes the first indications of the conceptual priority of impulse or impact-based explanations of corporeal change:

But 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 any thing but motion: but this being not at all necessary to the framing the idea of that relation of causes & effects I shall here passe by.<sup>46</sup>

which efficacy or action ... 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.<sup>47</sup>

These remarks fit very well with two previously identified strands in Locke's treatment of corpuscularianism in Draft B: he is inclined to see corpuscularian qualities as basic to our conception of body; like-

<sup>45</sup> In B 94, p. 211, Locke asserts that it is no harder to conceive how thinking should exist without matter than how matter should think, i.e. intelligibility of thinking matter is less than or equal to the intelligibility of thinking without matter. In later versions, the "less than or equal to" is changed to "equal to." See also his journal entry from 1677 (Locke, *An Early Draft* [Aaron e.a.], 91): "Inconceivable how matter should think and as incomprehensible how an immaterial thinking thing should be able to move a material or be affected by it."

<sup>46</sup> Locke, *Drafts* [Nidditch e.a.], B 138, p. 256.

<sup>47</sup> *Ibid.*, B 150, p. 262.

wise, he sees motion, the foundation for corpuscularian accounts of corporeal interaction, as exhausting our grasp of bodily efficacy. Nevertheless, he regards questions about the nature of physical objects and the way in which ideas are caused as being beyond the scope of his project. That his claims here are restricted to our conceptions of things and do not extend to the things themselves is nicely underscored by the remark about "colours to a blinde man." Objects, of course, do in fact have colors, and would have them even if we all were blind. Thus, the possibility is left open that bodies might act in ways we do not comprehend.

#### 4. Conclusion

It is clear even in these early drafts that corpuscularianism does shape Locke's thinking about body. Corpuscularianism provides the model that he draws upon in conceiving of corporeal substances and their manner of affecting us. Both drafts thus exhibit the familiarity with corpuscularianism that one would expect from a habitué of Boyle's chambers. In B, Locke shows an appreciation for the naturalness and intelligibility of corpuscularianism. In neither draft, however, does he exhibit any interest in developing or elaborating corpuscularianism, nor in arguing for its truth. The evidence of the drafts is in keeping with the hypothesis that Locke comes to the project of the *Essay* with a deep skepticism about our prospects for knowing the natures of bodies, a skepticism that may have been derived from or fueled by his association with Sydenham.

What is indisputable is that in the 1671 drafts Locke employs the corpuscularian hypothesis in a circumscribed fashion, as a resource for the elucidation and defense of the following philosophical points:

1. We must distinguish between idea and corporeal cause (more specifically, quality).
2. We lack sensory access to the crucial micro-level of causal processes.
3. Extension and cohesion are central to our conception of body, and impulse to our understanding of body's activity.

Nevertheless, Locke's expressed intention to distance himself from natural philosophical questions about the nature of bodies is in fact carried out in these drafts. At the ontological level, Locke officially commits himself to no more than the uncontroversial view that

macroscopic processes have causes which elude our senses.<sup>48</sup> Moreover, the effect of Locke's limited deployment of corpuscularianism in the drafts is to focus attention on the understanding, on our ideas (including our ideas of body) and the relations among them, and to emphasize our ignorance of the uncertain philosophical causes of those ideas.

WILHELM HOMBERG: CHYMICAL  
CORPUSCULARIANISM AND CHRYSOPOEIA IN  
THE EARLY EIGHTEENTH CENTURY

LAWRENCE M. PRINCIPE

1. *Introduction*

This paper represents a departure from other contributions to this volume in so far as it treats a time period in which corpuscularian ways of thinking about the world had already become fairly well established. By the early eighteenth century almost every serious thinker was well acquainted with corpuscularian perspectives; yet for many, this explanatory system—and particularly the mechanical framework of which it was often a part—remained in need of further development. The seventeenth-century corpuscularianism crafted at the hands of Pierre Gassendi, René Descartes, Robert Boyle, and all the other notables was still quite far from a comprehensive explanatory tool, especially for chymists.<sup>1</sup> The chymists, exposed as they were to an almost overwhelming diversity of laboratory phenomena, could find seventeenth-century mechanical corpuscularianism, generally based on one uniform (usually inert) matter differentiated only by the accidents of shape and local motion, too jejune to account for the multitude of varied interactions they witnessed in their laboratories.<sup>2</sup> Indeed, the corpuscularianism of 1700 was quite different from the chemical atomism to be established by John Dalton about a hundred years later. Thus, in terms of the elaboration of chemical corpuscularianism, the fate of corpuscles among the chemists between 1700 and 1800 remains a fertile field of study, and one that promises to throw

<sup>1</sup> I use the archaic spelling *chymist* to refer to a seventeenth-century practitioner of "chymistry" in order to evade the anachronistic modern connotations of the words chemist ("a modern") and alchemist ("an ancient") since I am dealing with a time period in which the division between alchemy and chemistry was neither clear nor distinct. See Newman e.a., "Alchemy vs. Chemistry."

<sup>2</sup> For example, Du Clos questioned the very possibility of reducing chemical phenomena to mechanical corpuscularianism in his examination of Boyle's essays; see Metzger, *Les doctrines chimiques*, pp. 266–272. Similarly, Georg Ernst Stahl was severely critical of mechanical chemistry, see Metzger, "La philosophie de la matière," pp. 428–435; Oldroyd, "An Examination," pp. 42–43; and Thackray, *Atoms and Powers*.

<sup>48</sup> I wish to thank the members of the St. Andrews conference on medieval and early modern corpuscular matter theory for comments on related work which inspired the research presented here. I gratefully acknowledge research support from the Dibner Institute for the History of Science and Technology, the University of Pennsylvania, and the Huntington Library.