# Uniformity and Aristotelianism in Locke's Philosophy of Body

by

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#### Abstract:

In this thesis, I argue that the corpuscularian doctrine of the uniformity of matter, together with certain aspects of scholastic philosophy, shaped Locke's notion of qualities as powers, his conception of primary qualities and his thought about solidity, atomism and cohesion. In particular, I argue that the doctrine of the uniformity of matter, which entails that, with respect to bodies, differences in size never amount to differences in nature, plays a pivotal role in Locke's ascription of solidity and primary qualities in general to unobservable bodies (something often thought in conflict with his empiricism). Moreover, I argue that this doctrine is in conflict with understanding Locke's atoms as simple or partless bodies. We should, therefore, think of Lockean atoms as clusters of material parts naturally inseparable, which gives rise to the problem of cohesion or the problem of explaining the natural unity of such bodies. With respect to the Aristotelian aspects of Locke's philosophy of body, I argue that Locke's list of primary qualities provides only a *nominal definition* of body, that the way scholastics thought about division plays an important role in the specification of the list of such qualities, and that the correct understanding of solidity and the problem of cohesion depends on the scholastic distinction between quantitative parts and qualitative parts, as well as on the Aristotelian notion of quantity.

In grateful memory

Felipe Temoche Rumiche

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# Introduction

Locke shared with the Aristotelians the belief that material substances can be known empirically, but only in the weak sense that their existence can be known in this way. He certainly did not believe that an individual material substance's particular or general nature could be known, empirically or otherwise. Aristotelians did hold that a sensible substance's nature (its species-defining *form*) could be known by observation. Descartes held that the nature of an individual body, *qua* body, could be known, but only intellectually. In other words, Descartes thought that the nature of the general substance "body" or "matter", out of which every particular body is made, could be known by virtue of intellectual grasp. But Locke, who did not believe in forms but rather in corpuscular constitutions<sup>1</sup>, thought that the prospects of discovering the "radical texture" of an individual body were rather dim. And he was equally if not more pessimistic about "grasping" the nature of the general substance "matter", if not only because his empiricist epistemology foreclosed the possibility of such Cartesian ways of knowing.<sup>2</sup>

<sup>&</sup>lt;sup>1</sup> I use 'corpuscular constitution' to encompass both internal constitutions, that is, the particular figure, size and arrangement of the parts that make up an individual sensible body, and real essences, that is, the figure, size and arrangement of parts causally responsible for the sensible qualities relative to which an individual body is classified under a certain sort. See *Essay* 3.3.15, that is, Book 3, Chapter 3, section 15 of Peter Niddich's edition of Locke's *An Essay Concerning Human Understanding.* For the distinction between internal constitutions and real essences see Jan-Erik Jones' "Locke on Real Essences" and, especially, Jean-Michele Vienne's "Locke on Real Essences and Internal Constitution".

<sup>&</sup>lt;sup>2</sup> In turn, Descartes' intellectualist epistemology foreclosed, as Davidson and Hornstein say, "the possibility of English corpuscularian hypothesis in physics"; for those hypotheses "invoked, in an essential way, the notion of solid atoms", solidity being a *quality* whose concept is "not amenable to geometrization." See Davidson and Honstein's "The Primary/Secondary Quality Distinction: Berkeley, Locke, and the Foundations of Corpuscularian Science," p. 282. According to Wilson, however, Locke's concept of solidity is a precursor of the concepts of *density* and *mass*. See his "Locke's Primary Qualities," p. 221, n.54. Wilson describes Locke's corpuscularianism as a '*massy* corpuscularianism'.

In contrast with the Aristotelians, however, Descartes and Locke denied that "matter" was in principle unknowable. For they held that, instead of being pure potentiality, matter had an actual and thus knowable nature. Listen to Descartes:

I think all these [particular] bodies are made of the same matter, and that the only thing which makes a difference between them is that the tiny parts of this matter which constitute some of them do not have the same *shape* or *arrangement* as the parts which constitute the others.(Descartes to the Marquess of Newcastle, 23 November 1646; CSMK, p. 302.)<sup>3</sup>

Shape, classified under the category of *quality* by Aristotle, is, for Descartes, "a function of the boundaries of [a limited] extension". Arrangement is reducible to position and motion, which are "a relation between various items possessing shape" and "change in position", respectively.<sup>4</sup> The arithmetization of geometry achieved by Descartes perhaps made him think it not only possible but *true* that the concepts required for an explanation of nature were, to put it crudely, "just those of geometry, together with the concept of time."<sup>5</sup>

But the reduction of qualitative aspects of the world to quantitative ones expressed (or, perhaps, motivated) Descartes' conception of matter as homogeneous in nature: as consisting only of geometrical extension. Something is homogeneous in relation to its constitution, i.e., is homogeneous if it consists "of parts or elements all of the same kind" or is "of uniform nature or character throughout."<sup>6</sup> Descartes held that the general substance "body" was homogeneous or uniform. I hold that, although Locke had no positive conception of the nature of matter, he thought that matter was uniform too.<sup>7</sup>

<sup>&</sup>lt;sup>3</sup> Quoted by Martha B. Bolton in "Modes and Composite Material Things according to Descartes and Locke", p.89.

<sup>&</sup>lt;sup>4</sup> Meditation 3; CSM 2, p. 30.

<sup>&</sup>lt;sup>5</sup> Bennett, "Descartes on Space and Subtle Matter", p. 5

<sup>&</sup>lt;sup>6</sup> OED definition.

<sup>&</sup>lt;sup>7</sup> In Boylean spirit I shall understand the doctrine of the uniformity of matter as one of the defining doctrines of "corpuscularianism" and, thus, I shall hold anyone who holds this doctrine to be a

I hold that Locke was doctrinaire about this, as is palpable in Locke's argument for the existence of God. Here is an excerpt:

...you may as rationally expect to produce Sense, Thought, and Knowledge, by putting together in a certain Figure and Motion, gross Particles of Matter, as by those that are the very minutest, that do any where exist. They knock, impell, and resist one another, just as the greater do, and that is all they can do.  $(Essay 4.10.10)^8$ 

This argument presupposes that differences in size between bodies never amount to differences in nature; if they did, then sizes would mark essential differences. It follows that in that case matter would not be uniform in nature. It follows, then, from the doctrine of the uniformity of matter that bodies, *qua* bodies, do not change in nature as a matter of size.<sup>9</sup>

This important consequence, I shall argue, is at play in Locke's definition of qualities as powers and his definition of primary qualities, as we shall see in Chapter 2. Moreover, it is also present in his thought about solidity and should be taken as a guiding principle in interpreting Locke's atomism, as I argue in Chapter 3. In that chapter as well I argue that Locke's motivation for endorsing atomism is comparable to the motivation some scholastic philosophers had for developing the doctrine of potential parts. Moreover, I argue in that chapter that the problem of cohesion, the problem of understanding the "natural" union of the parts that make up a body, can

corpuscularian. Descartes, thus, is as corpuscularian as Locke in this regard. Other doctrines shall prove relevant as our discussion unfolds.

<sup>&</sup>lt;sup>8</sup> For discussion of this passage see Bennett's "God and Matter in Locke: an exposition of Essay IV.x.", pp.166-67.

<sup>&</sup>lt;sup>9</sup> There is one extra aspect about the passage we have just discussed, and it is that it sounds as if Boylean corpuscularianism, that is, the scientific hypothesis that postulated extension, solidity and mobility as the only explanatory qualities of bodies, is for Locke what exhausts the nature of matter. I do not hold this, as I hope the discussion below shows.

be better understood in light of some Aristotelian distinctions. In Chapter 2, I argue that Locke's appeal to the process of division to identify the primary qualities of body manifests Aristotelian ways of thinking. All in all, I argue that the corpuscularian doctrine of the uniformity of matter, together with certain aspects of scholastic philosophy, shaped Locke's notion of qualities as powers, his conception of primary qualities and his thought about solidity, atomism and cohesion. But let me first paint the Aristotelian background against which Locke's doctrines shall be contrasted. This I shall do in my first chapter.

#### Chapter 1:

# The Transformative Natural World of the Aristotelians

# 1.1. Quantitative parts and qualitative parts

Aristotelianism in general favors an ontology where the ordinary and enduring physical objects of everyday experience are substances. They took individuality, being the same over time and being something to which some other things are predicated as marks of substantiality. Thus an oak, a horse and a human being were generally taken as substances. Questions about the composition of such things arise naturally from the observation that they undergo different kinds of changes: the leaves of an oak change their color according to the seasons; the oak itself survives the loss of its leaves in winter, throughout its development the oak changes in size and shape, and it also perishes. Ultimately, Aristotelians shought to give an explanation of these kinds of processes and they thought that a general account of change involves a distinction among the components of such entities.

It is natural to think that an oak may be composed of its leaves, branches and other such parts. Likewise it may be said that a human being is composed of bones, flesh, organs and tissues of different kinds. In standard scholastic terminology this kind of components or parts of a substance were called the substance's *quantitative parts*. Scholastics also recognized other kinds of parts of substances; for, following Aristotle, they thought that there are facts about these substances that could not be explained solely in terms of their quantitative parts. In general, scholastic philosophers thought that an account of change involved the postulation of at least two parts or components of substances that are different in nature from its quantitative parts. These were *form* and *matter*.

Form and matter are the elements of the hylomorphic account of natural objects first put forward by Aristotle and later developed and enriched in different ways up until the seventeenth century. The Aristotelians of the middle ages and the early seventeenth century called form and matter the essential or *qualitative parts* of a substance.<sup>10</sup> A general way to distinguish between the quantitative and qualitative parts of a substance, suggested by Pasnau, is to say that the quantitative parts of a body or corporeal substance are those parts which *are themselves bodies*.<sup>11</sup> On the other hand, qualitative parts are components of bodies which *are not* bodies themselves.

Following Pasnau, I shall say that Aristotelianism is thus the thesis that hylomorphic analysis is the ultimate analysis of nature. Thus, for the Aristotelians, *qualitative* and not *quantitative* composition is ultimate. Strict corpuscularianism, in contrast, can be stated as the thesis that quantitative analysis is ultimate. That is, that the phenomena of bodies can be explained by and are a consequence of its quantitative parts and their operations alone.<sup>12</sup> Below, I shall develop and qualify these theses. Let us first see how Aristotelianism accounts for change by appealing to qualitative parts.

# 1.2. Aristotle's analysis of change

For Aristotle, a fundamental presupposition of change is that, as István Bodnár says, "it is intrinsic characterisations of entities which are conferred on the object [changed]".<sup>13</sup> In his *Physics*, Aristotle recognized four kinds of change: qualitative change, quantitative change, substantial change and

<sup>&</sup>lt;sup>10</sup> Among other postulated items they thought necessary to explain change, e.g. real accidents.

<sup>&</sup>lt;sup>11</sup> See his Metaphysical Themes 1274-1671, p.7.

<sup>&</sup>lt;sup>12</sup> Bracketing God, of course.

<sup>&</sup>lt;sup>13</sup> My exposition of Aristotle's doctrines closely follows István Bodnár's "Aristotle's Natural Philosophy". Any distortions are my own.

locomotion or change of place.<sup>14</sup> When Socrates learns to play the flute and thus becomes *musical*, a qualitative change has taken place. When he grows a few centimeters, a quantitative change has taken place. But when Socrates comes to be (is born or conceived) or passes away (dies) a substantial change takes place. Aristotle thought that these three kinds of processes obey to some extent the same principle, which I shall explain below. Locomotion is different, however, and it requires a different kind of analysis; but Aristotle thought that it bore some priority in relation to the other kinds of change because none of these can come about unless the elements at play in them are in spatial proximity.

The kinds of change illustrated by the examples above involve, for Aristotle, the following elements: a pair of opposites: (i) a state or a feature (a 'form'<sup>15</sup>) acquired as a result of the process of change; (ii) a 'lack'' or an initial state of lacking the form; and (iii) something that persists through and underlies the process of change.<sup>16</sup> What remains the same through the changes described in the first two examples is a substance: Socrates. This is obviously not the case with substantial change, which requires a more complex analysis, as we shall see below. But let us first understand Aristotle's analysis of change with a simpler example, a case of qualitative change: a log heated by a fire.<sup>17</sup> Aristotle distinguishes between the entity effecting change (the fire) and the entity which undergoes change (the log). To effect change, the first entity must confer a form (heat) on the second entity.<sup>18</sup> In order to do so, the interaction and the matching of two potentialities is required. On the one hand, it requires a passive potentiality to receive the form in the entity undergoing

<sup>&</sup>lt;sup>14</sup> I ask the reader to bear in mind that 'quantitative' and 'qualitative' here refer to the Aristotelian fundamental categories, within four of which Aristotle recognized change as possible.

<sup>&</sup>lt;sup>15</sup> There is no strict isomorphism between the Aristotelian analysis of change and the hylomorphic analysis of substances and other natural entities. 'Form' here refers not only to form as a speciesdefining feature (i.e. substantial form), but also to whatever characteristic, state or feature is such that its deprivation and acquisition characterizes a process of change.

<sup>&</sup>lt;sup>16</sup> See Physics 1.7, 190a13–191a22. (Quoted by Bódnar)

<sup>&</sup>lt;sup>17</sup> Let us assume for the sake of argument that a log counts as a substance.

<sup>&</sup>lt;sup>18</sup> See Physics 3.2, 202a9–11 (Quoted by Bódnar).

change: in this case, the log, being inflamable, has the capacity to be heated. On the other hand, an active potentiality in the entity effecting change is also necessary. Our present case satisfies this condition as well: the fire has the active capacity to heat.

But Aristotle is committed to something stronger than the satisfaction of two potentialities. He holds that the active potentiality present in the entity which effects change must, ultimately, be an actuality. Our example illustrates this quite clearly. The fire not only has the capacity to heat but *it is itself hot* and, according to Aristotle, cannot heat something else unless this is the case. Thus, the term 'hot' applies to both of them univocally, that is, there is a common sense of the word as it applies to both.<sup>19</sup> This entails that the cause must be univocous with its effect in relation to the feature it confers. In our example, both the fire and the log are hot on account of the presence of the form of heat. The active capacity in the cause (the fire) is ultimately an actuality: heat in the fire. Change happens when the cause or the entity effecting change (the fire) confers its form (heat) to an entity with the capacity to receive it (the inflamable log). In Aristotle's scheme, it is forms which are the ultimate operative agents of change.

Substantial generation and corruption also obey this principle.<sup>20</sup> But, as I said, the element that remains the same in this process cannot be the substance. Aristotle argues that it is ultimately the substance's *matter* that underlies this kind of change. Let us start thinking about this with the case of an artifact. We can think of the bricks a house is made of when it is built and when it is destroyed or disassembled as what underlies both processes or events.<sup>21</sup> There is thus some *stuff* which is numerically the same before and after the existence of the house. But it is not clear what exactly counts as the same stuff after Socrates's death, let alone what precedes Socrates's birth or

<sup>&</sup>lt;sup>19</sup> See the section on essentialism and homonymy in Chistopher Shields's "Aristotle".

<sup>&</sup>lt;sup>20</sup> My discussion of this topic is also influenced by Thomas Ainsworth's "Form vs. Matter."

<sup>&</sup>lt;sup>21</sup> In this case, the craft in the mind of the craftsman is the operative agent in artificial creation.

conception. This is because, in the case of death, Aristotle denies that it is the same body that remains after Socrates passess away. For Socrates's body is an *organic* body and his corpse is at best only "homonymously" or "equivocally" called a body; that is, 'body' is not applied to them in the same sense. A real body, Aristotle insists, is an *ensouled* body, one which is at least capable of performing the functions necessary for maintaining life. In Socrates's case, his body is informed by a rational soul and it is thus capable of carrying out the development of a rationally-directed life. This is not true of his corpse, for when his rational soul is separated from his body, whatever remains is incapable of performing the characteristic functions of a human life. In this sense an organic body resembles an artifact, for Aristotle comes close to defining the body of a living organism *functionally*.

It is even more difficult to think what item could precede Socrates's birth or conception and be the underlying basis of this process. In this case, Socrates's "body" is a far less plausible candidate. But Thomas Ainsworth observes that Aristotle avails himself of some distinctions that allow him to deal with this case. Although he believes that all sensible (corporeal) substances are analyzable into form and matter, his hylomorphism has a near overarching application. Thus, a substance's matter can also be analyzed into form and matter. The bricks that make up a house are themselves clay-shaped in some way or another. Clay itself is made of mud. Aristotle held that, ultimately, the matter of any kind of sensible substance can be analyzed as consisting in some proportion of the four fundamental elements: earth, fire, air and water. The ultimate hylomorphic composite being the elements, we may think of a hierarchy of the matter of some sensible substance, say, Socrates, that begins with this substance's most proximate matter, i.e. Socrates's organic body, and that culminates in some combination of the elements. Somewhere in the chain between Socrates's organic body and the elements there will be some level of matter which is not biological or is not alive and can underlie Socrates's death. A similar account may be given of Socrates's generation. Now, one particular case of substantial generation and destruction that deserves our attention is that of the elements. Each of the elements itself is reducible to the pair of fundamental opposites: hot-cold, wet-dry. Aristotle believed that the elements can transform themselves into one another. Then, there must be some underlying matter that persists through such a change. Thus, we arrive at prime matter, which must itself be indeterminate and pure potentiality in order to receive the determinations that the fundamental opposites confer on it. Here concludes my exposition of the Aristotelian account of change and how qualitative parts, forms and matter are pivotal in such an account.

### 1.3. Overview as an interlude

It can be seen from the rough account in the previous section that Aristotelians took fire to be a natural substance, one of nature's four elements, something which has an inherent active capacity to transform whatever is inflamable into fire as well. Such was the way in which it was thought that processes of nourishment and growth come about. The flesh and the other bodily tissues of a living organism grow and develop on account of their active capacity to transform food into particles of tissue, while at the same time other particles of tissue decompose or are transformed into other kinds of substance. In general, it can be said that in the Aristotelian framework, changes are processes of assimilation: some natural stuff of some kind is assimilated or transformed into stuff of other kind on account of the active capacity, nature or form of the latter.

The appeal to underlying layers of matter to explain substantial change raises, of course, many questions. One of them is how to understand the presence of these levels of matter in the *actual* quantitative composition of some sensible substance or body. Are there bits of air, earth and water in my body, for the Aristotelians? I learn from Pasnau that the scholastics standardly held that the

elements do not *actually* exist within a mixed body.<sup>22</sup> If that is true, then the elements, with their different active or transformative capacities do not exist within the body. It becomes then very obscure to understand how could they or some mixture of them could survive or underlie the death of the living organism (me) that they in some way and at some level compose. It may seem as if what underlies any change, not only transformative processes among elemental masses, is prime matter.

Michael Ayers seems to think so. To illustrate growth and nourishment, Ayers reports that Aristotle used the metaphor of 'flowing water that is measured by one and the same measure', 'some flowing out and some flowing in'. Ayers explains that the 'measure' can be taken to be a vessel and it represents the form of the (living) flesh or even the form of the animal. Matter is represented by water in the vessel of the flesh, already transformed in tissue having been the matter of the food. This matter, which survives substantial change, must (according to Ayers) be taken to be indeterminate 'even in quantity'; this is the *materia prima* we talked about before. Ayers further explains that the form of the different kinds of tissue that quantitatively compose a body are subordinate to (or maybe an aspect of) the form of the living substance.<sup>23</sup> The living substance passess away when its form does so (except, perhaps, in the case of human beings). Thus, the forms (and their active capacities) of the bones, flesh and organs pass away as well. From what we have seen, it is clear that "dead 'flesh' is inactive as such, and therefore not flesh, however much it may look like it. It is as if the vessel had suddenly been annihilated, while the matter, which was a moment before contained in it, temporarily and imperfectly kept its shape."<sup>24</sup>

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<sup>&</sup>lt;sup>22</sup> Metaphysical Themes, p.619 n.10.

<sup>&</sup>lt;sup>23</sup> Ayers does not exactly say this. I have rephrased what he says in terms of the framework of quantitative and qualitative composition I have laid out.

<sup>&</sup>lt;sup>24</sup> Locke, vol.2, p.174.

Dead flesh is only *homonymously* called flesh', Aristotle would say. This consideration may give us a hand with our question about actual quantitative composition. It may be that, for instance, if we take a piece of flesh, we may say that it has as many quantitative parts as they are univocal with the whole they compose. When the parts fail to be univocal with the whole, we have parts that are only homonymous with the whole and, therefore, not actual. To clear up this obscure thought, let us think again of processes of destruction. If one chops up a log, there will be a point at which what results from such a process are not logs themselves, but something different. Insofar as division produces only two or a number of logs, these little logs may be taken to be actual quantitative parts of our log. Insofar as division produces something that is no longer a log, we may say that these things are not actual, but only *potential* parts of our log. As we shall see, this thought (or something like it) led Aristotelians of the Middle Ages to defend the view that a body has only *finitely many quantitative parts*. But we may first need to understand why they (or Aristotle himself) may have been concerned with the question of how many quantitative parts a body has.

#### 1.4. The Aristotelian analysis of the continuum

Continuous quantity, later known as geometrical extension and taken by Descartes to be the essence of body, is a species of quantity. Quantity was one of Aristotle's ten fundamental categories; itself subdivided between the continuous and the discrete. An Aristotelian definition consisting of the specification of a thing's genera and difference, no definition of 'quantity' was provided: since *quantity* belongs to the highest possible genera, there is no higher genus that could partly define this concept.

Luckily, Aristotle provides us with illustrations. In his *Physics* 5.3 Aristotle says that two things are in succession when they are ordered and nothing of the same kind is between them.<sup>25</sup> He then explains that a contiguous thing is '[a] thing that is in succession and touches'. And then he classifies the continuous as a subdivision of the contiguous: 'things are called continuous when the touching limits of each become one and the same.' An example of two continuous things could be two houses joined by a common wall. For in this the extremities of each are one and the same. Thus, Aristotle explains that 'continuity belongs to things that naturally in virtue of their mutual contact form a unity. And in whatever way that which holds them together is one, so too will the whole be one, e.g. by a rivet or glue or contact or organic union.<sup>26</sup>

Successions or magnitudes of body, space and time qualify as quantities. But quantities as such enjoy no natural unity: they are rather analogous, according to Ayers, to "a plurality or purely ideal aggregate". Think of the quantity of students in a class. No matter how widely dispersed the students may be, that quantity can still be identified. And that particular quantity survives as long as each of the students does.<sup>27</sup> Yet this is the case of a discrete quantity, which can be a case of a *contiguous* quantity. As we said, for Aristotle, two contiguous quantities are those which "touch" one another, either by being continuous, i.e., by sharing a common terminus, or by being each of them discrete wholes whose boundaries are next to each other (imagine the students next to each other in spatial proximity).

<sup>&</sup>lt;sup>25</sup> I learned this from Jorge Secada's "Suárez on Continuous Quantity". I follow Secada closely on this. See also the appendix to Norman Kretzmann's *Infinity and Continuity in Ancient and Medieval Thought*, which collects many of Aristotle's text on the continuum problem. Pasnau refers us, e.g., Phys.206a18–29 and 212b3–7 (*Metaphysical Themes*, p.616)

<sup>&</sup>lt;sup>26</sup> See *Physics*, 227a14–16, 1: 384. (Quoted by Secada)

<sup>&</sup>lt;sup>27</sup> Locke, vol.2, p.174

A continuous body, according to Aristotle, is one where 'one could find a common boundary --a line or a surface-- at which the parts of the body join together'<sup>28</sup>. Two bodies can be said to be contiguous insofar as they touch one another; bodies can be said to be continuous if they are joined by a common terminus or limit.

Aristotle shows that any continuous quantity is infinitely divisible. Take, for example, a line, which is a continuous succession of points. A line is, for Aristotle, necessarily *dense*, that is, it is a series such that there is always a third member between any two of them. For if it were not dense, then there would be two points next to each other, which contradicts our assumption that a line is a continuous quantity. For in this case, we would have a division in which there are two limits, instead of a single shared one. Thus, any line or line segment must be dense. Thus, any continuous quantity is necessarily dense. Since, in consequence, between any two members of a continuous quantity there is always a third, any continuous quantity is divisible into smaller quantities at such a third member. The same holds for the resulting quantities. It follows from Aristotle's principles that continuous quantities are divisible *in infinitum*. It follows that bodies are infinitely divisible.

It is a fascinating question how body could be a species both of substance and of quantity. But Aristotle's subjunction of body to the category of continuous quantity raises a question about how many quantitative parts a body has, i.e., how many bodies compose a body: infinitely many or not? how to decide? Another way to frame the question is the following: how many of the bodies or quantitative parts into which a body is divisible are *actual*?

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<sup>&</sup>lt;sup>28</sup> See *Categories* 6, 5a4–14, 1: 8. (Quoted by Secada)

## 1.5. The doctrine of potential parts

Most Aristotelians rejected the thought that a body has infinitely many quantitative parts. At the most, common sense may accept that bodies have innumerable parts; or that bodies have infinite parts in the sense that there can always be more of them.

It may be easier for common sense to identify the parts of an organic body: a plausible criteria is difference in composition. An organic body is made, according to Aristotle, of heterogeneous parts or bodies. Aristotle distinguished between homogeneous bodies and heterogeneous bodies.<sup>29</sup> Homogeneous bodies are, in some sense, stuffs: they have no internal structure and are composed of the same ratio of elements throughout. Thus, every part of an homogeneous body is the same as every other part. Heterogeneous bodies, in contrast, have internal structure. Their parts are made up of different kinds of stuff composed of different elemental proportions. This is the case of the different bodily organs or the different kinds of tissues that make up a body: Hands, feet, eyes, etc. A hand, for example, is composed of biological matter: flesh, bones, blood, etc. Thus, we may say that only the heterogeneous parts of an organic body, those with different ratios of components, are actual. But this cannot be the whole story, at least not for an Aristotelian. First, because in this picture quantitative composition seems to be ultimate. An Aristotelian would rather approach this matter by identifying parts according to their function within the whole organic body, determined by its form. Second, because of the difficulties of understanding the presence of the elements within an organic body that I raised above. Finally, this account cannot be applied to homogeneous bodies for obvious reasons.

<sup>&</sup>lt;sup>29</sup> Ainsworth makes reference to Aristotle's Parts of Animals i 1, 640b25-30.

Let us bring back the thought sketched in 1.3. There I said that a body may have as many quantitative parts as they are univocal with the whole they compose. Some Aristotelians followed this thought and articulated a view about where to draw the line between actual and potential parts. John of Jandun observed that

Flesh... can be divided into parts so small that if those parts were divided they would not remain flesh, but would dissolve into the air.<sup>30</sup>

This example is meant to illustrate the following point: 'Actual [quantitative] parts are those that, taken in themselves and separately, can participate in the form of the whole. Potential [quantitative] parts are parts of exceeding smallness that, taken in themselves and separately, cannot participate in the form of the whole, but would dissolve into what contains them.' Pasnau comments that the passage clearly establishes how to demarcate the distinction between the actual and potential parts of a body. Those parts that are large enough to be of the same kind as the whole are actual. Those parts that are too small to count are potential. The smallest parts that belong to the same kind as the whole were called by the scholastics '*minima*'. Thus, according to this view, the potential parts of a body are all and only those parts which are smaller than its minimal parts.

I would like to complement Pasnau's picture of Jandun's view with the topics we have been discussing. As Pasnau himself acknowledges, at first sight this view seems intuitive only in the case of homogeneous bodies, e.g., a piece of flesh, a piece of wood or a gold bar. But the point I would Like to draw here is that, to an Aristotelian nose, this passage smells like substantial change.

<sup>&</sup>lt;sup>30</sup> Quoted by Pasnau to illustrate a widespread view throughout the Middle Ages and present in the times of Locke. Pasnau's wonderful discussion of scholastic doctrines on parts and wholes (*Metaphysical Themes*, pp.606-632) has obviously deeply influenced my views on this. See *Metaphysical Themes*, p.615, n. 8 for bibliographical information about Jandun's observation.

Let us assume that the piece of flesh of Jandun's example has a form, regardless of whether it is part or a living organism or not. He says that if this portion of flesh is continuously divided then, at some point, what results 'would not remain flesh, but would dissolve into the air.' It should be obvious to us at this point that the example of the division of the piece of flesh is a case of substantial change: repeated division brings about the substantial transformation of some stuff that was flesh into some stuff that is now air. Perhaps more accurately, the active capacities of an elemental stuff such as a mass of air assimilates dead flesh into something of its own kind. Moreover, Jandun says that potential quantitative parts are parts 'of exceeding smallness that, taken in themselves and separately, cannot participate in the form of the whole, *but would dissolve into what contains them.*' This strongly resonates with the vessel and water metaphor used by Aristotle. With Ayer's explanation of it, we should say that the stuff that underlies the change from flesh to air is like the water, and the story to be told here in broad lines is that it has passed from one container (the form of the piece of flesh, which was destroyed in the process) to a different one (the form of a mass of air). In other words, this stuff was once determined in some way and, at some point of the successive divisions, it has received a new determination.

If we imagine Jandun's piece of flesh as part of a living animal, we can think that a desmembration that causes the death of the organism causes the perishing of the structure of forms that account for the active capacities of its organs and different vital parts (its flesh included). This is, indeed, what on some accounts explains the actuality of whatever parts that are actual in a given body (at least living beings): their contribution to the overall function of the animal.

I conclude that the possibility of substantial change is what demarcates actual from potential quantitative parts in homogeneous as well as in heterogeneous bodies. In consequence, such a criterion enabled some scholastic philosophers to recognize that although a body is infinitely divisible it has only finitely many parts.

#### 1.6. Summary

In this chapter, I have roughly outlined the aspects of Aristotle's philosophy or Aristotelianism in general that shall prove relevant for our understanding of Locke's philosophy of body. Section 1.1. introduced the distinction between quantitative and qualitative parts as motivated by questions about the composition of bodies. The quantitative parts of a sensible substance or body are those parts or components which are themselves bodies; qualitative parts are not bodies as such. Aristotelianism holds that the ultimate analysis of nature needs to appeal to qualitative parts or "qualitative composition", as I called it. Strict corpuscularianism was stated as the thesis that quantitative composition is ultimate; that is, that the phenomena of nature should be explained in terms of bodies alone, and their natural operations. But Aristotelians held that the postulation of form and matter was necessary for the understanding of the different kinds of changes that bodies undergo, in particular, for an account of generation and corruption, as section 1.2. illustrated. Moreover, forms account for a body's active capacities to transform other bodies into bodies of its own kind. As section 1.3. stated, in the Aristotelian framework, changes can be thought of as processes of assimilation: some natural stuff of some kind is assimilated or transformed into stuff of other kind on account of the active capacity, nature or form of the latter. Section 1.3. also put into question the postulation in section 1.2 of different layers of matter, e.g. elements, into the composition of a body and led to the recognition of prime matter as the subject of substantial change in general. In particular, the postulation of different layers of matter led to questions about the presence of the four Aristotelian elements into the composition of a body ("are bits of air, fire and water parts of my body?"). The recognition that scholastic philosophers held that the four elements did not actually compose a body led to the recognition of prime matter as the ultimate subject of substantial change. But as to the question of what actually composes a body, I developed a thought that was to be articulated in section 1.5.: I suggested that the actual parts of a body are those that are univocal with the whole. Roughly speaking, this thought comprises the doctrine of potential parts, exposed in section 1.5., which, according to my interpretation, postulated possible substantial change as the criterion to demarcate the actual from the potential parts of a body. It also led to the recognition that processes of division are useful to think about the actual and the potential in a body. But the motivation of this doctrine was, of course, the problem of the infinite divisibility of body, a problem that follows from Aristotle's understanding of body as a continuous quantity, as I explained in section 1.4. Possible substantial change allowed some philosophers to defend the view that although a body is infinitely divisible, it does not have infinitely many parts.

# Chapter 2:

# Locke on Primary Qualities

# 2.1. Locke's notion of qualities as powers

Locke claims that 'Powers... justly make a great part of our complex Ideas of Substances' (*Essay* 2.13.10); for example:

He, that will examine his complex Idea of Gold, will find several of its Ideas, that make it up, to be only Powers, as the Power of being melted, but of not spending it self in the Fire; of being dissolved in Aqua Regia, are Ideas, as necessary to make up our complex Idea of Gold, as its Colour and Weight: which if duly considered, are also nothing but different Powers. (*Essay* 2.13.10)

Locke is here, of course, talking about our *ideas* of substances and saying that many of its components are ideas of powers of different sorts. In *Essay* 2.8.8, Locke distinguishes ideas from qualities<sup>31</sup> by telling us that

Whatsoever the Mind perceives in it self, or is the immediate object of Perception, Thought, or Understanding, that I call Idea; and the Power to produce any Idea in our mind, I call Quality of the Subject wherein that power is.

Stuart, however, argues that we should read Locke here as saying that powers to produce ideas<sup>32</sup> are among the qualities of bodies, without thereby implying that qualities are *only* powers.<sup>33</sup> One of the reasons he puts forward and perhaps the most important in relation to the interpretation of

<sup>&</sup>lt;sup>31</sup> In the context of discussing this aspect of Locke's philosophy of body, I shall understand 'quality' as Locke defines it .

<sup>&</sup>lt;sup>32</sup> It should be understood that the only ideas that qualities (can) produce in us are simple ideas. See *Essay* 2.2.1; 2.12.1.

<sup>&</sup>lt;sup>33</sup> See Stuart's Locke's Metaphysics, p. 37.

Locke's system is that if qualities are defined as powers to produce ideas then insensible particles of matter would not possess any qualities, given that they are not able to affect our senses. Given the prominent role of insensible particles and the attribution of primary qualities to them (see e.g. 2.8.23-26) in Locke's natural philosophy, this is unacceptable.

It is textually undeniable that Locke attributes qualities to small or unobservable bodies. Therefore, this should be the starting point of any adequate interpretation of Locke on this. Stuart argues that this attribution is inconsistent with defining qualities as powers to cause ideas, because by definition unobservable bodies cannot have those powers. But we should ask ourselves first whether unobservable bodies are unobservable in principle or not; and if not, then, relative to what? Only if unobservable bodies are unobservable absolutely does Stuart objection work; for then to ascribe qualities to them, understood as powers to produce ideas, would be like literally ascribing some size to a theorem.

But think of Locke's "Man with Microscopical Eyes", who can "penetrate farther than ordinary into the secret Composition, and radical Texture of Bodies". With respect to some things, such a human being could "probably *get Ideas* of their internal Constitutions" (*Essay* 2.23.12, my emphasis). This means that with senses acute as these the minute particles of matter that constitute a body would still produce (probably radically different) ideas in us. Conversely, Locke says that the "altering" of the "proportion of the Bulk of the minute parts of a coloured Object to our usual Sight" would produce "different Ideas, from what it [does]". (*Essay* 2.23.11)

The enlargement either of the 'bulk' of the particles that make up some body or of our sensory capacities make it clear that it does not follow from the fact that a particle is too small to be perceived that it has no power to produce ideas. For it *would* produce ideas, if it were sufficiently

magnified<sup>34</sup> or if the power of our sensory faculties were somehow increased. The point made here is that, plausibly, small particles are insensible, for Locke, not absolutely but in relation to our sensory capacities. It is thus accidental to their nature that they "cannot" be sensed. Moreover, these two scenarios are just two sides of the same coin. They both illustrate Locke's commitment to the uniformity of matter, which entails that difference of size never amounts to difference in nature, thereby entitling Locke to use the language of 'qualities' and 'powers' in relation to portions of matter of whatever size, if he uses it to describe at some level the nature of bodies of *some* size. It would then be inconsistent with this commitment to think that small (observable) bodies have qualities different in nature from observable (small) bodies.

Stuart also objects that the idea that qualities are powers to produce ideas "makes for a strange anthropocentric metaphysics, one in which each substance's features are exhausted by its capacities to appear to us one way or another."<sup>35</sup> I reply that it may have been only for expository convenience that Locke introduces qualities as powers to produce *certain* ideas in us, as he does in the rest of 2.8.8:

Thus a Snow-ball having the power to produce in us the Ideas of *White*, *Cold*, and *Round*, the Powers to produce those Ideas in us, as they are in the Snow-ball, I call *Qualities*; and as they are Sensations, or Perceptions, in our Understandings, I call them *Ideas*. (*Essay* 2.8.8)<sup>36</sup>

<sup>&</sup>lt;sup>34</sup> Although this point is made by Martha B. Bolton in "Substances, Substrata, and Names of Substances in Locke's *Essay*", p.111, I think it should be complemented with its converse in the ways I do.

<sup>&</sup>lt;sup>35</sup> Locke's Metaphysics, p.34-35.

<sup>&</sup>lt;sup>36</sup> According to Bennett, there is one serious problem with the interpretation of this passage. It is that there doesn't seem to be any set of items which Locke could, as Bennett says, "soberly mean" to be the referents of both occurrences of 'they' in 'as they are... and as they are...'. See his "Ideas and Qualities in Locke's *Essay*", pp.75-76

Suppose that Locke had to introduce the distinction to a man with microscopical eyes. If Locke knew how things look to him, perhaps he would have introduced the distinction in terms of how things appear to him. The point here is that the basic contrast he may have wanted us to grasp is that qualities are features of bodies, ideas are not. Or, more specifically, qualities are *powers*, ideas are not. That this may have been his thought seems to be suggested in 2.8.23, where he says, of secondary and tertiary qualities, that they "*are only Powers to act differently upon other things*, which Powers result from the different Modifications of those primary Qualities." (my emphasis) Here no mention of (specific) ideas is made.

# 2.2. Primary qualities and Locke's argument in Essay 2.8.9: Some interpretations

Let us now dive into Locke's classic primary and secondary quality distinction. He introduces the notion of primary qualities, i.e., the determinables 'Solidity, Extension, Figure, Motion, or Rest, and Number',<sup>37</sup> thus:

Qualities thus considered in Bodies are, [1] First such as are utterly inseparable from the Body, in what estate soever it be; [2] such as in all the alterations and changes it suffers, all the force can be used upon it, it constantly keeps; [3] and such as Sense constantly finds in every particle of Matter, which has bulk enough to be perceived, and [4] the Mind finds inseparable from every particle of Matter, though less than to make it self singly be perceived by our Senses. (*Essay* 2.8.9)<sup>38</sup>

This long sentence comprises four clauses. Robert Wilson has presented a taxonomy of the views on the relation among these clauses and the role each of them play. He identifies, broadly, two interpretative tendencies.

<sup>&</sup>lt;sup>37</sup> Locke's list of primary qualities varies. For an overall interpretation that explains these variations see Wilson's "Locke's Primary Qualities."

<sup>&</sup>lt;sup>38</sup> I follow Robert Wilson in bracketing some parts of this passage for ease of reference.

The first sees Locke as raising or making a conceptual point about body in this passage. Thus, for instance, Edwin McCann argues that Locke is here providing criteria for primary qualities on the basis of our common sense idea of body. He thus must take the 'inseparability' Locke appeals to in clauses [1] and [4] to be some kind of conceptual separability: primary qualities are the qualities without which we cannot conceive a body to be. All in all, McCann's overall line of interpretation is that, for Locke, the distinction between primary and secondary qualities and the list(s) of qualities he provides are "the only understanding of the nature of qualities that is conformable to our commonsense, everyday, prescientific notions of body and of the causality of bodies."<sup>39</sup>

Wilson observes that under this interpretation clauses [1], [2] ad [4] are redundant: they all express the point that there is a set of qualities that bodies can't be conceived without, clearly expressed in clause [4], repeated in clause [1] and clause [2] drawing the trivial consequence that body is never conceived without this set of qualities. More poignantly, Wilson points out that clause [3], which makes an empirical claim about what qualities the senses find in bodies, sits rather uneasily with the rest of clauses. At best, it can be seen as a supplementary empirical consideration. Yet to give such a small role to the senses and experimentation in general does not seem congruent with Locke's empiricist approach. All things considered, Wilson argues that an interpretation where clause [3] plays a more predominant role should be preferred.<sup>40</sup>

Before moving on to Wilson's own interpretation, which represents the second interpretative tendency, I would like to say that Lisa Downing and Mathew Stuart follow a line of thought similar

<sup>&</sup>lt;sup>39</sup> "Locke's Philosophy of Body", p.61

<sup>&</sup>lt;sup>40</sup> The conceptual view is also held by Hill ("Locke's Impulse Principle", p.94) and Peter Alexander: "Of the four clauses in this definition [at II.viii.9], the first, second and fourth appear to go together and to make a conceptual point about matter, or body, as such. The primary qualities are just those that anything considered alone, must have if it is to be counted as a body." (*Ideas, Qualities and Corpuscles*, p.119; quoted by Wilson).

to McCann's. Downing offers a sophisticated interpretation of the role of clauses [3] and [4]. According to her, [3] and [4] offer, respectively, a sensory and a conceptual criterion for the determination of primary qualities. In combination, these two criteria single out the Boylean conception of body as "uniquely natural" for human beings. This is because the theoretical conception of body provided by Boylean corpuscularianism is the same as the conception of body we distill from ordinary experience when [3] and [4] work together. Clause [3], the sensory criterion, provides the raw material of a pre-theoretical conception of body, one which is nonetheless clear because of the familiarity of the empirical concepts it employs. Clause [4], the conceptual criterion, distills the conception of body that [3] delineates by asking us to think which qualities can anything we are inclined to call 'body' be conceived without and which cannot. The result of this process is the nominal essence we assign to body. Boylean corpuscularianism's unique status of an intelligible theory follows from its assertion that the real essence of body corresponds to the nominal essence of body.<sup>41</sup>

Stuart tells us a similar story about the roles and the interplay between clauses [4] and [3].<sup>42</sup> They both play a role in telling us why our abstract idea of body has the particular contents it has. Stuart's interpretation begins by assuming that clause [1] expresses the conceptual point that some qualities are inseparable from bodies. He interprets [3] as saying that every observed body or particle of matter is observed to have the qualities referred to in [1]. Stuart observes that this claim does not justify the claim made in [1]. Instead, he takes [3] to express a fact about the genesis of our abstract idea of body. He quotes the famous passage from 2.23.1, where Locke says that the mind notices that "a certain number of these simple Ideas go constantly together", which reveals to us the fact

<sup>&</sup>lt;sup>41</sup> See "The Status of Mechanism in Locke's Essay", especially pp.402ff for Downing's account of how precisely the two criteria yield the list of primary qualities. This view is inspired by Ayers's dictum that "for Locke, 'extended solid substance' gives a sort of nominal essence of matter rather than its real essence." ("Mechanism, Superaddition, and the Proof of God's Existence in Locke's *Essay*", p. 229)

<sup>&</sup>lt;sup>42</sup> Locke's Metaphysics, pp.49-50.

that some clusters of qualities are stably co-instantiated by a number of individuals. From this the mind furnishes an abstract idea of a kind: by way of abstraction it yields the complex idea of 'something that is solid, and extended, whose parts are separable and movable in different ways' (2.13.11). This is the idea we come to associate with 'body'.

This account of our concept-formation makes it a conceptual truth that body is extended, solid and movable. The role of clause [4] is just to confirm this result. It tells us that we cannot conceive of body without these qualities. Thus, to wrap up, we conceive of certain qualities as inseparable from body, as clause [1] says. This is just a conceptual point: we associate certain complex idea with the word 'body'. This association is the result of a process of abstraction from the deliverances of the senses (partly expressed in clause [3]). Clause [4] assures us of the contents of the abstract idea of body via conceptual test: we try to conceive a body without some qualities represented in our complex idea of body and we find out that we cannot.

Finally, a different line of interpretation is that of Robert Wilson's.<sup>43</sup> His motivation is to develop an interpretation of this passage which is, for him, more in line with Locke's empiricism. Somewhat like Stuart, Wilson thinks that the four clauses bear justificatory relations among themselves. But according to his interpretation, clauses [3] and [4] justify the idea that some qualities are inseparable from bodies. This is because [3] and [4] together constitute a two-step rule to determine which qualities are inseparable from a body. Moreover, on this view, clause [4] itself depends on clause [3], thereby making [3], the empirical claim that some qualities are constantly observed in bodies, bear the justificatory weight behind Locke's conception of primary qualities.

<sup>&</sup>lt;sup>43</sup> See "Locke's Primary Qualities", pp.207-9. For interpretations similar to Wilson's, see the papers by Arnold Davidson and Norbert Hornstein, "The Primary/Secondary Quality Distinction", and Margaret Atherton, "Ideas in the Mind, Qualities in Bodies': Some Distinctive Features of Locke's Account of Primary and Secondary Qualities".

Wilson develops his interpretation in two ways. The basic version of it takes clauses [1] and [2] to claim that some qualities (i.e. primary qualities) belong to all bodies whatsoever, from which it follows that all observable bodies have these qualities, explaining thereby why sense finds these qualities in every observable portion of matter [3]. Clause [4] follows from clause [3] via a "transdictive inference"<sup>44</sup>, an inference rule that allows us to say that whatever qualities are universal among observable bodies are also qualities that all insensible bodies have and, therefore, qualities that all matter has. Thus, the empirical claim in clause [3] not only justifies the claim of clause [4] but also the claims made in clauses [1] and [2].

The second, "radical", version of Wilson's interpretation takes clauses [1] and [2] to make claims only about sensible bodies, namely, that some qualities are inseparable from observable bodies and that these qualities are always present in them. From these claims [3] follows, the universal observability of these qualities in observable bodies. Then, according to this interpretation, Locke proceeds from affirming [1], [2] and [3] to *postulate*, via transdistive inference, that these qualities are also manifested by insensible particles of matter [4].

Now, Stuart has put forward various reasons to reject Wilson's interpretation(s). It seems to me that the most important of them is that Wilson motivates his account on the basis of a false dichotomy:

Wilson invites us to choose between seeing [1] as making a conceptual point about the contents of our idea of body, and seeing [3] as making an empirical claim that plays a role in justifying our beliefs about which qualities are primary qualities.<sup>45</sup>

<sup>&</sup>lt;sup>44</sup> The term comes from Newton. See Wilson, "Locke's Primary Qualities", p.208.

<sup>&</sup>lt;sup>45</sup> Locke's Metaphysics, p.48

But, as Stuart's own interpretation shows, we can do both. Moreover, he points out that, if clause [1] is making a conceptual point about body, it is just the somewhat vacuous point that there are some qualities that are inseparable from bodies. This is just a fact about the form of our concept of body. But then [3] can play the role of explaining which contents our concept does have: it has the contents it has due to sensory experience. An account like this is perfectly coherent. And I agree with this. Yet I am not myself convinced that clause [1] should be read as expressing a conceptual claim. Instead, I agree with Wilson's observation that the expressions "utterly inseparable" and "constantly keeps" in clauses [1] and [2] suggest that Locke is making a pair of *metaphysical* claims about the relation between bodies and their qualities.<sup>46</sup> I am thus not entirely convinced by the conceptual interpretation either.

# 2.3. The first sentence of *Essay* 2.8.9

Let me now spell out my interpretation of this passage. The conjunctions of the first sentence of 2.8.9 force us to say that the mind has ideas of qualities which are inseparable from bodies, as [1] says, and (consequently) they constantly keep whatever changes they undergo, as [2] says. Moreover, they force us to say that these ideas are provided by the senses, as [3] says. And the mind somehow attributes these qualities (represented by those ideas) to insensible bodies, as [4] says.

<sup>&</sup>lt;sup>46</sup> "Locke's Primary Qualities", p.206. I should add that Downing also takes clauses [1] and [2] to express a metaphysical characterization of primary qualities that is congruent with her interpretation according to which primary qualities are, for Locke, the intrinsic, irreducible qualities of bodies. ("The Status of Mechanism", p. 397) Moreover, in singling out the corpuscularian conception of body as uniquely intelligible, clauses [3] and [4] provide us with an idea of *what it would be like* to have knowledge of the nature of body. Of course, Locke is agnostic about that possibility. But according to Downing, the status of corpuscularian mechanism in Locke's *Essay* is that of providing only an illustration of metaphysical concepts like primary qualities. This interpretation is close to mine.

Now, since I take [1] and [2] to be metaphysical claims about bodies, does what I just have said mean that Locke is dogmatic about Boylean corpuscularianism? Does it mean that Boyle's primary qualities are the essential qualities of body and that the senses provide us access to it? Not necessarily. There are two kinds of attributes which are "inseparable" from a substance. On the one hand, the genus and species of the substance's species, which define its essence as a member of that kind; on the other, its *properties*, that is, those attributes that follow or "flow" from the essence of the species of that substance.

Indeed, scholastic philosophers distinguished between the essential features of a substance (as a member of a certain species) from its properties and its accidents. The essential features of a substance as the member of a certain kind were the genus and specific differentia of its species. This is captured by a real definition, for the real definition of a species expresses its essence or nature by identifying its genus and difference. Thus, 'the rational animal' was thought to capture the essence of the human species --and of Socrates as a member of the kind *humanity*. In contrast, a nominal definition succeeds at identifying the substance's species but fails to pick up the species's essential attributes. Instead, a nominal definition characterizes a species in terms of some of its *properties*, that is, in terms of those attributes that bear a natural, necessary or intelligible relation to the species essence without being its genus and difference. We would obtain a nominal definition if we appealed to *risibility* instead of *rationality* in defining the kind *human being*. For although every human and only humans have the capacity to laugh, it was thought that their rationality explained this fact. *Accidents*, on the other hand, were contrasted with properties; for they are not only non-

can be borne temporarily or permanently by the individuals of the species, do not flow naturally from the species's essence.<sup>47</sup>

It is thus consistent with Locke's claims that the primary qualities of bodies may not define the essence of body, but only characterize it in terms of its properties. Thus, it may be that Locke is only offering a nominal definition of *body* by defining it by its primary qualities. And this is, of course, in accordance and not in conflict with the following often-quoted passage:

The Ideas, that our complex ones of Substances are made up of, and about which our Knowledge, concerning Substances, is most employ'd, are those of their secondary Qualities; which depending all(as has been shewn) upon the primary Qualities of their minute and insensible parts; or *if not upon them, upon something yet more remote from our Comprehension*, 'tis impossible we should know, which have a necessary union or inconsistency one with another. (*Essay* 4.3.11, my emphasis)

It is of course consistent with Locke's definition of primary qualities as inseparable from bodies and with his further commitment that these qualities are experienced by us that they might depend upon something else. For if they are *properties* rather than essential attributes, Locke's definition, although may fail to pick up the essential qualities of bodies, may nonetheless pick up something inseparable and, why not, perspicuous to the senses.

<sup>&</sup>lt;sup>47</sup> Thus, accidents have no place within the Aristotelian conception of a complete science, for such science consists of the exhaustive taxonomy of the natural species, identified by their real definitions and from which all their properties have been derived. The above explanation is a rough summary of the Aristotelian Doctrine of Predicables. Locke scholars have widely recognized the importance and influence of this doctrine in Locke's philosophy of science and in his thought about the relation between a substance, its essence and its different kinds of attributes. See Ayers's "Mechanism, Superaddition and the Proof of God's Existence", esp. pp. 222-31; see also his *Locke*, vol.2, pp. 18-30 and pp. 142-53. See also the section on the historical roots of Locke's notion of *scientia* (and its bibliographical references) in Hylarie Kochiras's "Locke's Philosophy of Science".

## 2.4. The argument of Essay 2.8.9

Let us see now how Locke identifies a particular set of qualities as the qualities he calls "primary". Implicit in his argument, as we shall see, is a certain understanding or conception of the process of division and what it amounts to. After introducing the so much contested sentence discussed above, Locke continues 2.8.9 thus:

Take a grain of Wheat, divide it into two parts, each part has still *Solidity*, *Extension*, *Figure*, and *Mobility*; divide it again, and it retains still the same qualities; and so divide it on, till the parts become insensible, they must retain still each of them all those qualities. For division (which is all that a Mill, or Pestel, or any other Body, does upon another, in reducing it to insensible parts) can never take away either Solidity, Extension, Figure, or Mobility from any Body, but only makes two, or more distinct separate masses of Matter, of that which was but one before, all which distinct masses, reckon'd as so many distinct Bodies, after division make a certain Number. These I call *original* or *primary Qualities* of Body, which I think we may observe to produce simple Ideas in us, viz. Solidity, Extension, Figure, Motion, or Rest, and Number.

My reading of this passage parallels the arguments developed in 1.5. The target is to identify qualities that are inseparable and sensorily perspicuous. In some sense, the goal is to find the "marks" of the kind *body* (not, strictly speaking, its defining features). Certainly, if one picks up some *properties* of bodies, one can conclude that the loss of such attributes entails the loss of the essence. It thus makes sense to think about a process in which something may stop being a body and becomes something else. Locke is sensitive to this: he says that when we think of the division of matter 'into as minute parts' as we wish, 'we are apt to imagine a sort of spiritualizing, or making a thinking thing of it' (*Essay* 4.10.10). Processes of this kind were thought of, as we saw, as cases of substantial change by the Aristotelians. And it was also thought that division is a process which can bring about such a state of affairs.

It is my view that Locke is here thinking along these lines. The first sentence of the above passage says that if the parts of the grain of wheat become insensible after repeated division, 'they *must* retain still' solidity, extension, figure and mobility. The second sentence expresses this thought somehow differently: it tells us that division 'can never take away' the aforementioned qualities. We have talked above about how Locke's endorsement of the doctrine of the homogeneity of matter entitles him to talk this way: this doctrine entails that difference of size never amounts to difference in nature. Thus, if Locke characterizes the nature of bodies of *some* size in some way, he is entitled to characterize the nature of portions of matter of whatever size in the same way. The third, and final sentence, provides us with a final list of qualities. Thus, Locke's reasoning can be stated as follows:

There is no observable substantial change in bodies with respect to their extension, solidity and mobility when they are divided; that is, so far as we can see, division does not bring about the loss of such qualities. Given that matter is uniform or homogeneous (clauses [1] and [2]) and that at least some of its *properties* are perspicuous to sense (clause 3) we are entitled to assume that no such change or loss will happen once division makes the parts of body go below the threshold of observability (clause 4).

"This argument shows that there may be secondary qualities, but not that the line between primary and secondary qualities is to be drawn just where Locke draws it," Mackie would say.<sup>48</sup> I agree. Locke defines secondary qualities as "nothing in the Objects themselves, but Powers to produce various Sensations in us by their primary Qualities... of their insensible parts." (*Essay* 2.8.10) My interpretation does not, by itself, allow Locke to draw the line between primary qualities and secondary qualities where he does. I suspect that the whole of Bk.2 Ch.8 should be read as a single

<sup>&</sup>lt;sup>48</sup> Problems from Locke, p.22

argument. Once Locke identifies *solidity*, *extension* and *mobility* as the primary qualities of bodies, he may try to show that the reduction of the other qualities of bodies to the primary ones is plausible, as he seems to do in 2.8.12-13, 19.

Before closing this section, however, I would like to bring back into our discussion a passage that perhaps should be read in tandem with Bk.2 Ch.8:

Had we Senses acute enough to discern the minute particles of Bodies, and the real Constitution on which their sensible Qualities depend, I doubt not but they would produce quite different Ideas in us; and that which is now the yellow Colour of Gold, would then disappear, and instead of it we should see an admirable Texture of parts of a certain Size and Figure... Thus Sand, or pounded Glass, which is opaque, and white to the naked Eye, is pellucid in a Microscope; and a Hair seen this way, loses its former Colour, and is in a great measure pellucid, with a mixture of some bright sparkling Colours, such as appear from the refraction of Diamonds, and other pellucid Bodies.(*Essay* 2.23.11)

The "Man with microscopical eyes" passages (*Essay* 2.23.11-13) may allow us to see that, for instance, Locke does not take *pellucidity* to be a color. Thus, only bodies of a certain size have colors, as microscopes show, according to Locke. The doctrine of the uniformity of matter prevents us from taking color to be a mark of *body*.

It is, of course, natural that both passages mutually illuminate each other, for, as we have discussed above, they both present just two sides of the same coin.

#### 2.5. Summary

In this chapter, I have shown that Locke's conception of qualities as powers to cause ideas is consistent with his attribution of qualities to insensible bodies (section 2.1). Not only that, I have shown that it would be inconsistent with his commitment to the doctrine of the uniformity of matter to deny powers to small particles of matter if he acknowledges them in observable portions of matter. Section 2.2. provided a brief overview of some interpretations of *Essay* 2.8.9. Section 2.3. presented my interpretation of the first sentence of that passage, according to which primary qualities should be taken as Aristotelian properties of matter, and the list of primary qualities as merely a nominal definition of body. 2.8.9, according to which Locke thinks of division as the scholastics did: as a process that can bring about substantial change. This consideration, together with the doctrine of the homogeneity of matter, allowed us to see how Locke's argument works. Since there is no observable loss or gain of the primary qualities thought division, and since matter is homogeneous, then we are entitled to attribute these qualities to insensible particles of matter.

#### Chapter 3:

# Locke on Solidity, Cohesion and Atomism

Let me briefly outline in this final chapter how I would like to account for other aspects of Locke's philosophy of body in light of the ideas already developed.

# 3.3. The internal consistency of the *Essay* texts on *solidity*

Definitionally, solidity is an all-or-nothing property, it is universal and it entails impenetrability. However, Locke's examples, which mostly come from our tactile interactions with ordinary bodies, suggest that not all bodies are equally solid or impenetrable.

For instance, take Locke's famous "Florentine experiment". The experiment consists of a globe of gold being filled with water and then compressed with such force that "the water made it self way through the pores of that very close metal, and finding no room for a nearer approach of its Particles within, got to the outside, where it rose like a dew and so fell in drops" (*Essay* 2.4.4). Locke takes this to illustrate "the solidity of so soft a body as Water" (*Essay* 2.4.4.) But in *Essay* 2.4.1 Locke says that impenetrability, if not the same quality as solidity, may be at least a consequence of it. But the Florentine experiment seems to contradict this, for it seems to be a case of one body *passing through* another.

Another example: Locke says that solidity amounts to a "resistance, whereby [the body] keeps other Bodies out of the space which it possesses", which "is so great, That no force, how great soever, can surmount it" (2.4.3). But his examples fall short of being cases of unsurmountable resistance. For instance, to illustrate the solidity of air and to differentiate solidity from hardness, Locke appeals to the resistance one finds in a football when one puts it between one's hands and presses against it (*Essay* 2.4.6). Yet the resistance that we experience when we press the football between our hands doesn't seem to be unsurmountable; the ball seems somewhat compressible.

# 3.2. Some interpretations and solutions

To account for this some interpreters have drawn some distinctions. Alexander, for instance, distinguishes between absolute solidity and relative solidity and ascribes the first to individual corpuscles and the second to complex, observable bodies.<sup>49</sup> Alexander holds that absolute solidity is a theoretical extrapolation from our experience of bodies which whe daily handle, which are always hard or penetrable to some degree, but specially from those bodies which are specially hard. More recently, Robert Wilson has also drawn a similar distinction. He distinguishes between experimental solidity and absolute solidity. The first amounts to relative incompressibility; the second involves the complete repletion of the space within a body's boundaries or surface. According to Wilson, the sense of touch conveys the idea of experiential solidity, whereas the idea of absolute solidity is an abstraction.<sup>50</sup> Woolhouse has also denied that ordinary bodies are, strictly speaking, solid. Solidity involves repletion (*Essay* 2.4.4) and continuity (2.4.5), yet sensible bodies ("masses of sensible bulk") are not replete and continuous, as the golden globe in the Florentine experiment illustrates. Woolhouse attributes solidity only to particles of matter or corpuscles and hardness or softness only to complex bodies.<sup>51</sup>

<sup>&</sup>lt;sup>49</sup> *Ideas, Qualities and Corpuscles: Locke and Boyle on the External World*, pp.139-40; "Locke on Solidity and Incompressibility", p.145; "Solidity and Elasticity in the Seventeenth Century". <sup>50</sup> "Locke's Primary Qualities", pp.2017-18

<sup>&</sup>lt;sup>51</sup> "Locke and the Nature of Matter". p.146

Let us observe, however, that Locke says that "the Mind, having once got [the idea of solidity] from... grosser sensible Bodies, traces it farther; and considers it, as well as Figure, in the minutest Particle of Matter, that can exist." (*Essay* 2.4.1) This is just another instance of the form of reasoning we encountered above. His commitment to the doctrine of the uniformity of matter allows Locke to attribute a certain quality to insensible bodies if he attributes them to sensible ones. But what if solidity is like the gray color? That would allow Locke to attribute the darkest of the shades of gray to insensible bodies without thereby violating the doctrine of the uniformity of matter. However, Locke denies that "an Adamant [is] one jot more solid than Water"(*Essay* 2.4.4). This implies that solidity is an absolute quality, in explicit opposition to Alexander and Wilson's accounts.

#### 3.3. Solidity and quantitative parts

Stuart, following Jacovides<sup>52</sup>, attributes to Locke a conception of bodies according to which no empty space is a part of a body. It is because other accounts may be thinking of the vacua inside the boundaries of a body as parts of it that they see tensions in Locke's claims about solidity and his illustrations of the concept. For instance, only if one thinks of the pores in the golden globe as parts of it one may think of the Florentine experiment as a case of penetration. For, as Stuart says, if empty spaces circumscribed by a body's matter were parts of it, then if another body could come to be co-located with one of those spaces, it would be possible for a part of a body to be co-located with a part of another.<sup>53</sup>

A similar story can be told about compressibility. If one thinks about the void spaces circumscribed within a body's matter as parts of that body, then one can say that a body may become denser by

<sup>&</sup>lt;sup>52</sup> "Lockean Fluids", p. 224

<sup>&</sup>lt;sup>53</sup> Locke's Metaphysics, p.60

coming to occupy a smaller region of space. On the other hand, if vacua do not belong to bodies as parts, then bodies can't become more dense because there can't be a reduction of unoccupied space within their boundaries. The parts of a body may be brought closer together but in this way the body does not come to occupy less space, since any space it occupies is already full.

Our interpretation can accommodate the virtues of this explanation. Let us observe that it follows immediately from our understanding of quantitative parts of a body as bodies themselves that no empty space could be a (quantitative) part of a body. Moreover, it would be strange to think of a body as composed of both matter and empty, unsolid space within the Lockean framework: Locke emphasizes that what differentiates body from empty space is solidity (Essay 2.13.11-13). It thus looks difficult to think that Locke may have thought about bodies as encompassing both full and empty space.

#### 3.4. Cohesion and Atomism

Locke is careful with his language. About solidity he says that "the Mind... considers it... in the minutest Particle of Matter, that *can* exist." (*Essay* 2.4.1, my emphasis) About cohesion, however, he tells us that to explain it amounts to telling us "wherein consisted the union, or consolidation of the parts of those Bonds or that Cement, or of the least Particle of Matter that *exists*." (*Essay* 2.23.26, my emphasis)

Certainly, this difference of language can be accounted from the fact that Locke, as well as Descartes, holds that "every extended thing involves *actual* extended parts"; which is "not to say that the parts are, in fact, ever separated but just that this is possible in principle."<sup>54</sup> For Locke,

<sup>&</sup>lt;sup>54</sup> Martha B. Bolton, "Modes and Composite Material Things," p.80 (my emphasis).

indeed, posits atoms, which are bodies with naturally inseparable parts. As Bolton says, Locke does not explicitly say that these parts are substances, but he does recognize each atom as a numerically distinct "simple substance."<sup>55</sup> (*Essay* 2.27.3)

This may lead us to think that the form of Locke's atomism is different from that of taking atoms to be clusters of naturally inseparable material parts.<sup>56</sup> Insead, Locke may think of atoms as "simples", that is, as *partless*.

As a first observation let us notice that Locke acknowledged the infinite divisibility of matter:

Since in any bulk of matter, our thoughts can never arrive at the utmost divisibility, therefore there is an apparent infinity to us. . . in that. (Essay 2.17.12)

Certainly, it does not follow from the fact that something is infinitely *divisible* that it is, in fact, infinitely *divided*. And although Locke may have thought that, in fact, a body is made up of infinitely many parts, because, for the corpuscurlarians, every part of a body must be as real as the whole they compose,<sup>57</sup> he declared that the topic of infinite division is something we are 'at a loss about' *(Essay* 4.17.10).<sup>58</sup>

But suppose atoms are partless simples. How could this be? How is natural inseparability to account for simplicity? Perhaps atoms have some sort of quality which other bodies do not have --or perhaps do not have to the same degree. The first option is inconsistent with Locke's commitment to the uniformity of matter. If one takes the second option, one may appeal to *absolute* hardness or

<sup>&</sup>lt;sup>55</sup> Martha B. Bolton, "Modes and Composite Material Things," p.81.

<sup>&</sup>lt;sup>56</sup> How to understand the matter that composes or makes up an atom? As the bricks that make up a house or as the bronze that makes up a statue?

<sup>&</sup>lt;sup>57</sup> See Pasnau, *Metaphysical Themes*, pp.619-622.

<sup>&</sup>lt;sup>58</sup> See also *Essay* 2.29.17 and 2.23.31.

solidity (which ordinary bodies may have only to some extent). For reasons we have already explored, this option is not available either.

A more direct argument is the following: partless atoms would not only make atoms unsolid, for solidity is what accounts for the separability of the parts of a body (*Essay* 2.4.5), but also *unextended*, for, according to Locke, to be extended is to have "partes extra partes" (*Essay* 2.13.15). This is unacceptable as an interpretation of Locke, not only because of the inconsistency with the uniformity of matter I ascribe to him.

Thus, Locke's atoms should be taken as bodies with naturally inseparable parts. But how to account for their unity? This is Locke's problem of cohesion, developed in *Essay* 23-27.

Roughly, Locke's problem of cohesion is the problem of explaining the natural unity of some bodies only in terms of their quantitative parts, i.e., only in terms of other bodies. It is a foundational problem for corpuscularian mechanism, for Locke shows that no solution can be provided if one assumes that bodies are extended, solid things and the only account of what is *natural* is one that appeals to contact-motion and not to qualities like attractive forces. To explain the cohesion of some bodies one might appeal to the form of the parts that make it up (they may be hook-and-eye shaped) or to the pressure outside bodies exert on the body from without or to any other mechanism. But insofar as any explanation of a body appeals to other bodies it assumes the cohesion of the bodies that play the explanatory role and, thus, an infinite explanatory regress is generated.

But even if the unity of every complex body is extrinsic, that is, is explained as the effect of the operations of other bodies on it, Locke has the special task of explaining the unity or cohesion of atoms, which are thought of as *substances*, i.e., as things whose unity not only is *natural* but also

*intrinsic.* But this seems to be hopeless as well, for Locke conceives of atoms as discrete quantities of matter and, as we saw in section 1.4, the unity of quantities is neither natural nor intrinsic.<sup>59</sup>

But what could be Locke's motivation for committing to atomism? As Pasnau remarks, it is interesting to see atomism as the doctrine of potential parts reborn.<sup>60</sup> Both theses could be seen as motivated by the thought that although a body is infinitely divisible, it has only finitely many *actual* parts. Thus, at least in this sense, atomism manages to capture the commonsensical belief that bodies do have parts but not infinitely many. But how could corpuscularianism tell us where division stops? Having body as intrinsically extended and having no resources like forms (which are, as we have seen, qualitative parts) made things much more difficult. Locke, I think, was sensitive to this.<sup>61</sup>

#### 3.5. Summary

Section 3.1. introduced the problem of the internal consistency of the Essay texts on solidity: Locke introduces solidity as an absolute quality, but his illustrations suggest that it comes in degrees. Section 3.2. was a brief overview of the position of some interpreters that distinguish between absolute solidity, which is possessed only by atoms, and relative solidity, possessed by ordinary objects. It was shown that such distinction has no textual basis. Section 3.3. was an exposition of the Stuart-Jacovides account of solidity, which explains away the tensions between Locke's definition of solidity and his examples. It was argued that this interpretation follows like a corollary from our understanding that every (quantitative) part of a body is itself a body. Section 3.4.

<sup>&</sup>lt;sup>59</sup> This thought was inspired by Ayer's chapter on Locke on masses of matter in his Locke, vol.2.

<sup>&</sup>lt;sup>60</sup> Metaphysical Themes, pp.619-622.

<sup>&</sup>lt;sup>61</sup> For good discussions of the problem of cohesion, see Hill's "Locke's Problem of Cohesion and its Philosophical Significance" and Woolhouse's "Locke and the Nature of Matter".

introduced the problem of cohesion via a discussion of the forms Locke's atomism could take. It was argued that Locke should take atoms to be clusters of naturally inseparable material parts and that the problem of cohesion, ultimately, showed that no account is available in the corpuscularian framework for the *naturalness* of such unity. Moreover, it was suggested that no such account can be provided, given that Locke thinks of atoms both as quantities of matter, whose unity is extrinsic, and as substances, whose unity is intrinsic.

# **Concluding Remarks**

Chapter 2 began with a defense of the Lockean notion of qualities as powers. This made salient Locke's commitment to the corpuscularian doctrine of the uniformity of matter. Later, we saw this commitment at play in his account of primary qualities. I argued that Aristotelian ways of thinking were also at play in this account; in particular, the use of the process of division to single out some qualities as primary. I also defended the idea that the primary qualities were taken by locke only as "marks" of the kind *body*. In other words, I argued that Locke's list of primary qualities provides only a *nominal* definition of the substance body, not its essential or real definition.

In Chapter 3 I addressed the topics of solidity and, in particular, those of cohesion and atomism. I wish I could have elaborated more on solidity, especially in relation with Descartes. Descartes thought that impenetrability was a property of body, in the Aristotelian sense.<sup>62</sup> I have argued that Locke as well. Locke's arguments for the conclusion that impenetrability is different and not derivable from extension (Essay 2.13.11-13) should be taken then not as arguments that seek to prove that the essential qualities of body are extension *and* solidity. Instead, given Locke's agnosticism about the nature of body, Locke is prepared not only to take impenetrability as an Aristotelian property of body (as Descartes affirms) but extension as well (as Descartes would firmly deny).

<sup>&</sup>lt;sup>62</sup> See Descartes to More (CSMK, p. 3610). This is quoted by Downing in her "Are Body and Extension the Same Thing? Locke versus Descartes (versus More)", p.66. See Downing's paper, esp. pp. 66-72 for an exposition and a survey of different evaluations of Descartes' argument for taking impenetrability to be a *property* of body. Downing's paper also provides a good discussion of Locke's disagreement with Descartes about the identification of the nature of body with extension or, as he calls it, *space*. Bolton's "Locke on Space and Substance" provides a good account of the evolution of Locke's thought about space. For similarities between Locke and Descartes, on the other hand, see the discussion of their accounts of *hardness* in Hill's "The Cartesian element in Locke's anti-Cartesian conception of Body".

In relation to cohesion and atomism, I showed how the doctrine of the uniformity of matter shapes Locke's particular conception of atoms. I wish I could have made the links between atomism and the scholastic doctrine of potential parts clearer. This would have required me to be more precise about what such doctrine amounts to. In turn, this would have provided a clearer background against which we could have discussed cohesion more clearly; for I believe that the concepts of discrete and continuous quantity and the problem of infinite divisibility are pivotal for the understanding of that problem.

Two final observations: I distinguished in the Introduction between a particular material substance or body and the stuff or the general substance out of which it is made. But in my discussion of primary qualities it is not clear whether I am talking about the qualities of particular substances or about the general substance matter. Moreover, talk of primary qualities is related to and invites talk of internal constitutions, which I have said constitute the individual nature of a particular material substance for Locke. Yet I have talked of the list of primary qualities as somehow summarized by *extension, solidity* and *mobility*. But these are the qualities Locke uses to talk about the general substance matter (cf. Essay 2.23.23-27) and nowhere he implies that the list of primary qualities is reducible to these three attributes. Moreover, it would be incorrect to take the list of primary qualities as somehow describing the nature of the general substance, for primary qualities sometimes include 'motion' and, for Locke, matter as such is essentially passive and its essence is different from its operation, that is, motion.

I reply that, first, although a body's internal constitution consists of the primary qualities of its solid parts, talk here of primary qualities is more specific and less general than the talk I used in Chapter 2. For it is the *determinate* primary qualities of a body's solid parts which make up its internal constitution. However, we can talk about the primary qualities of a body *as such* by talking about the *determinables* extension, solidity.. and so on. This allowed me to say that primary qualities are the properties of matter as such. Secondly, although I recognize that Locke does not imply anywhere that the lists of primary qualities are reducible to the three mentioned attributes, I do not think that this point should weigh a lot: Locke may have neglected precision for the sake of brevity. Finally, I do not talk about motion but instead of *mobility* as one of the properties of the general nature of material things. This certainly raises a question: if matter as such includes a disposition among its natural properties, then maybe the nature of matter is not thoroughly *actual*, as I have said.

Finally, I have appealed to the Aristotelian Doctrine of Predicables to defend the idea that primary qualities are, for Locke, *properties* rather than essential attributes of matter. But Locke's agnosticism about the essence of matter may be more radical. Let us read this passage:

The infinite wise Contriver of us, and all things about us, hath fitted our Senses, Faculties, and Organs, to the conveniences of Life, and the Business we have to do here. We are able, by our Senses, to know, and distinguish things; and to examine them so far, as to apply them to our Uses, and several ways to accommodate the Exigences of this Life... Such a Knowledge as this, which is suited to our present Condition, we want not Faculties to attain. But it appears not, that God intended,we should have a perfect, clear, and adequate Knowledge of them:that perhaps is not in the Comprehension of any finite Being. (*Essay* 2.23.11)

A casual reader may think that Locke is here suggesting that the knowledge we can attain of the natural world may be confined to adaptive knowledge. From there it is thus possible to think that the only attributes of matter we may have access through our faculties may be only *accidents*, that is, attributes that matter bears only contingently and that bear no necessary connection to its nature. However,

..[W]ere our Senses alter'd, and made much quicker and acuter, the appearance and outward Scheme of things would have quite another Face to us; and I am apt to think, would be inconsistent with our Being, or at least well-being in this part of the Universe, which we inhabit. The words 'much quicker and acuter' suggest that our knowledge of nature may not be different in kind but only in degree from the knowledge higher beings have. But this question has yet to be settled.

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