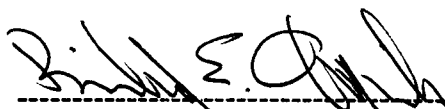
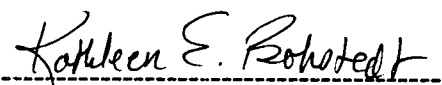
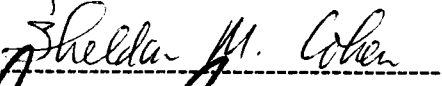
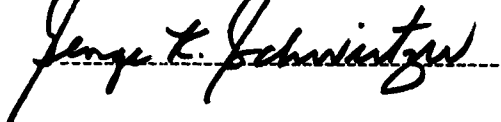


To the Graduate Council:

I am submitting herewith a dissertation written by Mashhad S. AL-Allaf entitled "Substance, Power, and The Mystery of Cohesion In Locke's Philosophy of Science and Nature." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Philosophy.


Richard Aquila, Major Professor

We have read this dissertation and
recommend its acceptance:

Accepted for the Council:


Associate Vice Chancellor
and Dean of The Graduate School

Substance, Power,
&
The Mystery of Cohesion
In Locke's Philosophy of Science and Nature

A Dissertation
Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

Mashhad S. AL-Allaf

May, 1995

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DEDICATION

This dissertation is dedicated to Professor Richard Aquila. Without his help this dissertation would not be what it is. His intelligence and insight have played a major role in forming the philosophical questions throughout this dissertation. In addition, his example of generosity and high standards has been an inspiration. To understand and appreciate him is to call to mind what Aristotle said about "The magnanimous man."*

Dedication of this dissertation to my parents also appears on the next page in Arabic.

*Aristotle: *Nicomachean Ethics* (1123b-5a).

إهداء

* إلى أبي الفاضل ..

سَيِّدِي دَوْلَتُكَ اللَّهُمَّ بَيْنَ الْعَالَمِينَ

* وإلى أبي الغالية ..

اعترافاً بفضلها عليّ .. دعاء لهما بالرحمة :

رَبِّ الْعَالَمِينَ يَا بَنِي صَفِيٍّ

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ABSTRACT

Locke's account of the problem of cohesion reflects a serious difficulty in his philosophy. What makes it more problematic is the way in which Locke himself relates it with the problem of substance (something about which "we know not what") in his search for something that not only underlies all properties in the traditional Aristotelian sense, but also holds the constituents of matter together. His account of substance was neither a sincere nor ironic way of reporting our ordinary talk about substance. Instead, Locke was looking for something that really holds qualities and particles together. In this respect, it is generally assumed that Locke had in mind a metaphysical entity that underlies qualities. I argue, however, that Locke's concern was different. He was more inclined to think that something like a cohesive power is what functions as the "cement" or the "bond" that ties and holds together, not only the qualities of a substance, but its individual corpuscles, and also on a deeper level even the parts of one single corpuscle. The latter question is generally ignored by commentators, but Locke clearly talks about the divisibility of matter *ad infinitum* and raises the question what makes even a quality such as material extension

possible in the first place, given that divisibility, Locke grants, however, that we have no real understanding of the cohesive power that must be in question.

To clarify the issue of cohesion we have first to clarify Locke's talk about qualities in general and power in particular (Chapter One). Chapter Two is an attempt to understand Locke's account of substance in its relation to the concepts of real essence and cohesion. Chapter Three deals with the problem of cohesion in more detail, including some related issues considered by Locke and some commentators, such as solidity and hardness. The Epilogue explain to a certain extent why cohesion cannot be explained in Locke's philosophy in terms of an act of divine superaddition.

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Chapter One

Qualities, Powers, and Relations

what a darkness we are involved in, how little 'tis of Being, and the things that are, that we are capable to know. And therefore we shall do no injury to our knowledge when we modestly think with our selves, that we are so far from being able to comprehend the whole nature of the Universe, and all the things contained in it, that we are not capable of a philosophical *Knowledge* of the Bodies that are about us, and make a part of us: Concerning their secondary Qualities, Powers, and Operations, we can have no universal certainty.

(IV.III.29)¹

¹I refer to Locke's *An Essay Concerning Human Understanding*, edited with an introduction by Peter H. Nidditch, published by Clarendon Press, Oxford, 1988. I will refer to this edition throughout the dissertation unless otherwise indicated.

1. Three Levels of Locke's Agnosticism.

Locke's talk of qualities of bodies and his agnosticism in their regard is sometimes understood as if it is concerned only with the observable qualities of bodies and the qualities of an unobservable corpuscle or particle. In fact Locke's agnosticism might be extended even further: beyond the level even of an unobservable corpuscle. Locke raised a problem of the latter sort, when he emphasized that one corpuscle is made of infinitely many parts², and when he emphasized the problem of the cohesion of these parts. This forces us to a deeper level, asking what makes a corpuscle possible in the first place. There are thus three levels that Locke himself emphasized:

²There are passages in the *Essay* where Locke talked about these parts of a corpuscle such as in Book II, Chapter XXIII, Section 23, when he considered critically the theories of cohesion: "concerning the cohesion of the parts of the Corpuscles of the Aether it self: which we can neither conceive without parts, they being Bodies, and divisible; nor yet how their parts cohere, they wanting that cause of cohesion, which is given of the cohesion of the parts of all other Bodies." Also in the same section Locke said: "if the pressure of the Aether, or any subtiler Matter than the Air, may unite, and hold fast together the parts of a Particle of Air, as well as other Bodies; yet it cannot make Bonds for it self, and hold together the parts, that make up every the least corpuscle of that *materia subtilis*."

1. The level of observable bodies.
2. The level of unobservable corpuscles.
3. The level of the parts of one corpuscle; what it is that makes a corpuscle possible in the first place.

The third level is generally ignored by Locke's reader, whereas Locke himself makes it explicit that it is a problem of fundamental importance.

In the course of this study, I want to bring out the depth of this problem. In order to appreciate it, we shall have to realize the following point. Despite our relative ignorance -- emphasized by Locke himself -- with respect to the second level, we are at least in possession of the appropriate general ideas; we simply lack the ability to apply those ideas in sufficiently particular judgments regarding the objects (corpuscles) in question. Our problem with the third level is more serious: we don't even have the general ideas that would be needed to make progress on this level.

The ideas with which, according to Locke, we are empowered to deal with problems of reality are primarily those of the qualities of things, including their various powers. (I ignore the idea of substance for now; it turns out to be more the name for a problem itself, rather than an idea that can help us fathom any mysteries concerning reality.) We

might find it natural to attempt to deal with the problem of cohesion, on either level two or three, in terms of some underlying natural force or power. But Locke limits his talk about powers to talk about a sub-set of the qualities of objects, thus to the first and second levels. On the third level, we are trying to talk about something more fundamental than objects, including even the most basic corpuscles. (Locke expresses some misgiving in referring to powers as qualities, but we shall see that this concerns another question: whether powers might be viewed as mere relations among objects.) Not only did Locke never say that cohesion is a power; perhaps surprisingly, he does not seem to consider it appropriate to discuss the problem in such terms at all.

As we shall see, cohesion is the most fundamental mystery of the material world for Locke. It is as fundamental and mysterious as the often-discussed problem of "substance" in his philosophy. In fact, while some commentators attempt even to minimize the latter problem, I shall suggest in Chapter Three that the two problems might best be viewed as a single problem for Locke. By appreciating this point, we shall see that Locke's agnosticism³ may go even further than is

³Among modern commentators Michael Ayers emphasized Locke's agnosticism in his paper (1975) and his book (1991). However Ayers did not emphasize the third level of Locke's

recognized in the usual readings of the *Essay*. This is because on the third level, which is usually neglected by commentators, we don't have even the appropriate concepts to deal with the problem there encountered.

2. **Qualities in General.**

In this chapter I am going to discuss qualities and powers on a general level in order to prepare for a better understanding of the problem of cohesion.

In Book II, Chapter VIII, Section 23, Locke said:

The *Qualities* then that are in *Bodies* rightly considered, are of *Three* sorts.

First, The *Bulk*, *Figure*, *Number*, *Situation*, and *Motion or Rest* of their solid Parts; those are in them, whether we perceive them or no; and when they are of that size, that we can discover *primary Qualities*.

Secondly, The *Power* that is in any Body, by Reason of its insensible *primary Qualities*, to operate after a peculiar manner on any of our Senses, and thereby produce in us the different *Ideas* of several Colours,

agnosticism mentioned above.

Sounds, Smells, Tastes, etc. These are usually called sensible Qualities.

Thirdly, The Power that is in any Body, by Reason of the particular constitution of its primary Qualities, to make such a change in the Bulk, Figure, Texture, and Motion of another Body, as to make it operate on our Senses, differently from what it did before. Thus the Sun has a Power to make Wax white, and Fire to make Lead fluid. These are usually called Powers.

Locke's classification of qualities "that are in Bodies" raises problematic issues. Locke scholars and commentators have different points of view on these issues. Before I consider these points of view in detail I would like to emphasize that the distinction of these qualities itself is not originally Lockean.

Such a distinction was made before Locke by Boyle (1627-1691). In fact Democritus (c.470-c.400 B.C), Descartes (1596-1650), and Galileo (1564-1642) even preceded Boyle⁴ in making

⁴Some commentators refer only to Boyle when they discuss the distinction of qualities in bodies; they emphasize the influence of Boyle on Locke, representing the qualities and thus Locke's distinction of them within the corpuscularian

that distinction or something similar. Galileo's fascination with mathematics as the new logic of science and the key to understanding nature suggested to him that the external world is expressed to the mind by mathematical properties:

Whenever I conceive any material or corporeal substance, I immediately feel the need to think of it as bounded, and as having this or that shape; as being large or small in relation to other things, and in some specific place at any given time; as touching or not touching some other body; and as being one in number, or few, or many. From these conditions I cannot separate such a substance by any stretch of the imagination. (Galileo 1957, 274)

Thus, since it is impossible to conceive a body without them, Galileo made the quantitative or measurable properties of bodies the only subject of scientific knowledge. In other

approach. E. M. Curley (1973) is an example of this, also Peter Alexander (1974, p. 60; reprinted in I. C. Tipton [1977], pp. 62-76, and Vere Chappell [1992], p.10). Martha Brandt Bolton disagrees with both of them. She argues that the text does not support the contention that Boyle's was the sole influence on Locke's doctrine of qualities. She, instead, points out some other influence such as that of Pyrrho from ancient philosophy. See her "Locke and Pyrrhonism: The Doctrine of Primary and Secondary Qualities" in *The Skeptical Tradition*, ed. Myles Burnyeat (1983, p.256); reprinted in Chappell (1992).

words, he mathematized matter. Other qualities, which are according to him non-mathematical, have no real existence in the external world:

Many sensations which are supposed to be qualities residing in external objects have no real existence save in us...I think that these tastes, odors, colours etc., on the side of the object in which they seem to exist, are nothing else than mere names, but hold their residence solely in the sensitive body; so that if the animal were removed, every such quality would be abolished and annihilated...If ears, tongues, and noses were removed, shapes and numbers and motions would remain but, not odors or tastes or sounds. (1957, 274)

In this sense not only has the world been divided into two parts, the world of matter and the world of mind, but also matter itself has been divided into two kinds of qualities, and then reduced to only one of them, the quantitative or measurable properties, the other being classed as mental or subjective. We may think that dualism is a Cartesian fault, but in fact it is much more rooted in science itself.

3. Three Approaches to Qualities.

I would like to distinguish three approaches to Locke's distinction of qualities⁵:

(a) The relational approach to secondary qualities: This is the view that Locke's distinction between primary and secondary qualities is a special case of the distinction between qualities and relations, where secondary qualities, being powers and therefore relations, are just for that reason a special kind of quality or rather not real qualities at all. Reginald Jackson represents this view in his article "Locke's Distinction Between Primary and Secondary Qualities" (1929, 62).

By contrast, primary qualities, which are not powers, are intrinsic properties of things which may be the grounds or bases of powers; they are modifications of matter in bodies.

⁵Although I am going to mention only three approaches, in fact Locke's qualities have been a subject of considerable research, some of the articles on this problematic subject for example published early in this century, such as that by John Dewey (1926), and by Jackson (1929). In the middle of this century there is, for example Adams (1948). In 1960-90 the discussion on qualities was enriched by the publications of Alexander (1974, 1977), Ayers (1975), Bennett (1965), Curley (1972), Bolton (1976, 1983), Palmer (1976), and other articles by Keith Campbell (1972), John Campbell (1980), Davidson (1984), Dicker (1977), Joske (1967), Macintosh (1976), Valberg (1980), and Westphal (1984).

Secondary qualities which are powers, cannot be regarded as intrinsic properties of things. The reason why powers cannot be intrinsic properties of a body is because describing them always involves reference to something else. It is simply a terminological matter whether to call them qualities at all. Mackie represents this view in his book *Problems From Locke* (1976, 12). Mackie's position does not seem to be substantially different from that of Jackson. In both cases secondary qualities are regarded purely relationally.

(b) The reductionist approach to secondary qualities: This is the view that secondary qualities are intrinsic properties of things, because they are identifiable with, or reducible to, 'textures' or arrangements or patterns of the insensible corpuscles of objects. Peter Alexander represents this view in his (1974), and in *Ideas, Qualities and Corpuscles: Locke and Boyle on The External World* (1985, 118,161). This may be regarded as the extreme opposite of a purely relational approach.

(c) A third approach: This is the approach that seems to me most reasonable; it considers secondary qualities neither as mere relations (not even as dispositions understood purely relationally), nor as reducible completely to a mere structure or texture. The strongest argument in favor of this approach

is that, whereas there is something relational about power by its very nature, our ideas of powers are always simple ideas for Locke. This approach will not deny the Lockean confession that power includes in it some kind of relation: "I confess power includes in it some kind of relation, (a relation to Action or Change)" (II.XXI.3). But this involvement of some, and only some, kind of relation does not allow us to go as far as Jackson does in interpreting it as mere relation. This is for at least two simple reasons: First, relations, according to Locke, are external, whereas power, in many aspects, is internal (II.XXV.8). Second, our idea of any relation is a complex idea (II.XII.3), and Locke emphasizes that power is a simple idea. We have to deal with these two problems if we are to adopt Jackson's approach. In fact Locke's confession does not allow the relational interpretation, even if it states clearly the involvement of relation. This involvement is no more than partial, to be understood in the light of the word "includes" to whatever extent we can interpret the meaning of inclusion. Locke himself grasped the unavoidable involvement as "inclusion" of relation, of whatever kind, throughout the entire realm of ideas: "as indeed which of our *Ideas*, of what kind soever, when attentively considered, does not" involve relation (II.XXI.3)? I will discuss Locke's

views regarding qualities in connection with the issues raised by these alternatives.

4. Primary Qualities.

Locke called the primary qualities the real or original qualities of bodies: "The First of these, as has been said, I think may be properly called *real Original, or primary Qualities*" (II.VIII.23). By contrast, whatever he means by this, the second and third kinds of qualities, considered by Locke to be powers, are therefore apparently neither real nor original qualities of bodies: "The other two, are only Powers to act differently upon other things, which Powers result from the different Modifications of those primary Qualities" (II.VIII.23).

Maybe this was the reason behind Jackson's idea that Locke's distinction between qualities and powers is not a distinction between two different kinds of real qualities at all. On the other hand, if this is so, why did Locke make not just a two-fold but a three-fold distinction among "qualities?" It might be argued that Locke's acceptance of the corpuscular theory led directly to such a distinction

between primary, secondary, and tertiary qualities.⁶ Consider the following three-fold distinction or model:

1. corpuscles with their intrinsic and non-relational qualities -- thus not including, for example, their ability to cohere with other corpuscles;
2. certain structures formed of many corpuscles, which are both (a) "intrinsic" to a body and yet also (b) identical with certain "powers" possessed by that body;
3. certain relations in which a body thereby comes to stand in relation to things outside itself.

If we adopted this model, we could identify "powers" with "intrinsic qualities" as opposed to relations after all, and yet still distinguish them from primary qualities. But we may note that (3) seems to include both Locke's second and third kind of qualities, inasmuch as his second comprises relations to perceivers, and such relations in turn rest on the powers of bodies to effect other bodies. Also, (2b) requires the "reductionist" approach to powers favored by Alexander. This

⁶This is despite the fact that Boyle himself divided the qualities or properties of bodies into four kinds: 1. "primary qualities," such as heat and cold; 2. "sensible qualities," such as tastes and odours; 3. "secondary or chemical qualities," such as fluidity, firmness, volatility, solubility; 4. "occult qualities," such as electricity and magnetism. See Boyle (1966, IV, 235). Also see Marie Boas (1953, 470).

approach has some problems, I shall return to them later.

As for primary qualities, we might also note the following initially. The first place in the *Essay* where Locke gives a list of primary qualities is in Book II, Chapter VIII, Section 9, when he is defining primary qualities through the example of the grain of wheat; the list is as follows: solidity, extension, figure, and mobility. The same list is repeated in the same section with no change, but by the end of the section Locke's list of primary qualities has changed: solidity, extension, figure, motion or rest, and number. Number is introduced here and "motion or rest" appears instead of "mobility."⁷ This may be a minor change. In Book II, Chapter VIII, Section 10, however, bulk, figure, texture, and motion, are considered as primary qualities relevant to the production of sensations in us. Also bulk, texture, motion, are mentioned in the same section as primary qualities of insensible parts. What we might note here is the addition of texture. This notion is also central to Alexander's approach, to which I shall be returning (section 10).

⁷Someone might think that Locke talked about "mobility" in Book II, then later on he replaced it with "motion or rest", in fact Locke used both of them in the same section, and he uses them interchangeably. In (II.XXI.73) he used "mobility" again.

5. Solidity as Problematic.

Among Locke's primary qualities, solidity may also be singled out for special attention. In Book II, Chapter VIII, Section 22 it is considered as just one primary quality along with others: solidity, extension, figure, number, and motion, or rest. The presentation in Book II, Chapter VIII, Section 23, seems significantly different. There Locke refers to: the bulk, figure, number, situation, and motion, or rest of their solid parts. In Section 22 (and of Section 9) solidity appears as a quality, but in section 23 it seems to appear on a deeper level, namely, as that in which qualities inhere (solid parts). A further issue is also raised by the fact that, as a quality, solidity would seem to be a certain sort of power. But then the presence of solidity in that list would seem to indicate that something we might regard as a "power" is classified by Locke not simply as a "real" and "intrinsic" quality, but indeed as a primary quality. I will discuss solidity further in Chapter Three: Substance and The Mystery of Cohesion.⁸ But initially we can say that Locke's

⁸Locke was never consistent in listing primary qualities throughout the *Essay*. In addition to what was mentioned above, his various lists of primary qualities include these:

In II.VII.14 bulk, figure, texture, and motion of parts.
In II.VIII.15 bulk, figure, and motion of the insensible

search for a deeper metaphysical ground, not only for the primary qualities, but also (and indeed therefore) for the very being of corpuscles themselves, may reflect how Locke considered the corpuscular hypothesis and its limitations. This will be clearest where he raises a question about the cohesion and the solidity even of corpuscles themselves, as

parts. In II.VIII.24 bulk, figure, texture, or motion of some of the insensible parts. In II.VIII.25 bulk, figure, or motion. In II.VIII.26 bulk, figure, extension, number, and motion of their solid parts. In II.XXI.73 Extension, Solidity, Mobility, or the power of being moved. Also bulk, figure, number, texture, and motion of its insensible parts. In II.XXIII.8 "For our senses failing us in the discovery of the bulk, texture, and figure of the minute parts of bodies, on which their real constitutions and differences depend." In II.XXIII.9 the bulk, figure, number, situation, and motion of the parts of bodies, which are really in them, whether we take notice of them or no. In II.XXIII.26 bulk, figure, or motion. In IV.III.13 "That the size, figure, and motion of one body should cause a change in the size, figure, and motion of another body, is not beyond our conception." In IV.III.15 each particular extension, figure, number of parts, motion, excludes all other of each kind. In IV.III.25 "I doubt not but if we could discover the figure, size, texture, and motion of the minute constituent parts of any two bodies." In IV.VI.14 "Before we can have any tolerable knowledge of this kind, we must first know what changes the primary qualities of one body do regularly produce in the primary qualities of another, and how. Secondly, we must know what primary qualities of any body produce certain sensations or ideas in us. This is in truth no less than to know all the effects of matter, under its divers modifications of bulk, figure, cohesion of parts, motion and rest...what sort of figure, bulk, and motion of corpuscles, would produce in us the sensations...and what sort of figure, bulk, and texture of parts,...the precise bulk, figure, texture, and motion of bodies in those minute parts."

well as when he discusses the notion of substance. The fact that solidity does not appear very frequently in his lists of primary qualities (see previous footnote) may suggest that Locke realized the need of "something" more essential to body than mere qualities, even the so-called primary ones. In fact Alexander has argued that for Locke solidity is really not a primary quality at all, so much as it is the very essence of matter or what matter really is. Alexander based his interpretation on passages such as that in III.X.15 when Locke discussed the difference between matter and body:

For *Body* stands for a solid extended figured Substance, whereof *Matter* is but a partial and more confused Conception, it seeming to me to be used for the Substance and Solidity of Body, without taking in its Extension and Figure: And therefore it is that speaking of *Matter*, we speak of it always as one, because in truth, it expressly contains nothing but the *Idea* of a solid Substance, which is every where the same, every where uniform.

Alexander takes this to refer to what he calls "absolute" solidity as the essence of matter: "That is, matter is a solid stuff, common to all bodies, whatever their shapes, sizes, and

other properties, and its solidity is absolute" (Alexander 1985, 132). Two things are worth mentioning here. First, Alexander's interpretation goes beyond the claim that solidity is "essential" to body, to claim that it is "the essence" of body. However, and secondly, this interpretation is controversial, for three reasons: (a) as we will see in Chapter Three, Locke seems in fact to speak of solidity only in the relative sense, and as a quality of a body; (b) we will see in the coming chapter on real essence that Locke is ultimately a skeptic about the very essence of matter; and (c) this interpretation neglects the issue of cohesion, which seems essential to Locke on a still deeper level, as that which makes the very existence of solidity possible in the first place.

6. Characteristics of Primary Qualities.

The first characteristic of primary qualities to be emphasized by Locke is their physical reality; they are "real or original or primary." This talk of the dimension of their physical reality occurs in the *Essay* in II.VIII.9,22,23,24 and II.XXI.73. Their reality or originality is based on the fact that they are independent of our consciousness, they exist in things themselves whether they are a possible object of

perception or not. These qualities, Locke said, "may be properly called *real, Original, or primary Qualities*, because they are in the things themselves, whether they are perceived or no" (II.VIII.23).

The second characteristic of the primary qualities is that they are not only real and exist in things themselves, but also are inseparable from the body, whatever alteration or change it may suffer; no force can separate them from the body. These qualities, Locke said:

are utterly inseparable from the Body, in what state soever it be; such as in all the alterations and changes it suffers, all the force can be used upon it, it constantly keeps; and such as Sense constantly finds in every particle of Matter which has bulk enough to be perceived, and the Mind finds inseparable from every particle of Matter, though less than to make itself singly be perceived by our Senses. (II.VIII.9)

A famous example, in the same section, that has been given by Locke to support the idea of the inseparability of primary qualities from the bodies in which they exist is the grain of wheat:

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 Pestle, 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.*

The argument does not prove as much as Locke might have thought. It says that the division of a mass of matter into many parts, till we reach insensible parts, does not alter or change certain of its qualities, such as solidity, extension, figure, or mobility. This is because these qualities are qualities of the minute particles, or corpuscles, of the body.

The talk is simply an assumed premise on Locke's part. Thus it seems as if Locke is begging the question, because the act of division is only an "alteration or change" with respect to the observable level of a body. With respect to the unobservable and insensible corpuscular level of the corpuscles themselves, it is simply assumed, not argued, that no alteration or change can deprive them of the qualities in question.

We might also note that, as far as primary qualities are inseparable from the body in what state soever it be, we must be considering such qualities only on the level of determinable quality, such as that of shape in general, as opposed to that of determinate quality, such as that of, e.g., round or square. To include the latter we would have to say that primary qualities are either: (a) whatever determinable qualities must be possessed, not simply by any body of perceptible dimension, but by any body no matter how small, qualities that must be had by corpuscles as well as larger bodies (e.g., shape); or (b) determinate of such determinable qualities.⁹ The second disjunct (b) would allow for

⁹O'Connor in his Book *John Locke* 1967, 66, thinks that Locke is confusing these two alternatives: "Locke does not make it clear if the word 'quality' is here to be taken in the sense of determinable quality,...,or in the sense of determinate quality."

determinate instances of size or motion, for example, that no corpuscle could have, even though they must have some size and motion. And on the other hand, while sensible bodies may be said to have shape and motion, etc., there cannot be, strictly speaking, any particular determinate shape or motion that they are required to have. However the fact is that once we see the role of the insensible level in Locke's argument, we must also see that according to Locke himself we cannot claim to know what the primary qualities are. Rather, he is offering only the most reasonable view within the approach of seventeenth century science, namely, the corpuscular hypothesis, as the "best inadequate"¹⁰ hypothesis available in his time.

Furthermore, though these primary qualities are considered by Locke as more clear, thus less problematic, than other kinds of qualities of our acquaintance, the fact is that they are also incomprehensible to us: "Whereby it appears that this primary and supposed obvious Quality of Body, (namely, extension) will be found, when examined, to be as incomprehensible, as any thing belonging to our Minds" (II.XXIII.26).

¹⁰I am using Ayers terminology here, mentioned in his (1991), Alexander called it as the best available hypothesis (1974).

We will see in Chapter Two that this passage and many similar passages in Book IV reflect the extent to which Locke himself is skeptical as to the ability of even the most advanced science to acquire anything deserving the name "knowledge" with respect to qualities of bodies.

The third characteristic of the primary qualities is formulated in terms of the notion of resemblance and in relation to our ideas of the qualities in question: "*the Ideas of primary Qualities of Bodies, are Resemblances of them, and their Patterns do really exist in the Bodies themselves*" (II.VIII.15). Presumably, Locke is here talking about primary qualities as determinate qualities: bodies must have some shape that is at least to some extent like the shapes of which we have actual ideas.

The last characteristic of the primary qualities is that "upon their different Modifications it is, that the secondary Qualities depend" (II.VIII.23). Again, the secondary qualities are certain sorts of powers that in some way "depend" upon "modification" of the determinate structure of the primary qualities. But before discussing this further, I would like to summarize some of what I have said so far.

The primary qualities (as determinable) are qualities of any object that are also qualities of its constituent

corpuscles. In this sense they are "inseparable from the Body" and part of its "real essence." I shall say more about the latter notion later. In any case, it is of course very rare (or for Locke impossible) to see either corpuscles or even the most elemental corpuscular (in our sense, atomic) structures existing in nature under normal conditions. In fact every thing is attached to something else or it is composed of compounds. This might help in understanding why Locke said: "and when they are of that size, that we can discover them, we have by these an Idea of the thing, as it is in it self." Here Locke is calling attention to two points about primary qualities. First, there is the ontological point that these must be qualities not only of observable bodies, but even of their most elemental constituents. Then there is the following two-fold epistemological point: (a) our ability to have any idea of the qualities of unobservable bodies presupposes our ability to become aware of the primary qualities of sufficiently large structures of such elemental constituents; (b) it is only by way of a kind of conceptualization or hypothesizing that we are then able to judge regarding the real essence of any such observable body (since that involves facts about specific configurations or textures involving such elemental constituents.)

When objects affect our senses to thereby produce ideas in us, what enables them to do so is certain qualities, which Locke calls powers in those objects. These are distinct from, but dependent upon, the object's primary qualities. But sometimes, as we will see below Locke also calls the powers ideas. This is because of Locke's desire to distinguish between the qualities in question in objects and these same qualities as they enter our "Understanding" in sense perception:

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*: which *Ideas*, if I speak of sometimes, as in the things themselves, I would be understood to mean those *Qualities* in the Objects which produce them in us. (II.VIII.8)

7. The Idea of Power.

In Book II, Chapter VII, Section 1, power appears within

a list¹¹ of "simple ideas" that "convey themselves into the Mind" by two ways, "sensation" and "reflection." Similarly, Locke says: "Power also is another of those simple Ideas, which we receive from *Sensation and Reflection*" (II.VII.8).

It is very important to try to understand the meaning of classifying power as a simple idea. In fact to talk about ideas at all, it is important to begin by focusing on Locke's two-fold distinction between ideas as qualities in objects and as something in the mind:

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 a *Quality* of the Subject wherein that power is. (II.VIII.8)

From this passage, compared to the example of the snow-ball in the passage previously quoted, there seems to be a certain ambiguity: (a) we have something in the mind called an idea on the one hand; on the other hand, we have either (b1) something in "the things themselves" which causes (a) to be in

¹¹ The other items on that list are pleasure, pain, existence and unity.

the mind or (b2) something in the things themselves which actually is (a), namely, (a) as it is in the things themselves. And apparently Locke feels free to use the word idea for both.

It is important to recognize such ambiguity in Locke's use of the word ideas because that ambiguity makes Locke's discussion of ideas more difficult to deal with, since (b2) allows Locke to mean by "idea of power" both a certain idea *qua* content of consciousness and *power itself* (i.e., that of which (a) is an idea) as a quality in things; (b1) only allows Locke to mean by "idea of power," besides (a), *something* in objects that causes us to have (a) in our minds. Given (b2), when Locke says that the idea of power is x, y, or z, we would have to ask whether or not he means that *power itself*, as a quality in things of which we have a certain idea in our minds, is x, y, or z. In fact it isn't always clear what Locke means. For example, in speaking of idea of power as simple, is he meaning to be talking about something that, as a quality in things themselves, is simple, or is he only pointing out that it "appears in our minds" as something simple? Is Locke himself perhaps sliding from one to the other? In fact in regard to (b2), Locke would simply be

assuming that there is such a thing as power in objects, as opposed merely to *something* in objects that causes us to have an idea of power in our minds.¹²

There is also a further distinction that will be important. This is between ideas as contents of thought and ideas as contents of immediate awareness. For example, sometimes Locke uses the term ideas to refer to what he calls sensory "appearances" (II.I.24). In this case ideas are the content of a kind of immediate awareness. But ideas may also be the content of mere thoughts. This may be relevant to the question of the simplicity of our idea of power. We noticed earlier that in some sense our idea of power cannot be simple, since it involves relation in some way. But Locke also classifies it as a simple idea. Maybe we should make the following distinction: Reasoning assures us that the relevant quality in the object must involve some sort of relation, but in our immediate awareness of such qualities, we are presented with no such complexity.

¹²Ayers emphasizes the "imagistic" aspect of Ideas in Locke's philosophy. He thinks that "The question whether Locke's 'ideas' are all sensory images...is a question which has yet to be settled by modern commentators, few of whom even approach it from this direction. Despite the relative unpopularity of an affirmative answer, the grounds for holding him an imagist are conclusive." (1991, 44)

The problem with this suggestion, however, is that when Locke talks about our ideas of secondary qualities, and means to be talking about something like immediate awareness or experience as opposed to conceptual thoughts that might be derived from experience, he seems to mean only the sensory appearances (e.g., colors) that are produced by the powers in question. If there is anything like an immediate awareness of power for Locke, as opposed to an awareness of such appearances, it would seem to come from only from the inner experience, through "reflection," of our own power to act. Maybe Locke has in mind some kind of simplicity in this inner experience, while his reasoning assures him that there must be something complex about the powers in objects. However, it is difficult to be clear what this inner experience could have to do with the powers of objects to produce sensory appearances in our consciousness.

The following comment could also be made about the passage quoted from II.VIII.8. However we interpret Locke's views about secondary qualities as powers in objects, we should not take that passage to say that all qualities in objects are powers. He only says that he calls the power to produces ideas in our minds a quality of the object that has such a power, not that he is equating powers with qualities in

general. The main problem is simply that it is difficult to understand what sort of quality the power in an object is supposed to be, beyond its primary qualities or the qualities of the corpuscles that make it up. Again, one approach would be to identify those powers with certain configurations or textures of corpuscles. But the problem remains that this would make powers extremely complex structures, whereas our idea of power is supposed to be something simple. Furthermore, it would make them complex in a way that goes beyond merely "involving relation" in the sense that powers in objects are always powers to bring about certain effects. Maybe there is a way to view the idea of power as simple, while power in an object is something complex, but Locke is very confusing on this point.

Finally, we may note that Locke also makes a distinction between "active" and "passive" powers:

the aptness we consider in any substance to give or receive such alterations of primary qualities, as that the substance so altered should produce in us different ideas from what it did before; these are called active and passive powers: All which powers, as far as we have any notice or notion of them, terminate only in

sensible simple ideas. (II.XXIII.9)

Again (II.XXI.2): "Power thus considered is twofold, viz. as able to make, or able to receive any change: The one may be called Active, and the other Passive Power."¹³

Let us consider this example: "the sun has a power to harden clay, and soften wax." According to Locke the causal relation between the cause and effect is only possible because the sun has an active power to harden the clay and the clay has a passive power to be hardened. O'Connor objects: "the notion 'passive power' was a verbal triviality. If we know that A affects B, it is an analytic and uninformative statement that B is affected by A" (1967, 90). O'Conner adds: "Locke seems to have thought that this statement was more than the mere tautology: whenever X occurs it must have been possible for it to occur" (90). However, I think that Locke has a good reason to think about this as more than a mere tautology or verbal triviality. Since he is talking about the causal connection between two things, it is necessary to consider the power of both of them. If we consider only the

¹³We might note that, in a certain sense, matter has only passive power; God alone "is truly above all Passive powers" (II.XXI.2). I shall not discuss the active/passive distinction when it is taken in this sense.

cause A, as it has an active power to produce change in something else B, then we would have to say that this cause A must affect all things in the same way, producing the same result. In fact, observation of things, using the "historical plain method," shows that the same cause with the same power can affect two different things at the same time in two different ways, producing two different results.

The question is how is it possible for the same power of the sun, for example, to produce different results in different things? In other words, how do we keep the identity of the sun while it acts differently producing different results, without introducing the properties of the thing that is changed or related to the sun? The concept of passive power, which Locke introduces to explain how things are affected by others and how it is possible to make that change in many different ways, is an important concept. It is necessary for an understanding of causality and change.

On the other hand, the importance of the distinction between active and passive power can be seen as no more than recognition of the fact that the ability of one body to have an effect on another is a function of some underlying structure or corpuscular constitution of both bodies. However, if this is going to imply that there is really only

one kind of power after all, that may be because we are assuming that the powers in question are simply reducible to particular corpuscular structures. As already noted, that is Alexander's suggestion. To some extent it may be possible to agree with that suggestion, but not entirely. I shall return to this point shortly. First I want to comment on Jackson's purely relational approach.

8. The Relation Approach to Secondary Qualities.

To talk about secondary qualities as powers to affect our sense organs¹⁴, is to talk about them in a relational sense. As we have seen, Jackson holds that secondary qualities, being powers, simply are relations of various sorts. The distinction between qualities and powers, including those powers which Locke calls secondary qualities, is a distinction between qualities and certain sorts of relations; therefore, secondary "qualities" are strictly speaking not qualities at all. This would perhaps explain why, in several passages, Locke suggests that an object's secondary qualities are not real qualities: the suggestion is that they are only relations

¹⁴as they are "*Powers barely, and nothing but Powers, relating to several other Bodies, and resulting from the different Modifications of the Original Qualities.*" (II.VIII.24)

in which a thing stands to other (actual or possible) things.

Jackson thinks that the main reason Locke was anxious to make the absolute distinction between primary and secondary qualities is "In order...to distinguish knowledge of an individual body through itself from knowledge of its relations to other things" (Jackson 1929, 60). I shall discuss now Jackson's interpretation of powers as relations. Jackson said: "Knowledge of what a given body is in itself is knowledge, not of the relations in which it stands, but of the qualities which it has" (61). Thus he thinks that any change in the relations would neither be a change of our knowledge about that thing nor a change in that thing itself:

But it is not difficult to illustrate the meaning of the distinction as Locke understands it. The shape of a given table is, *prima facie* at least, a quality of this table; but its being in this room is a relation because it involves something other than this table. A change in a relation would not logically, though it might be causally, involve a change in a table, or would not itself be, though it-or what caused it-might cause, a change in the table. But a change in its shape would be *eo ipso* a change in the table." (61)

Jackson's interpretation has textual support. There are passages in the *Essay* in which Locke combines the second and the third kind of qualities as having one common or similar character or aspect, which is the relational. Locke said: "The other two, are only Powers to act differently upon other things" (II.VIII.23). However, while the relational aspect of this kind of power is clear enough, it is not enough to suggest unambiguously that they are mere relations.

The term "relation" is ambiguous in Locke¹⁵. Maybe there

¹⁵Relation is a neglected subject in Locke's philosophy. There is only one article by Douglas Odegard (1969) on "Locke and the Unreality of Relations." The unreality of relation has been overemphasized by Aaron in his book (1937) pp 174-89. A relation is "not contained in the real existence of Things, but something extraneous, and superinduced." (II.XXV.8) However, the fact that Locke said that relations are (1) "made" by the mind, and (2) are "not contained in the real existence of things," he surely does not mean to regard relations as "unreal." Regarding (1), his claim that relations are produced by the mind is only his way of saying that our *ideas* of relations are produced by the mind. Regarding (2), Odegard suggested that "The contrast between 'what really exists in things' and 'what does not really exist in things' is...not a contrast between what exist and what does not exist, but between what exist in things regardless of other things and what exists in something only in virtue of other things" (1969,149)

¹⁵The fact remains that Locke did not give a satisfactory or a comprehensive discussion to such a concept that plays an essential role in his theory of knowledge, and neither did his commentators. Aaron pointed out that Locke's language is "obviously very loose" (176) and the account that Locke gave to relation or to causality, as the most comprehensive relation according to Locke, "is far from

is one sense in which secondary qualities are relations, namely, that they explain certain relations in a special way, and another sense in which they are not, whereas the "third kind" is. However, it seems extremely unlikely that Locke thinks that an object's power or disposition to have certain sorts of effects is a purely relational matter. There seems to be a more dynamical element: the object's possession of some sort of internal force or dynamism that, being internal to the object, precisely cannot be a matter of mere relations but constitutes the underlying ground of certain relations. Furthermore, the idea of power is classified in II.VII.8 as a simple idea obtainable both from sensation and reflection, whereas ideas of relations are classified as complex in II.XII.3.

The special status of power in general seems to have made Locke reluctant to regard an object's (particular) powers as qualities of the object; however Locke does call them secondary qualities. To the question why he did he call them

satisfactory" (178).

It seems clear that Locke thinks that substances do exist in kind of real interaction or connection to each other. Therefore, it seems especially problematic why he suggests that relations have a certain sort of "unreality." Perhaps the explanation is that Locke's attention is focused too narrowly on the act of "comparison" required in order to produce our idea of a relation.

qualities at all, Jackson citing Locke himself answers that Locke uses the term "secondary qualities" "only to comply with the common way of speaking" (67). Thus they are not kinds of qualities "but entities that are wrongly supposed to be qualities and are really relations" (67); they are pseudo-qualities. Jackson's approach may go too far in the opposite direction. In any case, as Alexander pointed out, Jackson in his answer to this question, has supplied the "only" to Locke, whereas Locke does not use it in his II.VIII.10, which Jackson cites.

9. The Reductionist Approach to Secondary Qualities.

Alexander, who holds a reductionist view, thinks that secondary qualities are both qualities and powers (1985,154). He quotes Locke from II.XXXI.2

for though Fire be call'd painful to the Touch, whereby is signified the power of producing in us the *Idea* of Pain; yet it is denominated also Light, and Hot; as if Light and Heat, were really something in the Fire, more than a power to excite these *Ideas* in us; and therefore are called *Qualities* in, or of the Fire. But these being nothing, in truth, but powers to excite such *Ideas* in us,

I must, in that sense, be understood, when I speak of secondary *Qualities*, as being in Things; or of their *Ideas*, as being in the Objects, that excite them in us. Such ways of speaking, though accommodated to the vulgar Notions, without which, one cannot be well understood; yet truly signify nothing, but those Powers, which are in Things, to excite certain Sensations or *Ideas* in us. Since were there no fit Organs to receive the impressions Fire makes on the Sight and Touch; not a Mind joined to those Organs to receive the *Ideas* of Light and Heat, by those impressions from the Fire, or the Sun, there would yet be no more Light, or Heat in the World, than there would be Pain if there were no sensible Creature to feel it.

According to Alexander, Locke does not say anything here to support Jackson's interpretation. Jackson thinks that Locke was not only "anxious to preserve an absolute distinction between qualities and relations", but that the distinction between primary and secondary qualities was put forth precisely as part of this endeavor:

there is one kind of relation which he [Locke] thinks

especially likely to be mistaken for a quality, the kind of relation which, according to his wider use of the term, he calls a "power"...according to Locke a body can have a power only by means of a quality, and as long as we know only the power we are ignorant of what the body is in itself; while, if we know the quality, we do not need to mention the power in a statement of what the body is in itself. (1929, 61)

Alexander agrees with the last part of Jackson's statement, but he holds that Jackson "failed to see all its implications" (1985, 153). Alexander suggested a modification of Jackson's statement to fit his reductionist point of view, thus (aside from any question of the powers of corpuscles themselves) reducing the powers of bodies to their textures, which are in turn themselves *identified* with the internal constitution of the bodies in question. According to Alexander, Jackson "might have added that we do not need to mention the power in a statement of what the body will do if we know in detail what the body's constitution is" (1985, 153). Again for Alexander: an object's powers simply are various "configurations" or "textures" or "structures" composed of the corpuscles or basic particles comprising the object (given

particular primary qualities of the latter). "The secondary qualities themselves are 'textures' or arrangements or patterns of the primary qualities of the insensible corpuscles of objects" (1985, 118).

Of course, it is clear that Locke thinks that an object's power or dispositions are grounded in the primary qualities of the object and ultimately in the corpuscles composing it; the latter in a certain way give it its powers. But this does not necessarily imply the sort of reductionism that Alexander has in mind. Locke said:

since we neither know the real Constitution of the minute Parts, on which their Qualities do depend; nor, did we know them, could we discover any necessary connexion between them, and any of the secondary Qualities: which is necessary to be done, before we can certainly know their necessary co-existence.
(IV.III.14)

Going beyond what this passage seems to say, Alexander not only identifies (so opposed to merely correcting) power with texture ("I wish to take the unorthodox view that Locke uses the word 'texture' for the pattern of corpuscles in a group

and regards the power of a body to affect our senses or another body as identical with this texture so that powers are, at this level, intrinsic properties of bodies" [1985, 121]), but he also went further to identify what Locke call "essence" with power. Also does this from a passage in III.VIII.1 where Locke said:

and in Substances, the most frequent [*Ideas*] are of Powers; v.g. a *Man is White*, signifies, that the thing that has the Essence of a Man, has also in it the Essence of Whiteness, which is nothing but a power to produce the *Idea* of Whiteness in one, whose Eyes can discover ordinary Objects.

Alexander concludes: "Here Locke is *identifying* Essence and Power, and as we shall see, Locke calls textures 'real essences'. Thus I believe that a secondary quality is a texture" (1985,121).¹⁶ This may lead someone to conclude that Alexander is identifying, though indirectly, secondary qualities with what Locke calls "real essences," which might

¹⁶In fact there is only one passage in the whole *Essay* in which Locke identifies or mentions texture as real essence. This passage is III.VI.9.

seem to be contradicting not only Locke but also Alexander's interpretation itself. I shall talk about "real essence" in connection with substance, later. In the meantime, to keep Alexander's approach consistent, we can read Alexander not as saying that secondary qualities are what constitute the real essence of particular substance, but only that they are particular aspects of a "texture" that constitutes such an essence. Nevertheless, the term "texture," and some related terms, are problematic terms in Locke's *Essay*, and it is time to give them some thought. Such related terms are "modifications," "configurations," and "combinations" with respect to an object's primary qualities.

10. Texture.

Alexander's identification of power with structure or texture might be based on some passages such as those in II.VIII.20, 22, 23, 24 and II.XXXII.14 and especially in III.VI.9 where texture in fact appears as real essence.

Let us start with the passage where Locke refers to "those *secondary and imputed Qualities*, which are but the Powers of several Combinations of those primary ones" (II.VIII.22) and one (Section 23) where the word "modification" appears:

real, Original, or primary Qualities, because they are in the things themselves, whether they are perceived or no: and upon their different Modifications it is, that the secondary Qualities depend.

Also in Section 24 of the same chapter, where powers are said to result from the modification of the primary qualities:

these two latter sorts of Qualities are Powers barely, and nothing but Powers, relating to several other Bodies, and resulting from the different Modifications of the Original Qualities; yet they are generally otherwise thought of.

These passages might be taken to support Alexander's view that the primary qualities of the corpuscles are brought into various combinations and arrangements which form various internal constitutions or textures, and these textures are then identical with powers which can be said to "result" from the combinations or modifications in question. Thus according to Alexander "The internal constitutions need not be said to be the grounds of, rather than identical with, the powers" (1985,155). However, in section 24 Locke talks about two

kinds of qualities, the secondary and the tertiary qualities.

In the latter case (tertiary qualities) a certain modification of an object's primary qualities (or corpuscular structure) is the ground of its power to produce certain changes in the primary qualities of some other object, for example, in a physical sense organ. In the former case (secondary qualities), we are talking about an object's power to produce changes in a perceiver's sensations. However, an object's power to produce changes in sensations is itself grounded for Locke in its power to produce changes in the primary qualities of sense organs, thus it is grounded in tertiary qualities.

It does not seem correct to say for Locke then that an object's powers to produce changes in a perceiver's sensations is the same as its power to produce certain changes in a sense organ; the former is only grounded in the latter. Therefore, a power is not necessarily identical with what grounds that power. However, in the case of secondary qualities, Alexander claims that the powers in question, which are grounded in certain modifications of the primary qualities of an object, are identical with those modifications, which seems unjustified.

Maybe a single modification of an object's primary

qualities is the ground of both powers, but the two powers are not identical with each other. However, why should only one of these powers be regarded as identical with that modification? And if only one of them is to be singled out in this way, it would seem logical that it should be the tertiary quality, since the power to affect a perceiver's sensations (secondary quality) has to be grounded in such a quality. Therefore, even if Locke's terminology sometimes suggests that secondary qualities are identical with certain modifications of an object's primary qualities, this might mean only that they are grounded in those modifications in a way that we might not be capable of comprehending, not that they are identical with those modifications as Alexander suggests.

Consider also the example of Porphyry (II.VIII.19), where Locke said:

It has, indeed, such a Configuration of Particles, both Night and Day, as are apt by the Rays of Light rebounding from some parts of that hard Stone, to produce in us the *Idea* of redness, from others the *Idea* of whiteness: But whiteness or redness are not in it at any time, but such a texture, that hath the power to produce such a sensation in us.

This may seem to say that secondary qualities are textures, because it seems to say that whiteness and redness, which are secondary qualities, are textures. However, secondary qualities are powers, and Locke does not seem to say here that such powers are identical with textures, but only that certain textures have the power to produce certain sensations in us. This would say only that secondary qualities are grounded in the texture in question. (Of course, we might say in a loose sense that secondary qualities are identifiable with what Locke often calls the "texture," "modification," "arrangement," or "configuration" of corpuscles, namely, insofar as such texture is sufficient to account for a body's ability to affect our senses. However, that is just another way to say that the ability in question is grounded in that texture, not that it is reducible to it in Alexander's sense.) As for the suggestion that "texture" is also what constitutes real essence, as in III.VI.9, we may reply that Locke himself is very skeptical about real essence to the extent to make us wonder what then any texture is in itself. Locke said:

We have very imperfect Ideas of Substances; and that the real Essences, on which depend their Properties and

Operations, are unknown to us. We cannot discover so much as that *size, figure, and texture* of their minute and active Parts, which is really in them...This consideration alone is enough to put an end to all our hopes of ever having the *Ideas* of their real Essences.
(IV.VI.12)

However, according to Locke we do have ideas of very many powers possessed by objects. It is also possible that the term "texture" in Locke might be used for two things, and commentators may fall short by failing to see the possibility of more than one meaning for this term.

A. Texture as a quality along with other qualities of a thing as in, for example II.VIII.10, 14, 18, 23, 24, II.XXI.3,73, XXIII,8, IV.III.25; listed along with bulk, figure, and motion, sometimes with number or size):

- (1) of a minute part of matter (as in IV.VI.12); or
- (2) of an observable body, as in II.XXXII.14 and IV.VI.14 where texture is a holistic structure of the corpuscles of a macroscopic body:

what sort of Figure, Bulk, and Motion of Corpuscles, would produce in us the Sensation of a yellow Colour,

and what sort of Figure, Bulk, and Texture of Parts in the superficies of any Body, were fit to give such Corpuscles their due motion to produce that Colour.

In the second case, a body's texture would itself seem to be something observable, which would seem to fit well with the fact that an object's secondary qualities are observable for Locke. However, we might also speculate that, even when he is talking about texture with respect to observable objects, Locke might not be talking about something observable, such as, for example the holistic structure of its surface.

B. Even when he is talking about texture with respect to observable objects, perhaps Locke sometimes means, not an observable holistic structure composed of many unobservable corpuscles, but rather an unobservable pattern of sub-microscopic force or activity that is involved in maintaining such a structure. For example, such activity might include, in addition to motion, whatever sort of "bond" maintains the cohesion of matter, essential for the structure in question. (This is something about which Locke himself says very little, even though it is something that we might be inclined to regard as a pre-eminent example of power or force.) If this is what Locke means by texture, it would be a further reason

for denying that he is identifying the secondary qualities of objects, which are observable powers possessed by them, with textures. Rather, such powers would only be grounded in such textures in a way that is not comprehensible to us. I begin the next section with a passage in which Locke's use of the term "operation" with respect to an object's texture suggests this more active notion of texture. I also comment there in an initial way on the notion of cohesion.

11. Power and Cohesion.

Locke said:

it alters not the Nature of our simple *Ideas*, whether we think, that the *Idea* of Blue, be in the Violet it self, or in our Mind only; and only the Power of producing it by the Texture of its Parts, reflecting the Particles of Light, after a certain Manner, to be in the Violet it self. For that Texture in the Object, by a regular and constant operation, producing the same *Idea* of Blue in us, it serves us to distinguish, by our Eyes, that from any other Thing. (II.XXXII.14)

Because of its connection with the notions of "operation" in

this passage, we may be justified in regarding texture as some sort of underlying activity in a body. Even if we do, however, Locke is not saying that the texture is the operation in question, but something that grounds that operation. Similarly, it seems not to be the powers which are secondary qualities, but to be the underlying ground of those powers. This is because Locke speaks, for example, of the "power of producing" sensations "by the Texture of its Parts" and of the texture producing ideas in us "by a regular and constant operation."

In any case, whatever structure or combination of corpuscles might be involved in the production of sensations in an observer, this could not be the ultimate explanation of the operation involved in producing those sensations. For such combination must itself exist by virtue of a deeper something, that we may call cohesive power, that make the structure or the combination itself possible in the first place and thus makes a secondary quality possible too.

Thus when Locke said of "*secondary and imputed Qualities*," that they "are but the Powers of several Combinations of those primary ones" (II.VIII.22), it is arguable that by this he meant to say, first, that they are powers of certain combinations of basic corpuscles, and

second, that such powers are indeed identical with the very texture of those particles. However, this might still be very different from Alexander's view. After all, why couldn't someone say that secondary qualities are powers possessed by certain textures (in sense A) of primary qualities, but not *identical* with such textures? The powers in question might be identified with texture in sense B, but still be regarded as powers merely *possessed* by texture in sense A, i.e., by the whole set or structure of the particles in question. In that case, the powers in question might be more like some sort of irreducible force or activity, such as the mysterious "something that, as we shall see, Locke supposes must account for the ultimate cohesion of matter.

On the other hand, 'the force that keeps cohesion' intact, should, in at least one respect, be clearly separated from the issue of secondary qualities. At least such force cannot be itself an *example* of what Locke means by a secondary quality. If we can regard secondary qualities as identical with texture in sense B, the most we can say is that cohesive force is an essential *part* of what secondary qualities are; but then so are primary qualities. As to why Locke does not include cohesive force as a "primary" quality, I will discuss this in Chapter Three.

I have already suggested that the cohesive aspect of the internal corpuscles' arrangement is an example of power. However, once again, this is only to suggest that it is an example of what we would call power, but maybe not what Locke would. In any case, the cohesive aspect could not be any more than an essential part of what Locke calls secondary qualities, not itself an example of a secondary quality.

12. Tertiary or the Third Kind of Qualities.

Locke defines the third kind of qualities as:

The *Power* that is in any Body, by Reason of the particular constitution of its *primary Qualities*, to make such a *change* in the *Bulk, Figure, Texture, and Motion of another Body*, as to make it operate on our Senses, differently from what it did before. Thus the Sun has a Power to make Wax white, and Fire to make Lead fluid. These are usually called Powers.

(II.VIII.23)

We may note at first a possible ambiguity in the term "the senses." If we consider "the senses" in their specifically mental or conscious dimension, then we could say that the

second and third kind of quality are not clearly distinguished by Locke. This is because, his second kind concerns the qualities of a body to make a change in physical *sense organs*, i.e., in *other bodies*, and thereby to "operate on our senses." On the other hand, if we equate our senses with our *sense organs*, then there would be a difference. Namely, the second kind would concern the powers of objects to operate *directly* on our senses while the third kind would concern the powers of objects to operate upon other bodies that *in turn* operate upon our senses, and this is what Locke talks about in terms of what is immediately and mediately perceivable in II.VIII.26.

Now even though this is a distinction, it is not clear what importance that distinction could have. This in turn might be a reason to suspect that Locke is confusing one possible three-fold distinction with another. I shall return to this point. In any case, Locke describes both secondary qualities and qualities of the third kind as "powers." In both cases, furthermore, the power in question appears in any body because of its unique corporeal constitution, defined in terms of primary qualities, such as size, shape, and mobility.¹⁷ Water, or say a molecule of water, operates on

¹⁷ Also we can say according to Locke that God has given matter such a power, (II.XXXII.14.)

our senses causing sensations which manifest the secondary qualities of water. If the molecule of water is placed upon a piece of iron and so produces rust, this in turn affects our senses producing different sensations. In fact oxygen, only by the reason of its particular constitution of its primary qualities, has a power to combine with metal causing rust.¹⁸ The appearance of rust, as a sensation, manifests one of the water's tertiary qualities.

Now we must ask: Is there any more reason to identify the third kind of qualities with corpuscular structure or texture than there is to identify secondary qualities in that way? Perhaps we could argue that Locke suggests that it is not the structure of a body that produces a change in the corpuscular structure of another body, it is rather the power of a body that causes that change, and Locke calls this power of a body a quality of the third kind. Thus power can do something the corpuscular structure cannot do, so it is not the structure, although it may be dependent on the corpuscular structure.

Thus Locke said:

¹⁸This example has been given and illustrated by Gregory D. Walcott in his comments and discussion of John Dewey's article on "Substance, Power and Quality in Locke" (1926).

But the Third sort are call'd and esteemed barely Powers, v.g. the Idea of Heat, or Light, which we receive by our Eyes or touch from the Sun, are commonly thought real Qualities, existing in the Sun, and something more than mere Powers in it. But when we consider the Sun, in reference to Wax, which it melts or blanches, we look on the Whiteness and Softness produced in the Wax, not as Qualities in the Sun, but effects produced by Powers in it. (II.VIII.24)

What the text clearly says is that the change in the structure of the wax, being softened, for example, by the sun, is the effect of a certain "power" in the sun, not of some corporeal structure in it, even though that power may be grounded in some corporeal structure in it.

However, Alexander would regard this argument as question-begging. Alexander says of the third kind of qualities that "they too are texture of objects; the interactions between objects are, it is hoped, to be explained in terms of the arrangements of their insensible corpuscles" (1985, 118). Since for Alexander the powers in question are textures or (as Alexander understands it) structures or combinations or arrangements of corpuscles, if those powers

can produce certain effects then this is just to say that the corpuscular structure in question can produce those effects. But then why does Locke never speak that way? Why does he never talk about textures producing effects, but only of textures as "having" powers to produce effects?

On the other hand, why does Locke list the third kind of qualities as third in the first place?¹⁹ What is the logical progression?²⁰ Insofar as they are powers, qualities of the third kind seem to be more basic than secondary qualities, because secondary qualities are powers to change a perceiver's

¹⁹Curley, 1972, argues that Boyle, and thus Locke, is inconsistent in discussing powers and qualities. Sometimes Boyle identifies a body's power to affect other bodies with its intrinsic qualities and sometimes taking the power to be something which might be acquired or lost without any change in the body's intrinsic qualities (446). Alexander does not agree with Curley in his article "Curley on Locke and Boyle" (1974) Alexander reply to Curly arguing from his reductionist approach that power is identified with texture.

²⁰One suggestion is Yolton's. Yolton, (1993, 200) said: the "third type of body-qualities; in a sense they are a subclass of the secondary ones." However, Locke defines the second kind of qualities in terms of what it is a power to do, i.e., it is a power to produce a change in a person's sensations, while qualities of the third kind are simple powers to bring about change in the corpuscular structure of something else even if that never could ever be perceived. Secondary qualities in Locke always depend on the qualities of the third kind, because the only way in which a body can bring about a change in our sensations is by bringing about change in our sense organs and the power that a body has to bring about change in our sense organ is the quality of the third kind.

sensations, and these are grounded in powers (qualities of the third kind) to change the primary qualities of something (sense organs). There is a very important three-fold distinction of levels in Locke: beginning with the primary qualities of observable bodies, then going to internal textures on a corpuscular level, then finally on to something even deeper than the corpuscular level. This three-fold distinction will be very important for our discussion later. It may not be plausible to suggest that this is what lies behind the progression from primary to secondary to tertiary qualities. However, maybe Locke was not clear in his own mind.

If we want to look for a three-fold logical progression, maybe a more plausible suggestion would be something like this: Primary qualities ground certain powers in an object, where those powers are identical, not as Alexander thought with textures in sense A but with textures in sense B (including, for example, internal cohesive forces or powers on the corpuscular level); in turn, these internal textures ground causal relations in which the object stands to other objects. This would allow us to identify the third kind of qualities with relations, as Jackson holds, but the second kind with internal textures, somewhat as Alexander holds.

However, it still allows us to think of the second "level" in more dynamical terms than Alexander, because texture in sense B is not simply a combination or arrangement of corpuscles but something more dynamic that is responsible for holding corpuscles together in such a combination in the first place. The reason that Locke only mentions, in describing the third kind of qualities, the ability to change the primary qualities of other objects, and not the ability to change the sensations of perceivers, might simply be that the latter ability is grounded in the former. What Locke might be emphasizing on the third level is the relational aspect, whereas on the second level he is trying to emphasize something more internal. It is possible to recognize this without agreeing with Alexander's reduction of the internal something to corpuscular structure.

13. Conclusion.

I conclude that Alexander may be right in reducing secondary qualities to something internal to an object, which he calls (among other things) texture. This contrasts with a view that would make only primary qualities internal, such as Jackson's view. However, insofar as secondary qualities are powers, Alexander's approach may be wrong, by suggesting that

the powers in question are reducible to mere arrangements or structures of corpuscles. Such a reduction might remove a lot of the mystery from the notion of power. This is because it would supposedly explain it in terms of the notion of primary qualities. However, if we think, not in terms of arrangements or structures of corpuscles, but the underlying bonds or forces required to hold corpuscles together into the appropriate arrangement or structure in the first place, the mystery still remains.

Locke himself did not speak of forces, but he did speak of "bonds" as in II.XXIII.26, when he was speaking of the problem of the cohesion of matter. We shall see later that this is a fundamental mystery for Locke. It is so deep a mystery that it might even be equated (at least for material substance) with the problem of our obscure notion of "substance in general," which is frequently ridiculed. Even if we cannot equate the power or force of cohesion with the underlying power of secondary qualities, given Locke's emphasis on the problem of cohesion and the necessity of cohesion for any secondary qualities, it seems reasonable that if secondary qualities are reducible to something, it would be more like that than like what Locke calls primary qualities.

Locke may also be somewhat confused in his distinctions.

This comes out when we bring in his distinction between secondary and tertiary qualities. Although Locke calls both of them powers, it may be that he thinks of the tertiary qualities more as relations and he thinks of the secondary qualities as more internal in the way that Alexander has in mind. That might mean that Jackson is right about tertiary qualities. This would have the advantage of emphasizing the two different features which are important for the notion of power, the relational feature and the internal feature, but it would separate them under two different headings. Also, it would list as third the feature that would in fact come logically third. However, it might also be that Locke thinks of both of the kinds of qualities in a confused way, thinking of them both as: a) textures of things that can be said to operate upon other things; (b) mere relations of a certain sort.

In case (b), it would not sound logical to speak of the qualities in question as doing any sort of operating, since they would be mere *relations*. On the other hand, if we emphasize (a) will we do enough justice to the idea that secondary qualities essentially involve the power of bodies to operate upon other things, in particular to cause sensations? This might be more of a problem for Alexander than for the

suggestion I have made. The suggestion I have made is that secondary qualities might be reduced to textures in sense B, which are both internal but involve a relational aspect since they are forces. That is, they are what we would naturally call forces even if Locke did not use that term for them. Alexander reduced secondary qualities to textures in sense A. It is difficult to be sure what Locke really means. In any case, the problem of cohesive force turns out to be central in Locke's thinking about the nature of bodies. But first I want to discuss the notion of substance.

Chapter Two

Power, Substance, and Real Essence

14. Different Approaches to Locke's Substance in General.

In this chapter I discuss the idea of substance in Locke's philosophy. There are three basic concepts in this regard: the concept of pure substance in general, the concept of a particular substance (or kind of substance), and the concept of real essence. My discussion will focus on the concepts of substance in general and real essence, in particular, to show what Locke meant by substance in general, and its unknowability, and on the *prima facie* plausibility of identifying it, as some commentators propose, with real essence, and how the two concepts relate to the concept of power. The chapter should prepare us to see how the concepts of substance and real essence are related to that of cohesion, which is the subject of the next chapter in which I will argue against the proposed identification. However, the identification approach is not the only approach that commentators have suggested to interpret Locke's notion of

substance. The other approaches will be mentioned below and some of them will later be examined thoroughly as they are relevant to the issues that concerns us. First let me present the issue in a general way.

Our knowledge of, or judgment about, any thing or object is tied to what we can know or judge about its qualities or properties, but Locke insists that these qualities cannot represent the whole thing. There must be something that underlies all these qualities, in which they may be said to "inhere" and "subsist," and from which they, in some sense, result; this something or X is called by Locke "pure substance in general." In connection with our interest in the case of material substance in particular, we shall see that:

(a) Locke connects the problem of substance as an underlying unknown support for qualities with the problem of the ultimate source of the cohesion of matter, and (b) Locke makes it clear that the latter problem is not simply a problem regarding the cohesion of corpuscles with other corpuscles; it is an internal problem as to the very possibility of any single corpuscle in the first place. This requires us to take Locke's concern with pure substance in general seriously.

On the other hand, we find that Locke's claims about substance are frequently ridiculed, either as absurd in

themselves, or as going beyond anything that Locke is entitled to maintain with consistency, or both. Sometimes, to rescue Locke from such ridicule, an attempt is made to identify the concept of substance in general with that of real essence. What I shall argue, to the contrary, is that such identification is contradicted by Locke's correspondence with Stillingfleet, as well as by considerations internal to the Essay. In any case, we may distinguish the following approaches.²¹

A. The non-endorsing presupposition approach: As represented by Mackie in his (1976), Locke was not himself endorsing the idea in question; he was only reporting on a supposition that we cannot help making. As Mackie put it, "Locke is primarily describing what he takes to be our ordinary way of thinking, and is not necessarily endorsing it himself" (74). He thinks that Locke is certainly not constructing anything that we could call his own theory of substance; in fact he was disapproving of some parts of this ordinary way of thinking. The non-endorsement approach finds its support from some passages, such as the following one from Locke's discussion

²¹Dr. Aquila's Lectures on Empiricism 1995 were very helpful in clarifying these approaches, as was a conversation with him in October 1994. Also McCann's 1994 article in *The Cambridge Companion to Locke*, ed. Vere Chappell 1994.

of space (II.XIII.17-18), according to Mackie:

If it be demanded (as usually it is) whether this *Space* void of *Body*, be *Substance* or *Accident*, I shall readily answer, I know not: nor shall be ashamed to own my Ignorance, till they that ask, shew me a clear distinct *Idea* of *Substance*...And I desire those who lay so much stress on the sound of these two Syllables, *Substance*, to consider, whether applying it, as they do, to the infinite incomprehensible GOD, to finite Spirit, and to Body, it be in the same sense; and whether it stands for the same *Idea*, when each of those three so different Beings are called *Substances*?

Mackie takes Locke's point to be that, if his opponents recognize three different kinds of substance, then there is no reason why they should not recognize space as a fourth. From this Mackie concludes that

The doctrine of substance, then, is not something that Locke is himself constructing, using, and relying upon; rather it is something he found already in use, of which he was both critical and suspicious,

anxious that it should not be allowed to restrict scientific inquiry. (75)

Mackie's conclusion can be made only by neglecting many other passages in the *Essay* where Locke insists that there must be "something there" that is in some way over and above any qualities of mind or matter that we are capable of making intelligible to ourselves.

We can distinguish two aspects of Locke's discussion of substance in general. First, there is a discussion of the notion of the substratum as it is implied in or might be useful in regard to, our ordinary ways of thinking and talking, as in I.IV.18 "I confess, there is another *Idea*, which would be of general use for Mankind to have, as it is of general talk as if they had it; and that is the *Idea of Substance*." Similar points are also expressed in the *Essay* in II.XXIII.3 and II.XIII.17-18. In these passages Locke's discussion still seems to operate within the traditional (primarily Aristotelian) philosophical approach²². On this approach, it is taken for granted that there are many

²²Among 20th century commentators who give a traditional interpretation of Locke's substance, for example, is Michael J.Loux in his book *Substance and Attribute* (1978, 111), and footnote on page 119.

qualities or properties that we are able to think of things having, but since there must be something to have them there must be something in which they somehow inhere, or which supports them, which we can call substance. However, there are other passages where Locke's emphasis is different. For example, there are passage where Locke raises the question of the very possibility of qualities in the first place, on a deeper level. Here the language of "inhering" does not seem to be appropriate. The most fundamental problem concerns the very possibility of extension or solidity, even of the most minute particle of matter. Locke does not present this as a problem as to what extension or solidity inhere in, but how they are possible in the first place, and in fact what they really are. Locke's suggestion is that some mysterious sort of "cohesion" is in question (cf. II.XXIII.23).

Thus there is not simply a question how several qualities, starting with such primary qualities as extension and solidity, might cohere together in a single thing or object. In response to that traditional question, we might think it was appropriate to suppose that they all inhere in a single underlying substratum. However, there is also the deeper question, namely, how extension and solidity are possible in the first place. If Locke suggests that some sort

of cohesion must be responsible for this, then it seems reasonable to suppose that some sort of cohesion must also be responsible for the combining of several qualities into a single thing or object in the first place. After all, Locke himself does emphasize the problem of the combining or "putting together" of qualities as well (e.g., II.XXIII.2) just as much as there need for something to inhere in. Thus the traditional model of something that underlies qualities and the model of some sort of cohesive force or power seem to both play a role in Locke's thinking.

Thus I see part of Mackie's conclusion as right in regard to the fact that Locke "was both critical and suspicious" about "something he found already in use." However, neither the *Essay* nor Locke's correspondence with Stillingfleet (where Locke said: "there must certainly be substance in the world" [Works IV, 446]) offer enough support for saying, as Mackie did, that Locke was only reporting (maybe ironically) a familiar notion of substance. This denies the fact that there are many passages in which Locke himself insisted on the reality of substance in general. Although there is no particular idea of substance in general that Locke was thereby endorsing, we shall see that Locke's critical approach itself constructs an alternative non-traditional approach to

substance.

B. The bare particular approach: Locke's notion of substance is that of a bearer of qualities which is nothing more than a substratum or support for these qualities and is therefore in itself qualityless or featureless, with no qualities of its own. McCann claims that this is in fact the (absurd) position to which Locke's reasoning ought to have led him, according to Berkeley's famous criticism of Locke. However, Berkeley criticizes Locke for inconsistency: "His [Berkeley's] complaint is the opposite one, that Locke's notion of substance as substratum (as this figures in the idea of material substance) is too robust." (1994, 87). This is because Locke also adopts the corpuscularian theory of matter. McCann agrees with Berkeley at least to the extent that he thinks that the bare particular approach does not have any place in the corpuscularian theory, which was, after all, Locke's aim to advance. According to McCann, if we take the substratum of a body to be something over and above the aggregate of insensibly small particles or corpuscles of matter that make it up, then we have rejected corpuscularianism (1994, 76). It might of course be argued that even a single corpuscle requires a substratum to support its qualities. However, what supports the qualities of an

observable body, according to corpuscularianism, is just the corpuscles themselves. As we shall see later, the approach that identifies substance with real essence rescues Locke's corpuscularianism from this criticism by rejecting the bare particular approach.

Although the bare particular approach has been criticized by some commentators, the notion does not seem absurd to every one of them²³

C. The identification approach or the real essence approach:
This could be put into two forms:

²³In fact this notion has been defended by some 20th century philosophers and commentators such as Russell in (1959) and especially in his paper "On the Relation of Universals and Particulars." He thinks that his theory of substance as presented in this paper involves an implicit appeal to the notion of bare particular. Also see Edwin B. Allaire in his papers (1963) and (1965), the latter being a reply to V. C. Chappell's "Particulars Re-Clothed" (1964), which is a discussion of Allaire (1963). Another defender of this approach is Gustav Bergmann in his 1967 book.

Loux in his book (1978), page 147, criticizes it by adopting Wilfrid Sellars' arguments, offered in his paper "Particulars" (1952). Sellars thinks that the notion of bare particular is implicitly contradictory. Loux built on that his argument (which is in essence Sellars argument) as follows: The defender of bare particulars tell us that an entity is bare just in case it *exemplifies* no properties *essentially* (my emphases). If a thing is bare, it would seem, then it is necessarily bare. But, then every entity that is bare has at least one property essentially, the property of having no properties essentially, and this is to say that the notion of bare particular is inconsistent and impossible, because the property of having no properties essentially is itself a property that is essential to any thing that has it.

(i) The standard real essence approach: The view identifies substance with what Locke calls real essence, or the corpuscular constitution of a thing, considering Locke's talk about an underlying "substratum" or "support" as just his way of talking about the fact that all of the observable qualities of a body in some sense causally flow from its underlying real essence or corpuscular constitution. Stillingfleet, Mandelbaum, Yolton, and possibly Woolhouse, are defenders of this approach. I will focus on this approach later.

(ii) Ayers offers a form of real essence approach which is frequently, but according to Ayers mistakenly, equated with the above.²⁴ It has been considered by some commentators (such as Alexander [1985, 216]) as an attempt to support an argument in the favor of the standard real essence identification approach, or at least as a source of it (as McCann thinks [1994, 88]). However, Ayers himself has subsequently denied that it was meant to support the standard real essence approach to substance in general. As McCann notice: "Ayers has informed me in correspondence that he never in fact

²⁴I should acknowledge here that without the help from Dr. Aquila to clarify Ayers' view, this point would have been impossible to make. Conversation with him in October 1994 was very helpful in clarifying some issues in Locke's philosophy. Also, Dr. Aquila's excellent mastery of Locke's commentators, especially Ayers' writings, further helped me in elucidating this approach.

intended to do this" (1994, 88, note 13). McCann explains this misconstrual of Ayers' position as follows: Some of Ayers' arguments against the view that Locke is committed to substratum as an actual entity distinct from the real essence, and from the individual objects, are similar to arguments given by Mandelbaum, and this similarity may have contributed to the misconstrual of Ayers' position. However, McCann admits that "Ayers's essay does contain a forceful and influential presentation of some of these arguments" (88).

Ayers does adopt a form of real essence approach, but his use of the term "real essence" in this context is different from that in the above interpretation. What Ayers means by "real essence" is something different from what Locke officially calls "real essence." For Locke "real essence," within talk about material substance, is simply the corpuscular constitution from which the individual's observable qualities flow. Thus it is always with regard to the real essence of individuals that Locke uses that term. What Ayers has in mind, at least with regard to matter, might rather be called the real essence of matter itself (and of mind, if we were to extend our consideration thereto). Thus while Ayers has in mind an ultimate identification of substance in general and essence in Locke, he should not be

taken as a proponent of the sort of view that Mandelbaum has proposed. He argues with Mandelbaum that substance is neither identifiable with the particular object nor with a bare particular instantiating its qualities. However, it is not identified with real essence, in Locke's sense either. He thinks that Locke was not talking about substance as any sort of particular entity at all, nor with a thing's corpuscular constitution. Then what is it? Ayers seems mainly content to emphasize mystery at this point. Thus there is something that remains mysterious which even the corpuscular constitution of a thing cannot explain; as we shall see, however, we may still have two possibilities:

1. to leave the issue open, saying nothing more about it;
2. to bring in a notion to which Ayers in fact gives a lot of weight in his discussion of Locke, namely, that of some sort of supernatural element at the heart of Locke's naturalism.

I will discuss Ayers' view in more detail below in section 20.2, and in the epilogue.

D. A concrete ordinary object view: The view that Locke's substance, as substratum, is something we observe as an ordinary object. This is Martha Bolton's view. This view

will be discussed later (section 20.4).

E. Alexander's approach: Alexander considers Locke's talk about "substance in general," at least regarding material substance, as simply his way of talking about the matter of which material things are composed. Solidity considered in this approach, as we saw in Chapter One, as the very essence of matter. Thus matter is in its essence some sort of general solid stuff. I will discuss Alexander's approach in detail later (section 20.5).

F. Jonathan Bennett.

There are two approaches offered by Bennett, one of them in his 1971 book, where Bennett thinks that "Locke's treatment of 'substance in general' is mainly skeptical in content and ironical in form" (61). This seems to be similar to Mackie's approach, discussed above. Since Bennett himself rejects this approach in his 1987 article "Substratum," I will not address it. In his new approach Bennett is arguing that the concept of substance in general is as the concept of something that instantiates qualities. Bennett's emphasis on the logic of instantiation of qualities is meant basically to be an approach that opposes the identification of substratum and real essence in all its forms, although Bennett particularly refers to Ayers. This will be discussed in more detail later

on in this chapter, section 20.3.²⁵

G. McCann's approach: The view that there will always be something unexplained (e.g., cohesion). Locke's talk about substance in general is not meant to suggest an explanation for anything, but only a way of referring to whatever must remain ultimately a mystery to us.²⁶

I will discuss these approaches in some detail through out this chapter while I am discussing substance in general.

15. Substance in General: Locke's Non-Traditional Treatment.

We may now take a more direct look at what Locke actually says.

Locke thinks that in the mind - which is furnished with a great number of simple ideas - there are a certain number of

²⁵Bennett also criticized Elizabeth Anscombe, who in her 1981 article understood the idea that a substratum has to be the bearer of all the qualities, and must therefore be bare or unqualified, in a way that makes it "so idiotic as to be almost incredible" (38) Bennett thinks that the substratum idea does involve a problem that could be put in terms of the upholder of properties not itself having properties, "yet it is not idiotic or absurd" (1987,199).

²⁶McCann in his 1994 article in footnote #13 said that his view is similar to that of Ayers, and in footnote #7 said that his view is similar to that of Bennett. Since Bennett's view is completely opposed to Ayers' view, I think due to this apparent contradiction, it is necessary to separate McCann's view for the sake of clarification.

simple ideas that go constantly together

which being presumed to belong to one thing, and Words being suited to common apprehension, and made use of for quick dispatch, are called so united in one subject, by one name; which by inadvertence we are apt afterward to talk of and consider as one simple *Idea*, which indeed is a complication of many *Ideas* together; Because as I have said, not imagining how these simple *Ideas* can subsist by themselves, we accustom our selves, to suppose some *Substratum*, wherein they do subsist, and from which they do result, which therefore we call *Substance*. (II.XXIII.1)

We might note at first, in light of the ambiguity of 'ideas,' that Locke means by a "single idea" a simple appearance of some quality of an object immediately present to our senses. In fact, Locke considers single ideas as sources of at least some sort of knowledge, given their necessary conformity to some reality outside us:

the Mind comes to reflect on its own operations, about the *Ideas* got by sensation, and thereby stores it self

with a new set of *Ideas*, which I call *Ideas of Reflection*. These are the *Impressions* that are made on our *Senses* by outward *Objects*, that are extrinsical to the *Mind*; and *its own Operations*. (II.I.24)

However, that does not yet raise the question of substance in general. The idea that concerns us is that Locke calls the "*Notion of Pure substance in general*," or simply "*substance in general*." Locke thinks that if someone examines his idea of substance in general, he will find "no other *Idea* of it at all, but only a *Supposition* of he knows not what support of such *Qualities*,...which *Qualities* are commonly called *Accidents*" (II.XXIII.2). The relationship between accidents and substance is well known in the history of philosophy, but, contrary to what is frequently supposed, and Locke's own terminology, Locke was not concerned with this metaphysical problem as traditionally understood in the philosophical heritage.

Locke started with the data of natural science of the seventeenth century in order to support his acceptance of the corpuscularian hypothesis to deal with problems presented in both science and philosophy. He faced a real problem in that qualities of matter cannot subsist by themselves; thus they

necessarily need a subject or something in which they inhere and subsist. On one level, of course, this subject might be regarded as the corpuscles themselves. Thus: "If any one should be asked, what is the subject wherein Colour or Weight inheres, he would have nothing to say, but the solid extended parts" (II.XXIII.2). In any case, there is no doubt that the quote above might also be interpreted as if Locke were dealing with, and operating within, the traditional subject-predicate conception of substance as it has been passed on since Aristotle. It is true that what Locke said above implies the grammatical sense of substance, simply because when we talk of colour, we talk about the colour *of something*. Therefore, a quality must be a quality of something and must exist in something if it is to exist at all. However, in fact, I want to suggest that Locke was trying to go beyond the subject-predicate conception of substance. Although he could not overstep the Aristotelian logic altogether, nevertheless, Locke's concern was different. For example, after he raised the question as to in what colour or weight inheres, he said that the only answer would be in "the solid extended parts," and then he continued on to raise a critical question, which would mark a significant turn in the philosophy of substance, saying that one could then demand to know "what is it, that

that Solidity and Extension inhere in" (II.XXIII.2). I am aware here and I acknowledge that this statement of Locke itself can be, and has been taken as, still wholly within the subject-predicate metaphysics. However, I shall suggest that Locke has something different in mind.

For Locke (in contrast to the Cartesian)²⁷ solidity and extension are questionable.

Locke sometimes expresses his difficulty with extension and solidity in terms that suggest the traditional approach: In what do extension and solidity inhere? Yet he also emphasizes that, as so formulated, the question seems to be pointless:

he would not be in a much better case, than the
*Indian...who, saying that the World was supported by a
great Elephant, was asked, what the Elephant rested on;*

²⁷Descartes believed in the existence of universal matter or material substance in addition to the mind or spirit. Descartes' approach to "extended substance" differs from that which either an Aristotelian or a defender of "Bare particulars" would adopt. Locke himself was concerned about how that universal matter or substance in general is modified in order to form the natural kinds. Locke's answer would be that it is modified by the real essences or the different underlying structures or constitutions. The fundamental difference from Descartes is that Locke regarded the very idea of extension and solidity as problematic in the first place.

to which his answer was, a great Tortoise: But being again pressed to know what gave support to the broad-back'd Tortois, replied, something, he knew not what. (II.XXIII.2)

From this Locke drew a conclusion:

thus here, as in all other cases, where we use Words without having clear and distinct *Ideas*, we talk like children...The *Idea* then we have, to which we give the general name Substance, being nothing, but the supposed, but unknown support of those Qualities, we find existing, which we imagine cannot subsist, *sine re substante*, without something to support them, we call that Support *Substantia*; which, according to the true import of the Word, is in plain *English*, *standing under or upholding*. (II.XXIII.2)

This passage may of course be taken to suggest the non-endorsement interpretation of Locke's discussion of substance. However, as noted briefly earlier there are also passages in the *Essay* that strongly support the idea that Locke accepted the real existence of substance. Thus Locke said:

from our not having any notion of the *Substance* of spirit, we can nor more conclude its non-Existence, than we can, for the same reason, deny the Existence of Body: It being as rational to affirm, there is no Body, because we have no clear and distinct *Idea* of the *Substance* of Matter; as to say, there is no Spirit, because we have no clear and distinct *Idea* of the *Substance* of a Spirit. (II.XXIII.5)

As noted earlier as well, Locke also defended himself against Stillingfleet's claim that Locke discarded the concept of substance out of the reasonable world.²⁸ In his reply to Stillingfleet's first letter Locke said: "as long as there is any such thing as body or spirit in the world, I have done nothing towards the discarding substance out of the reasonable part of the world" (*Works* IV, 7). Stillingfleet took what Locke said in the *Essay* about substance simply as saying that we accustom ourselves to suppose some substratum. To this misunderstanding Locke replies: "I grounded not the being, but

²⁸Maybe the first scholar who noticed the significance of Locke's treatment of substance is Stillingfleet. Nevertheless he perceived it negatively. He thought that Locke's "dismissive" treatment of substance was part of an attack on the traditional theological doctrine of Trinity, whereas Locke's concern was clearly epistemological.

the idea of substance, on our accustoming ourselves to suppose some substratum; for it is of the idea alone I speak there, and not of the being of substance" (*Works*, IV, 18). Locke referred Stillingfleet to his *Essay* II.XIX.13 and II.XIII.19 where

you will find those passages were not intended to ridicule the notion of substance, or those who asserted it, whatever that 'it' signifies, but to show, that though substance did support accidents, yet philosophers, who had found such a support necessary, had no more a clear idea of what that support was, than the Indian had of that which supported his tortoise, though sure he was it was something. (*Works* IV, 448)

However, Locke also introduces an element into his discussion of substance besides that of inherence or supporting accidents. Here it becomes clearer that this issue is not that of some sort of particular "thing" underlying accidents, but simply a special sort of togetherness connecting the accidents, modes, or qualities, that natural science is in a position to examine as accidents, etc. of particular things. In calling what accounts for this

togetherness "substance," there is no presumption that it is itself a particular thing. The emphasis is simply on "combination" itself. Thus Locke said:

all the Ideas we have of particular distinct sorts of substances, are nothing but several Combinations of simple Ideas, coexisting in such, though unknown, Cause of their Union, as makes the whole subsist of itself.
(II.XXIII.6)

This idea of an underlying substance in terms of an underlying causal power of union or combination marks a move away from the traditional treatment of the concept "substance." Locke is not only discussing something that might be called "substratum" in which qualities subsist and inhere, but also the unknown cause of the union of those sensible qualities of a body. Thus, Locke's concern was not, or at least not simply, with the questions: *what underlies accidents or qualities? and is it material or not; could it exist by itself with no accidents?* Such questions constitute the major discussion and literature of ancient and medieval metaphysics. Locke, from the background of corpuscular philosophy, raises this question: *how could the qualities in*

question be unified or hold together? Such a move from "what" to "how" was not a Lockean mood, rather it was an aspect of seventeenth century thought. (Of course, another reason the problem of substance couldn't be dealt with in terms of the traditional approach is one I gave earlier: for Locke, the need for a notion of substance is not simply a need to account for the togetherness of qualities in a single thing, but also to account for such a thing as the very qualities of extension and solidity in the first place.) Thus if the Bishop of Worcester charged Locke with discarding the concept of substance out of the reasonable part of the world, I think he was in a way not mistaken, because Locke was not dealing with the concept "substance" in the same way that Stillingfleet and other philosophers were accustomed to dealing with it.

However, to make this point fully, we shall have to return to the concepts of "cohesion" and "power," which I shall treat extensively in Chapter Three.

16. Substance as Support or Substratum of Ideas.

It is also worth noting that some of Locke's talk about substance can be confusing, because he frequently talks about substance as a substratum or support for ideas. Thus:

Because, as I have said, not imagining how these simple Ideas can subsist by themselves, we accustom ourselves to suppose some *Substratum*, wherein they do subsist, and from which they do result, which therefore we call *Substance*. (II.XXIII.1)

This passage may give the impression that Locke here is looking for, and talking about, a substratum as a support of simple ideas. Such an interpretation is not easy to support, because immediately after that, in section two of the same chapter, Locke starts to talk about substance in the material sense as a support of qualities or "accidents." Locke's continuing discussions in sections three and four is on corporeal substance as something in which qualities subsist. If he needs to find a substratum to support simple ideas, then such a substratum must be mental substance, but Locke did not discuss mental substance when he talked about simple ideas. One way to deal with this problem is to give a purely causal interpretation of the notion of "support" for simple ideas. Even if we are talking about corporeal substance, we can think of it -- or at least particular corporeal substances -- as the causal source of the togetherness of simple ideas, or appearances, in our sensory experience. In that sense,

corporeal substances may be thought of as the underlying substance or support for those ideas. However, when Locke talks about what accounts for particular combinations of simple ideas in our experience, he seems always to be talking about the underlying corpuscular constitution of objects. Therefore, this way of looking at it seems to favor the identification of substance with Locke's "real essence," which I shall criticize later.

A better approach might be that of Alexander, although we do not have to accept Alexander's own view of substance (as a general stuff out of which things are made) in order to adopt it: "I take Locke to be saying that we cannot imagine how groups of qualities, represented by groups of simple ideas, can subsist by themselves; qualities need something to qualify. Whatever they all qualify we call 'substance'" (1985, 208). Alexander offers this interpretation in the light of what Locke himself said in II.VIII.8, when he discussed ideas as sensations or perceptions and then adds "*which Ideas, if I speak of sometimes as in the things themselves, I would be understood to mean those qualities in the objects which produce them in us.*" Accordingly, when Locke said something such as "the power of drawing iron is one of the *Ideas* of the complex one of that substance we call a Loadstone"

(II.XXIII.7), Alexander takes this to be understood "as saying not that power in a *substance* is an idea but that the idea of the power is part of the idea of a Loadstone. The power is what causes the idea in us" (1985, 208).²⁹

This approach would allow us to regard Locke's primary interest as the problem of what holds together the very qualities of particular objects, rather than what accounts for combinations of ideas in our experience, although of course Locke is interested in the latter question too. However, what I want to suggest in this dissertation is that it is possible to recognize Locke's interest in this problem of what holds together the qualities of objects, and thus supports them, without adopting either a standard subject-predicate approach, or a bare-particular theory, or other views of the sort mentioned earlier. At the same time, it also allows us to emphasize a causal element, without having to identify Locke's notion of the substance or substratum with the real essence

²⁹I think that Alexander's interpretation has some positive aspects such as: 1. It keeps Locke's discussion more consistent. 2. It avoids our facing a paradox similar to those in the field of set theory. If we think and talk about the substance of ideas, then we must have an idea of that substance of ideas and this idea must inhere in a substance and so on. Thus is the "idea" of all ideas of "substance of ideas" included in the last idea or is it not? It is not easy to find a solution for paradoxes in Locke's *Essay*; however, it is not difficult to find some of them throughout it.

(in Locke's sense) from which a thing's qualities causally flow. This would be the case, for example, if the underlying substance is something like a fundamental and unknown cohesive power or force as opposed to a thing or combination of things.

On the other hand, there must also be a substratum for mental qualities. This is what Locke calls spiritual substance. Such substance is the idea of that thing in which mental operations subsist; it is "the *Substratum* to those Operations, which we experiment in our selves within" (II.XXIII.5). Spirit is clearly defined by Locke as "a Substance, wherein *Thinking, Knowing, Doubting*, and a power of *Moving, etc.* do subsist" (II.XXIII.5). In this sense, spiritual substance is also the substratum for ideas, insofar as ideas are something mental and therefore a part of our mental operations.

Putting aside the possibility, which Locke recognized, that mental operations might really be operations on the part of something material, what alternatives are there here? On the real essence approach, as it is standardly understood, this seems to lead to difficulty. It would require us to suppose something analogous in a immaterial being to the corpuscular constitution of bodies from which their particular powers and sensible qualities flow. As we have seen,

Alexander suggests an alternative: some kind of undifferentiated mental "stuff" out of which minds are formed, analogous to the solid stuff out of which bodies are formed. Another alternative would be to suppose some special sort of mental cohesion analogous to the cohesion that must ultimately hold together the qualities of a body and even makes the primary qualities of a body possible in the first place. However, the fact is that Locke himself seems to limit his attention to the case of corporeal substance.

17. The Obscurity of the Idea of Substance.

I would also like to comment briefly on the obscurity of the idea of substance for Locke. That emphasis -which may be fully justified- should not be taken to suggest that he is not in fact endorsing the supposition in question, as obscure as that supposition might in fact be. According to Locke, "We have no clear, or distinct *Idea* of that *thing* we suppose a Support" (II.XXIII.4). Also in Section 15 of the same chapter, in discussing the idea of spiritual substance: "For our *Idea* of Substance, is equally obscure, or none at all, in both; it is but a supposed, I know not what." And again: "An obscure and relative *Idea* of Substance in general being thus made" (II.XXIII.3).

I would like to point out that all of our ideas of particular substances, which are complex ideas, already include or contain, as a component idea, the idea of substance in general. In other words, we don't first get the latter by a process of abstraction from our ideas of particular things. How do we get it as a simple idea from sensations and reflections:

the *Idea of Substance*, which we neither have, nor can have, by *Sensation* or *Reflection*... We have no such *clear Idea* at all, and therefore signify nothing by the word *Substance*, but only an uncertain supposition of we know not what; (*i.e.* of something whereof we have no particular distinct positive) *Idea*, which we take to be the *substratum*, or support, of those *Ideas* we do know.
(I.IV.18)

An obvious question is where we get the idea of substance in the first place, if it is not derived from sensation or reflection. This would be a serious problem if the idea of substance were supposed to be the idea of a special sort of thing, or of something that stands in a special sort of relation ("supporting") to the qualities that we apprehend

through sensation and reflection. However, I agree with Ayers that, insofar as it involves any actual idea of substance, Locke's talk about substance is primarily talk only about our own ignorance, or about the obscurity of our knowledge of what we do apprehend through sensations and reflection.

It is also necessary to be careful when Locke talks about "clear ideas." In this context the only clear and distinct ideas we have are ideas of the qualities or properties of certain substance, derived from sensations and reflections, but, of course, not of the substance itself. Anything beyond these ideas of certain qualities will not only be incomprehensible because of its nature but also impossible to know or to comprehend due to the limitation of our faculties. However, we should also note that in fact Locke placed a limit to the clarity of our ideas even of primary qualities themselves. We should not think that the only obscurity lies in the ideas of an underlying support for such qualities. Locke said:

But beyond these *Ideas*, as received from their proper Sources, our Faculties will not reach. If we would enquire farther into their Nature, Causes, and Manner, we perceive not the Nature of Extension, clearer than

we do of Thinking. (II.XXIII.29)

This relates to my suggestion that substance for Locke, if we could apprehend it, would not simply provide an understanding of a "support" for a quality such as extension, but would be what first allows us really to understand extension itself. In this context, in other words, the idea of extension, even though it is presented to the senses, is just as obscure as the idea of substance itself.

This point supports my argument that Locke's conception of substance in general is an attempt to go beyond the traditional conception of substance as mere support for qualities or subject of predicates. Locke places a great deal of emphasis on our limitations. What we know is limited to our ideas which represent, according to Locke, the boundaries of our thoughts. Moreover, the knowledge of such a being is not a matter of scientific progress. Locke said:

it seems probable to me, that the simple *Ideas* we receive from Sensation and Reflection, are the Boundaries of our Thoughts; beyond which, the Mind, whatever efforts it would make, is not able to advance one jot; nor can it make any discoveries, when it would prie into the Nature

and hidden Cause of those *Ideas*. (II.XXIII.29)

Despite this pessimism Locke's use of the expression "clear *Ideas*" may give us the impression that we have at least a clear comprehension of the qualities of objects, as we are aware of them through sensation and reflection. However, as we shall see more clearly in the next chapter, that is not really so. We are as unclear as to the nature of extension and solidity as we are of its underlying substance; in fact the two questions are not really distinct for Locke.

In any case, Locke's commentators have different points of view concerning the issue of the unknowability and the obscurity of the idea of substance in general.³⁰ Nicholas

³⁰Some commentators emphasis other issues underlying Locke's concern with discussing and introducing the notion of substance. Woolhouse thinks that Locke's motivation in introducing this idea represents a "Lockean attempt to explain the nature of substantival concepts" (1971, 68), in other words to make a distinction between concepts of things as substantival and concepts or ideas of dependent things or entities. Thus "The notion of Substance, it has appeared, is to be understood as belonging to an account of substantivality whilst that of a corpuscular real essence is the key to a suggestion as to how Nature's regularities ought to be explained" (134). This...of issues concerning substance from issues concerning causality and the natural order is opposed in this dissertation. Locke himself emphasizes this in emphasizing the unknowability of substance: "For when the Mind would look beyond those original *Ideas*...and penetrate into their Causes, and manner of production, we find still it discovering nothing but its own short-sightedness"

Jolly, in his book *Leibniz and Locke* (1984, 83), divides commentators into two opposing camps. One is Bennett (1971), who thinks that Locke's interest is in a problem of predication. Because of this interest, substance can only be "something" that we cannot capture, since nothing can be said except that its function is to bear or support qualities. This is why Locke was led to consider the idea of substance in general as an obscure idea (Bennett 1971, Chapter 3). The other are Michael Ayers and John Yolton, who think that Locke's claim about the obscurity of the idea of substance relates to the limits of scientific knowledge in his own day. Thus substance, if we could comprehend it, could be used to explain the observable, macroscopic qualities of body. Ayers called it a 'dummy concept' in his "Ideas of Power and Substance" (1975, 85) meaning that it is really only a placeholder for what remains beyond our power of comprehension. Jolley comments: the "idea [of substance] is obscure not because a substratum underlying all properties can have no nature, and would thus be in principle unknowable, but because on the present state of scientific knowledge there is more to be known about why the observable features cluster and behave

(II.XXIII.28).

in the way they do" (1984, 84). This comes closest to my own point of view. However, what it neglects is that Locke saw a problem, not only in accounting for how observable qualities of bodies "cluster and behave" in certain ways, but in comprehending the very nature of those qualities themselves, including the supposedly most "clear" qualities of extension and solidity.

18. The Real Essence Approach.

Perhaps the most common alternative to an approach that emphasizes predication is the approach that identifies substance with what Locke calls "real essence." This approach has been described by McCann as "probably the currently most widely accepted interpretation of Locke's doctrine of substance" (1994,81). The central idea here is that Locke's talk about the need for ideas, or the observable qualities of objects, to have an underlying support may be equated with his view of them as "supposed to flow from the particular internal Constitution, or unknown Essence of that [particular] Substance" (II.XXIII.3). In support of this, we may note three things: 1. Locke is speaking of both substance and real essence as "supposed." 2. Locke's notion of substance is causal, and so, as we shall see, is his notion of real

essence. 3. Locke speaks of both as "unknown" and even "unknowable."

The real essence of a substance is "that Foundation from which all its Properties flow, and to which they are all inseparably annexed" (III.III.18). By this definition Locke differentiates his account of real essence from two other views: first, the traditional one which conceived the real essence of a thing as a substantial form³¹ and second,

³¹Locke discusses this view as the one represented by those

who using the Word *Essence*, for they know not what, suppose a certain number of those *Essences*, according to which, all natural things are made, and wherein they do exactly every one of them partake, and so become of this or that *Species* (III.III.17).

Locke criticized such a view that considers real essences as irreducible natural kinds, where the determination of species is only a way of how nature works. On this approach nature is what sets the boundaries of species of things. Locke plainly rejects this view: "I cannot see how it can be properly said, that Nature sets the Boundaries of the Species of Things" (III.VI.30). The fact that Locke was, from a corpuscular philosophy, looking for a more particular and understandable conception of corporeal substances makes him think that such a universal conception of their "real essence" is an unacceptably obscure and confused notion. Those who think that the species of substances have their distinct internal substantial forms which constitute their distinction into species and genera, have their

Mind set upon fruitless Enquiries after *substantial Forms*, wholly unintelligible, and whereof we have scarce so much as any obscure, or confused Conception in general (III.VI.10).

Stillingfleet's notion of the real essence as flowing from the substance. Locke said in his letter to Stillingfleet:

Here I must acknowledge to your lordship, that my notion of these essences differs a little from your lordship's; for I do not take them to flow from the substance in any created being, but to be in every thing that internal constitution, or frame, or modification of the substance, which God in his wisdom and good pleasure thinks fit to give to every particular creature, when he gives it a being. (*Works* IV, 82)

Locke considers various qualities to flow from the internal constitution or real essence of a substance; he does not consider that essence itself, however, to flow from the substance in question. Rather, it requires that a particular modification be "given" to the latter. The real essence, as Locke understands it, is a particular modification. Assuming that it is a particular modification of the "substance in general" underlying the object in question, this seems to make it clear that it is incorrect to identify that substance in general with the real essence in Locke's sense, that is, with

the particular corpuscular constitution. I shall suggest in Chapter Three that it is more reasonable to think of the underlying substance as what accounts for the very cohesion of matter that makes such a corpuscular constitution possible in the first place. The real essence may then be regarded as a particular modification of that general cohesive power.

We might also find a difficulty in the real essence approach by considering Locke's views about the unknowability of real essences in comparison with that of the underlying substance of things. As mentioned already, Locke frequently emphasizes the limitations of our power of knowing. For example, in the chapter on substance, he mentions the cohesion of bodies as something beyond our comprehension:

He that could find the bonds, that tie these heaps of loose little Bodies together so firmly; he that could make known the Cement, that makes them stick so fast one to another, would discover a great, and yet unknown secret. (II.XXIII.26)

Locke also mentions our ignorance as to how one body moves another. All we can say is that it involves "impulse," but this process is unknown to us too: "For in the communication

of Motion by impulse,..., I think, is as obscure and inconceivable, as how our Minds move or stop our Bodies by Thought" (II.XXIII.28). And of course Locke emphasized our ignorance of the underlying substance of things: "The substance of Spirit is unknown to us; and so is the substance of Body, equally unknown to us" (II.XXIII.30).

What about our ignorance of real essence, that is, of the particular corpuscular constitution from which the observable qualities of things flow? Is it for example unknowable in principle (as I shall argue in the next chapter the underlying substance of things is unknowable), or might we hope to know it in the future according to the advance and development of our experimental philosophy?³² In any case, what is the nature of its unknowability?

Locke has doubts that the enhancement of instruments or the development of experimental science will ever give us a perfect and adequate complex idea of real essence:

³²James P. Danaher in his paper "Did Locke Believe that Real Essence Would Someday Be Knowable?" (1991) argues against the view of some (or as Danaher thinks many) that our ignorance of real essence is temporary and will vanish due to the development of science. Danaher thinks that this position is incorrect, and the legitimate consequence of what Locke says is that the real essence of material substance will never be known in spite of whatever instruments are developed. However, it is clear from Locke's text that it is not merely a matter of scientific instruments which determines the knowability of real essence.

I am apt to doubt that, how far soever human Industry may advance useful and *experimental* Philosophy in *physical things*, *scientific* will still be out of our reach: because we want perfect and adequate *Ideas* of those very Bodies, which are nearest to us, and most under our Command...Thus having no *Ideas* of the particular mechanical Affections of the minute parts of Bodies, that are within our view and reach, we are ignorant of their Constitutions, Powers, and Operations. (IV.III.26)

Indeed, he seems skeptical as to the possibility of ever having an adequate idea of the real essence of anything:

we have very imperfect Ideas of Substances; and that the real Essences, on which depend their Properties and Operations, are unknown to us. We cannot discover so much as that size, figure, and texture of their minute and active Parts, which is really in them; much less the different Motions and Impulses made in and upon them by Bodies from without, upon which depends, and by which is formed the greatest and most remarkable part

of those Qualities we observe in them, and of which our complex *Ideas* of them are made up. This consideration alone is enough to put an end to all our hopes of ever having the *Ideas* of their real Essences; which, whilst we want, the nominal Essences, we make use of instead of them, will be able to furnish us but very sparingly with any *general Knowledge*, or universal Propositions capable of real *Certainty*. (IV.VI.12)

"This consideration alone is enough to put an end to all our hopes of ever having the *Ideas* of their real Essences." This seems to say that it is impossible in principle for us to have such knowledge. Thus it may seem to open the possibility of equating our ignorance of the underlying substance of things with our ignorance of their real essences. However, we have to remember to consider Locke's discussion in the context of his general views about "knowledge." Locke has a very high standard for calling something knowledge, in the technical sense in which he generally uses the term, although he does sometimes use the term more loosely. He does not require absolute certainty, although he does require certainty (III.VI.50, IV.VI.9). Thus in his discussion of sensitive knowledge in Bk. IV, he holds that we can know that something

is presently affecting our senses, even if that is not beyond all conceivable doubt (IV.III.5). On the other hand, Locke's demands of knowledge are so strict that we can not claim to have genuine knowledge of the *continued* existence of things no longer affecting our senses, not to mention the underlying natures of those things.

The important point to make is that, even if we could never have genuine knowledge or certainty of the natures of things, the question would still remain whether we might hope, with the advance of science, to have a sufficient basis for making probable judgments and hypotheses, of the sort that would at least count as "knowledge" in science, even if it is really not strictly speaking knowledge. Locke does not seem to exclude the possibility of that sort of progress in gaining "knowledge" of the real essences of things, that is, in gaining what we might call knowledge of such matters. As we shall see in the next chapter, however, Locke's discussion of the mystery of cohesion, which he himself connects with our ignorance of the underlying substance of things, seems to be of a different sort. Locke nowhere suggests that we might ever be able to have a basis for making probable judgments in the matter.

Our ignorance regarding real essences lies in the fact

that they are supposed to be what accounts for certain connections among our ideas, that is, among the observable data grounded in those essences. Thus Locke complains about our "want of a *discoverable Connection* between these Ideas which we have. For wherever we want that, we are utterly incapable of universal and certain Knowledge" (IV.III.28). "The Things that, as far as our observation reaches, we constantly find to proceed regularly, we may conclude, do act by a Law set them" (IV.III.29). Locke immediately adds:

but yet by a Law, that we know not: whereby, though Causes work steadily, and Effects constantly flow from them, yet their Connexions and Dependencies being not discoverable in our Ideas, we can have but an experimental Knowledge of them.

Because of this ignorance and darkness we are involved in, and how little we are capable of knowing, "we are so far from being able to comprehend the whole nature of the Universe, and all things contained in it" (IV.III.29). This ignorance involves two things: first, the corpuscular structure itself, with its corpuscles defined in terms of primary qualities; second, the *connections* between these

primary qualities and the observable qualities of bodies.

Locke says:

Besides this Ignorance of the primary Qualities of the insensible Parts of Bodies,... yet another and more incurable part of Ignorance,...that there is no discoverable connection between any *secondary Qualities*, and those *primary Qualities* that it depends on.
(IV.III.12)

Because of our lack of insight into necessary connections between the *ideas* of the qualities in question, analogous to the sort of insight that would yield knowledge in mathematics (IV.IV.6), we cannot have knowledge of the connections in question. That is, we cannot have sufficient certainty to reach the level of knowledge in Locke's strict use of that term. Accordingly, Locke concludes:

But as to a perfect *Science* of natural Bodies, (not to mention spiritual Beings) we are, I think, so far from being capable of any such thing, that I conclude it lost labour to seek after it. (IV.III.29)

We need to remember, however, that Locke also said: "though Causes work steadily, and Effects flow from them, yet their Connexions and Dependencies being not discoverable in our Ideas, we can have but an experimental Knowledge of them" (IV.III.29). Here Locke must be using the term "knowledge" loosely, namely, for something about which we might make a probable judgment of the sort that is to be found in the most advanced sciences. In other words, even if the real essences of things are strictly unknowable, we may possibly with the advancement of science be able to make judgments about such things that are sufficiently reasonable to count as "knowledge" in a more everyday sense. What I want to emphasize is that the situation is very different, once we connect the problem of substance in Locke with the problem of the underlying cohesion of matter itself, as we shall do in the next chapter. For Locke nowhere suggests that we might someday have even "experimental" knowledge of such a thing. To the contrary, he suggests that such a thing is completely beyond the capacity of philosophy or natural science.

19. Real and Nominal Essence.

Before going on, it may be useful to add for the sake of completeness a few additional points regarding real and

nominal essence. First, I want to emphasize that Locke generally speaks of real essences as the corpuscular constitution of particular individuals from which all their observable qualities flow causally. However, the term might also be extended to refer to the real essence of, for example, matter in general. This is what Ayers has in mind when he suggests the possibility of equating substance with real essence in Locke. That is very different from the approach I have just considered. Second, while Locke generally speaks of real essences as the corpuscular constitution of particular individuals, he also sometimes speaks of the real essences of species or kinds of things, e.g., gold. In a discussion of the concept of substance in Locke, it is only the first way of talking that is in question.

The real essence of a species would be a corpuscular constitution shared by all members of that species. One aspect of Locke's anti-Aristotelianism is that we can never know whether any given species does have a real essence. So what constitutes a species for Locke, since it is not a real essence? This is what Locke calls "nominal essence."

Nominal essence in Locke's philosophy is the abstract idea of a group of co-existent qualities and powers of a particular substance. The mind, and not nature, make the

nominal essence by collecting a number of simple ideas of qualities and powers and putting them together into one complex idea assigned by a name which stands for species. Locke said:

Since then it is evident, that we sort and name Substances by their *nominal*, and not by their real *Essences*, the next thing to be considered is, how, and by whom these *Essences* come to be made. As to the latter, 'tis evident they are made by the *Mind*, and not by Nature: For were they Nature's Workmanship, they could not be so various and different in several Men, as experience tells us they are. (III.VI.26)

However, as Locke also observes: "'Tis true that many particular Substances are so made by Nature, that they have agreement and likeness one with another, and so afford a Foundation of being ranked into sorts" (III.VI.30).

How is it possible for Locke to affirm that the things that exist are particular and at the same time ranked into sorts? In fact the sorting in question is the work of our own understanding, not of the real essence of things:

the *sorting* of them [Locke means things] under Names, is the *Workmanship of the Understanding*, taking occasion from the *similitude* it observes amongst them, to make abstract general *Ideas*, and set them up in the mind, with Names annexed to them, as Patterns, or Forms, (for in that sense the word Form has a very proper signification,) to which, as particular Things existing are found to agree, so they come to be of that Species, have Denomination, or are put into that *Classis*.
(III.III.13)

We sort things according to their observable qualities, but that does not mean that they share a single underlying structure. Of course, the forming of any idea by the understanding, in Locke's philosophy, must be made in the light of "experience." This is where the reference to observable similarities comes in.

20. Further Commentary on The Problem of Substance.

I would like to conclude this chapter with a brief survey of some commentators.

20.1. Mandelbaum.

I need only to refer briefly to Maurice Mandelbaum, since he defends the real essence approach on which I have already commented. He seems to be the first commentator to provide a systematic defense of that approach.

Mandelbaum is led to his conclusion by overemphasizing some passages from the *Essay*, for example, the one in Section 3 of Chapter XXIII, Book II, where Locke talked about simple ideas as "supposed to flow from the particular internal Constitution, or unknown Essence of that Substance." Mandelbaum take this passage "as evidence-though not conclusive evidence-that Locke actually was linking those notions in his own mind" (1966, 38, footnote 75). He suggests that it is possible to take "the unknown essence" to be equivalent to the Lockean substance or substratum in Locke's passage. This is because the idea of substratum functions simply as "a surrogate for what in the object is material and exists independently of us-i.e., that which is not merely an idea or groups of ideas...our conception of a substratum is an indeterminate and general notion standing for something in the object which makes that object a self-subsisting thing" (39). He then goes on to suggest that "this vague notion of a substrate corresponds to the atomist's view of the role of

atoms as the original and unchanging matter on which all sensible appearances depend" (39). From this analogy between the role or the function of substance and that of atomic structure, Mandelbaum drew the quick conclusion that "it is the *atomic constitutions* of objects, not "pure substance in general," which *cause the idea* of them which we actually have, and which also *cause the effects*, whether perceived or unperceived, which objects have upon one another" (39) (my emphasis). In effect, the idea of pure substance in general is simply an indeterminate notion whereby Locke is able to refer to *whatever* particular atomic constitution is in question. In this sense Mandelbaum concludes that the substance is identified with the atomic constitution of the material object, as he "believe[s] the context permits us to do" (38, footnote 75).

20.2. Ayers.

Eleven years after the publication of Mandelbaum's book, Ayers offered an argument similar to that of Mandelbaum. Ayers thinks that the concept of substance or substratum as something having properties is "a concept by which we refer to what is unobservable and unknown-or known only through its effects and relatively to the level of observation. In other words, *substance* is a 'dummy' concept like *power*" (1975, 85).

Ayers continued to say that "what underlies 'the powers or qualities that are observable by us' in anything is a *substance constituted* (or modified or determined) *in certain ways*. There are not two underlying levels, *first* the real essence, *then*, beneath it, the substance" (94).

Locke speaks of substance in general as a common subject and the same everywhere, "that unknown common subject, which inheres not in anything else" (II.XXIII.6). Locke also talked about "the *Idea* of a solid substance, which is every where the same, every where uniform" (II.X.15). Ayers argues that Locke says that substance is everywhere the same, "not because Locke thinks that there is a mysterious undifferentiated substrate, the same in everything, but because the idea is equally lacking in positive content whenever it occurs: the idea of 'something' is every where the same" (1975, 91).

Thus Ayers rejects the view that Locke's substance is something that underlies a thing's real essence, and he regards the indeterminate and general notion of substance in general not as a reference to something indeterminate underlying the qualities of things, but rather as an indeterminate way of referring to something, which may or may not be the same in different things. The question remains what the term might be referring to.

It is understandable that Ayers' position has been read as a defense of the real essence approach, as originally defended by Mandelbaum. For example, this is how Bennett (1987, 202) takes Ayers' approach. As we have seen, however, Ayers has stated (in correspondence with McCann) that this is not his position (McCann 1994, 88). The possible source of the confusion is that Ayers uses the term "real essence" in a broader way than Locke generally does. In particular, he uses the term to stand for the unknown essences of matter in general and of mind in general. This can in fact be connected with a broad use of the term "substances," where we might speak simply of two substances, spirit and body as Locke says in II.XXIII.5. Thus Ayers suggests: "Locke a little hesitantly shares with Descartes, an 'abstract', i.e. determinable nature...or with that of Boyle when he says of the physical world that there is one substance, 'universal matter'" (1975, 91-92).

Correspondingly, we may speak of the general essence of either of these two "substances." We might call this the real essence, in order to distinguish it from a purely nominal essence. However, it would not be real essence as Locke most often uses the term, namely, at least in the case of matter, the particular corpuscular constitution of a body:

although Locke normally, perhaps exclusively, uses the term 'real essence' for *specific* natures, he also uses the term 'essence' in the way of Descartes for the general nature of matter or spirit(cf. II, i, 10: '...the perception of *ideas* being... to the soul what motion is to the body: not its essence, but one of its operations'). In *this* usage, knowledge of essence and knowledge of substance are one and the same. (91, note 27)

I would like to note here that in identifying substance with real essence in the broader sense -- with the real essence of matter -- Ayers is not agreeing with Descartes' view that we actually have, or are even capable of having, a *clear idea* of that essence. For Ayers, we are ignorant of the real essence of matter (Ayers 1991, Vol, 2, 57). This of course also distinguishes Ayers' view from Alexander's, as we will see later.

In general, however, according to Ayers, if we couldn't say that particular bodies are X, e.g., extension or whatever the essence in question is, then it wouldn't make sense to say that the underlying *substance* of bodies is the X in question. In this way he is like Descartes. Ayers said: "If we had an

adequate idea [of the essence], the definition would have needed to contain no place-marker" to designate a substratum (1991, Vol, 2, 52). In other words, if the idea of extension were an adequate idea of the essence of body, then the two words would be interchangeable. Ayers quotes Locke from III.XI.21:

We can never mistake in putting the Essence of any thing for the Thing it self. Let us then in Discourse, put *Extension* for *Body*....He that should say, that one Extension, by impulse, moves another extension, would, by the bare Expression, sufficiently shew the absurdity of such a Nation. The *Essence* of any thing, in respect of us, is the whole complex *Idea*, comprehended and marked by that Name.

He interprets the passage above as if Locke were saying: "If X-ness were what extension is not, the essence of body, then to say that one X-ness impelled another would make sense" (Vol. 2, 52).

In this broader sense of real essence we may think about the identification of substance in general with real essence (as a corporeal or material general real essence) as somehow

acceptable. However I think there are two points I need to mention here that differentiate my view from that of Ayers, although they do not necessarily indicate that Ayers' view is implausible. First, Ayers thinks that the term "substance in general" refers to what we could call the "real essence of matter." Both of them must refer to the same thing, although Locke did not use the term "real essence" in that general reference, but rather he reserved the term to mean the particular corporeal structure. However, I think the concept of substance in general is not a mere place-holder for the eventual concept of that essence. Instead, it involves the concept of cohesion. Because substance in general involves some sort of "togetherness," "causing," and "unifying," and it is always associated with this kind of terminology, it essentially involves at least a general concept of cohesion. In fact the same passage that Ayers used to support his view states clearly that substance is "an unknown Support and Cause of ...Union." Thus even if "substance in general" and "real essence of matter" both refer to the same thing. Thus have the same reference, they still have a different sense. Second, I shall argue that the real essence of matter does not merely involve cohesion because it involves some general sort of unifying function, but rather it is a certain sort of

cohesion, the modifications of which constitute particular corporeal structure.

20.3. Bennett.

Bennett (1987), thinks that Locke's concept of substance in general as a support of qualities is a "substratum" that "instantiates" qualities, and thus understood in the logical sense of subject-predicate. Bennett's emphasis on the logic of instantiation of qualities is meant basically to be an approach that opposes the identification of substratum and real essence in all its forms. Particularly Bennett refers to Ayers.

Bennett thinks that if Locke means 'substratum' to refer to the real essence of kinds of substance, he would have no reason to say that the "first and chief" idea in our ordinary way of thinking is a "supposed or confused" idea. To the contrary, Bennett says, Locke thinks that our notion of real essence is not implied in our ordinary way of thinking, whereas the notion of substratum is: it is implied in the very notion of a *thing*. Also Locke never criticizes the idea of internal constitution as "supposed or confused," "obscure," "unclear," or the like. According to Bennett "the 'substratum' and 'real essence' terminologies are sharply separated in the pages of the *Essay*" (204). However, there

are two passages in which both are combined. Here is the first:

if we could have, and actually had in our complex *Idea*, an exact Collection of all the secondary Qualities, or Powers of any Substance, we should not yet thereby have an *Idea* of the Essence of that thing. For since the Powers, or Qualities, that are observable by us, are not the real Essence of that Substance, but depend on it, and flow from it, any Collection whatsoever of these Qualities, cannot be the real Essence of that Thing. Whereby it is plain, that our *Ideas* of Substances are not *adequate*; are not what the Mind intends them to be. Besides, a Man has no *Idea* of Substance in general, nor knows what Substance is in it self. (II.XXXI.13)

Bennett take this as clearly meaning that we lack knowledge or ideas of underlying two things: of the real essence and of the substance. Bennett emphasizes Locke's use of the word "Besides," he concludes that this "implies that there are two concepts here, not one" (204-05). Ayers on the other hand argues that:

The word 'besides' is appropriate, not because knowledge of substance would be *additional* to knowledge of real essence, but because the former is, in a sense, a *lesser* knowledge, comprised within the latter, as knowledge that something is a plane figure is comprised within knowledge that it is a triangle. The whole sentence therefore means, 'what is more, human beings do not even know the *general* nature of substance, as it is in itself. (1975, 94)

Bennett thinks that Ayers interpretation of "besides" "is not proper English."³³ It would be as if "Ayers would have us say things like this: 'She doesn't realize that the city block she lives on is square. Besides, she doesn't realize that it is rectangular'" (1987, 205).

The second passage is from II.XXIII.2, where Locke raises the question: "what is it, that that solidity and extension inhere in"? Ayers takes this as referring to "*observable* solidity and extension" (1975, 89), thus leaving room for the possible reading of Locke as saying that "*underlying*" observable qualities such as those of solidity and extension

³³Bennett said: "I cannot tune my ear to the proposed use of 'besides'" (1987, 205).

must be a particular real essence or internal constitution. This would leave room in turn for relating the notion of "inherence," not to the logical notion of predication involving some "thing," which is what Bennett supposes, but rather to the grounding of higher-level qualities in an underlying constitution that might then be characterized in terms of qualities as well.³⁴ Ayers interpretation, according to Bennett, "stands Locke on his head" (206):

Locke does not explicitly say, or even weakly imply,

³⁴ Ayers view here very similar to that of Yolton (1970, 45). Yolton identifies substance in general with real essence. Yolton based his view on the following passage from the *Essay*:

If any one should be asked, what is the subject wherein Colour or Weight inheres, he would have nothing to say, but the solid extended parts: And if he were demanded, what is it, that that Solidity and Extension inhere in, he would not be in a much better case, than the *Indian* before mentioned; who, saying that the World was supported by a great Elephant, was asked, what the Elephant rested on; to which his answer was, a great Tortoise: but being again pressed to know what gave support to the broad-back'd Tortoise, replied, something, he knew not what. (II.XXIII.2)

Yolton understands that Locke meant by the "solid extended parts" the 'observable' solid extended parts of a particular thing, but not the 'unobservable' or corpuscles of which each particular substance was constituted: "'the solid extended parts', meaning, I would suggest, the observable" (1970, 45). What Yolton takes as the observable parts to "inhere" in is the real essence (which is the internal constitution of its unknowable corpuscles).

that the qualities he is discussing are possessed only by observable things and that invisibly small things have other qualities that go by the same names. If that were Locke's position, it would be a muddled mistake.

(206)

Here we could agree with Bennett's view that Locke is not simply concerned in this passage with what observable extension and solidity inhere in, but means to include even the extension and solidity possessed by corpuscles. But even so, some sort of real essence approach might be correct, where we are talking about real essence not as a particular corpuscular constitution, but rather as whatever it is that constitutes the real essence of matter in general. Furthermore, Bennett is taking Ayers as representative of the standard real essence approach, whereas Ayres' ultimate aim is to identify substance with real essence in a broader sense.

20.4. Bolton.

Bolton (1976) opposes Bennett's (1971), without, however, apparently opting for a real essence approach of any sort. In fact, her discussion would seem to apply equally to Bennett's (1987).

She argues that Locke's account of substrata cannot

plausibly be extended to provide a general account of property instantiation for two reasons: first, "properties clearly belong to things other than substances" (1976,493). Bolton appeals to the idea of "mode" to support her position. A mode, for example, murder:

bristles with properties; properties themselves have properties. Each of them belongs to something, but does not subsist in substratum; each is one of several properties belonging to the same thing with no substratum to glue them together. (493)

Thus Lockean substrata are not the only things which instantiate properties. Modes do as well: "modes are the *things* to which modal properties belong" (493).

The second reason that Locke's notion of a substratum cannot be explicated in terms of the notion of property instantiation is that it "is only the causal powers of a thing, not its properties in general, which are supposed to be supported by a substratum" (495):

A quality, or power to produce ideas, requires a constitution capable of producing those ideas; other

properties, which are not causal powers, do not depend in the same way on a constitution with specific law governed capabilities. (513)

This may seem to suggest the standard real essence approach to the substratum in Locke. However, that does not seem to be Bolton's position. Her emphasis is rather on the notion of an ordinary object or actual thing, with a particular emphasis on the notion of the actual existence of the thing in question; that is what the notion of substance is supposed to emphasize in Locke. Thus:

An idea of a mode, if merely consistent, cannot fail to be real; an idea of a substance, even if consistent, is not real unless there is some actual thing which conforms to it. (496)

She concludes: "to have a substratum is to be an actual thing with an internal constitution (or real essence) which lawfully gives rise to certain properties" (513).

Again, this suggests the real essence approach. However, Bolton does not identify the substratum which a thing has with the thing's real essence. Her point seems to be only to call

attention to the distinction between the mere idea of a certain essence and the actual existence of a thing with that essence. On the other hand, maybe this is not inconsistent with the real essence approach, since Bolton does not explicitly deny that the actual thing is the real essence either, namely, the real essence insofar as it has actual existence. It is difficult in fact to compare her approach with those who adopt a real essence approach, because she does not seem to confront this issue. However, she may be taking for granted that a thing that has a certain essence could not be identical with that essence.³⁵

20.5. Alexander.

According to Alexander Locke's talk about "substance in general," at least in the case of material substance, is simply his way of talking about the matter of which material

³⁵ Woolhouse thinks that it is an awkwardness of Bolton's account that, at least as initially stated, it equates the idea of having a substratum with that of being an actual thing with a real essence. Modes have real essences too for Locke. However:

the awkwardness is later smoothed over by recognition of the fact that substances and modes have different sorts of real essence; but it can be avoided altogether if we make use of the fact of a difference in real essence in development of the idea that substances and modes have different kinds of instantiation. (In Brandt [1981], 199)

things are composed. This would also mean the matter of which even a single corpuscle is composed. However, this is very different from Ayers' approach. Alexander does not emphasize our ignorance as to the essence. On the contrary he considers it to be solidity, as we saw in Chapter One, which is something known to us as the very essence of matter. Thus matter is in its essence some sort of general solid stuff (or universal matter)³⁶ that gets modified into various particulars: "Matter is a solid stuff which is what, in material bodies, is qualified by specific shapes, sizes and mobilities" (1985, 224).

Alexander took the standard real essence approach, at least in the case of its interpretation of solidity as it appeared in II.XXIII.2, to yield an implausible reading of that passage:

If any one should be asked, what is the subject wherein Colour or Weight inheres, he would have nothing to say, but the solid extended parts: And if he were demanded, what is it, that that Solidity and Extension inhere in, he would not be in a much better case, than the *Indian*

³⁶when Locke said substance in general is the same everywhere, Alexander take this as meaning the same stuff in all material things; see Alexander (1985, 224).

before mentioned; who, saying that the World was supported by a great Elephant, was asked, what the Elephant rested on; to which his answer was, a great Tortoise: but being again pressed to know what gave support to the broad-back'd Tortoise, replied, something, he knew not what.

The standard real essence interpretation is implausible because it makes Locke's passage seem to be concerned with the explanation of merely observable solidity and extension. Alexander replies: "This, however, seems implausible to me if only because anyone giving that answer would be, in Locke's eyes, in a better case than the Indian." (Alexander 1985, 217). Alexander thinks that the question is not what supports observable qualities, but "the questioning goes beyond that and concerns what supports qualities making up these real essences, and the answer to that is substance-in-general" (Alexander 1985, 217). In other words, as Alexander continues to say on the same page, "if qualities are logically in need of support that must apply to unobservable as well as observable qualities."

Thus Locke's talk about substance in general is neither his way of talking about the fact that a thing's qualities

must causally flow from a particular corpuscular constitution, nor is it a "something" or X that is featureless or qualityless; it is no longer a bare substratum or bare particular, because "solidity" is its "essential" characteristic. As Alexander puts it: "My suggestion is that this is what Locke meant by substance-in-general for material things. It is not featureless because it is solid and solidity is its essential characteristic although it is not a quality; it does not exist independently of qualities since being solid entails having shape and size" (224).

Alexander's interpretation performs a considerable task in opposing both the bare particular approach and the standard form of the real essence identification approach. It would also be presumably contrary to Bennett's approach, implying the logic of instantiation, since matter is not a particular that instantiations qualities, but rather some sort of general solid stuff that might modified into various particulars. However, Alexander's approach can not be adopted without facing two serious problems. The first of these is the problem of spiritual or immaterial substance.

Locke himself suggests that minds (except for the divine mind) might for all we know be systems of matter to which

mental powers have been divinely superadded.³⁷ However, it is also possible that this is not the case, and that the essence of mind is completely different from the essence of body. In that case, Alexander's view would commit him to holding that, besides a general solid stuff out of which all bodies are made, there is also some other sort of stuff out of which all minds must be made. While Locke does frequently make the former suggestion, he does not ever seem to make the latter. However, Alexander does accept the conclusion: "Locke held that there were at least two substances-in-general, one material, one immaterial, each characterized by one characteristic which was neither a quality nor a power" (232). Also on the same page: "I am suggesting, then, that, like Descartes, he [Locke] is accepting a two-substance theory but characterizing the two substances differently."

The second problem is that of solidity as a primary quality. Locke mentioned this in many passages in the *Essay*, as we saw in Chapter One. Thus solidity seems to be a quality which must exist in a substratum, and cannot itself be the very essence of that substratum. In fact Alexander asserts, contrary to what Locke said on many occasions, that solidity

³⁷I will discuss the issue of "superaddition" in The Epilogue on The Mystery of Nature and The Divine.

should not be regarded as a primary quality; it is no mere quality of material bodies, but the very essence of matter itself.

Alexander's interpretation might be considered somewhat useful in understanding Locke's theory of substance if he considered the passage quoted above from Locke as including the cohesion of the parts of matter. It is not only the search for support for the qualities, but also what makes them qualities in the first place, but Alexander did not pursue his discussion to include the question of solidity or extension as such.

In fact for all commentators the substance in which the qualities in question are supposed to inhere is a kind of thing (even if an indeterminate thing for Alexander), while what I am suggesting here is an alternative to make no such presumption, where the substance is compatible with being some kind of power or force, or cohesive force.

21. Conclusion.

According to Locke we cannot arrive at any perfectly adequate ideas of substances:

Because, those Qualities, and Powers of Substances,

whereof we make their complex *Ideas*, are so many and various, that no Man's complex *Idea* contains them all. That our abstract *Ideas* of Substances, do not contain in them all the simple *Ideas*, that are united in the Things themselves, is evident, in that Men do rarely put into their complex *Ideas* of any Substance, all simple *Ideas* they do know to exist in it. (II.XXXI.8)

Based on this, Locke concludes that our ideas of substances are both "deficient, and inadequate" (II.XXXI.8). It is also important to note that when Locke says that qualities and powers of substances make up their complex ideas, he is presumably talking about the ideas of power and ideas of qualities. However, in Book II, Chapter XXIII, Section 7, he is discussing power as such, not mere ideas:

For he has the perfect *Idea* of any of the particular sorts of *Substance*, who has gathered, and put together, most of those simple *Ideas*, which do exist in it, among which are to be reckoned its active Powers, and passive Capacities.

For Locke, for example, the power of drawing Iron is one of the qualities, the idea of which enters into our complex idea of the nominal essence of that substance we call a Load-stone:

which Powers pass for inherent Qualities in those Subjects. Because every *Substance* being as apt, by the Powers we observe in it, to change some sensible Qualities in other subjects, as it is to produce in us those simple *Ideas*, which we receive immediately from it. (II.XXIII.7)

This move from the epistemological level of talk about ideas to the ontological level of qualities in Locke's talk about power and substance is not well clarified in the *Essay*, in spite of his note on the point in Book II, Chapter VIII, Section 8. In any case, the ideas of powers according to Locke make up a great part of our complex ideas of substances, for example, the complex idea of Gold. If someone examines this idea he

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 dully considered, are also nothing but different Powers. (II.XXIII.10)

As we saw in a previous chapter, of course Locke not only discussed power as an idea and as corpuscular structure (or as an intrinsic quality somehow grounded in corporeal structure,) but also as a relation between one substance and another:

The simple *Ideas* whereof we make our complex ones of Substances, are all of them (bating only the Figure and Bulk of some sorts) Powers; which being Relations to other Substances, we can never be sure that we know all the Powers that are in any Body, till we have tried what changes it is fitted to give to, or receive from other Substances, in their several ways of application: which being impossible to be tried upon any one Body, much less upon all, it is impossible we should have adequate *Ideas* of any substance, made up of a Collection of all its Properties. (II.XXXI.8)

Locke seems to be arguing as follows: we can not have an

adequate idea of substance unless we know all the powers in that substance, and in order to know these powers we have to know the changes that these powers give to or receive from other substances. Since it is impossible to know all these changes, we do not know all these powers; therefore it is impossible to arrive at an adequate idea of substance which is made up of a collection of all its properties (together with the idea of supposition of a support for them).

The question is why can't we know all powers? From what Locke said we can suggest at least three reasons. One of them is related to bodies or the external world, where the number of powers is infinite: "The simple Qualities which make up the complex Ideas, being most of them Powers, in relation to Changes, which they are apt to make in, or receive from other Bodies, are almost infinite" (III.IX.13). The second reason is related to the mind itself and the ability to know. Locke said:

He that shall but observe, what a great variety of alterations any one of the baser Metals is apt to receive, from the different application only of Fire...will not think it strange, that I count the Properties of any sort of Bodies not easy to be

collected, and completely known by the ways of enquiry,
which our Faculties are capable of. (III.IX.13)

The third reason why our ideas of the powers of substances, and therefore our ideas of substances themselves, will necessarily be inadequate is more directly related to our concern in the present and the next chapter. It is that we are unable to comprehend how the powers possessed by any substance cohere with one another, or are held together into a single thing. This brings in the question of a support or substratum for qualities or the obscure idea of substance in general. On the most common ways of reading Locke, he is supposing that the reason for the obscurity of this idea is not our lack of understanding of some further cohesive power underlying an object, but rather that there must be some thing which accounts for the cohesion in question, and either this thing must remain quality-less so far as our understanding goes, or else it is what Locke calls real essence or the particular corpuscular structure of a thing and Locke is pessimistic about our ability to comprehend it. (Or, on Bennett's reading, the obscurity lies in the inability of Locke's official theory of ideas to comprehend the "logic of instantiation.") Locke himself never says that the problem of

substance in general is the problem of an underlying cohesive power of some kind. In fact, since Locke uses the term "power" to stand for particular qualities, his terminology prevented him from using the term this way. However, in the next chapter I shall suggest that it may be possible to regard the problem of substance in general as a problem concerning what we ourselves might call a certain sort of cohesive power, rather than an underlying thing or subject of predication. (Perhaps Locke could have spoken of a "force" rather than a "power" here, but he did not.)

There are several questions of concern to Locke that concern some kind of holding together or cohesion: (a) what holds the sensible or observable qualities together as the qualities of a single thing; (b) what holds several corpuscles together to compose a corpuscular constitution underlying the sensible qualities; (c) what holds the several (insensible) qualities, including for example extension and solidity, of any particular corpuscle together as the qualities of a single corpuscle; (d) how the very qualities of extension and solidity are possible in the first place, since they involve some sort of cohesion or holding together *of matter itself*.

The real essence approach appeals to corpuscular constitution to explain (a). It tries to argue that the

obscurity of the idea of substance in general is just the obscurity of our knowledge of the corpuscular constitution. For (c), many commentators will appeal to a bare particular or instantiation view regarding our obscure idea of substance in general. (b) is generally ignored in any discussion of Locke's problem of substance. As we shall see in the next chapter, however, Locke himself connects (d) with that problem, and (b) and (d) must be very closely connected in his mind, because Locke uses the single term "cohesion" to speak of both. In any case, since Locke himself clearly regards the problem of substance (i.e., substance in general) as a problem concerning some sort of holding together, it is reasonable to speculate that a cohesive power of some kind rather than an underlying thing must be in question. If this is so, it must be a power that lies deeper than the real essence of any substance, at least as the term real essence is generally used by Locke. In any case, as we have seen, sometimes Locke himself describes the inadequacy of our ideas of substances in terms of our lack of understanding of the powers that are in them.

Chapter Three

Substance and The Mystery of Cohesion

Speculation, however, was now reaching a deadlock, successive elaborations of aether theories leading no nearer the solution of the problem of cohesion. None saw this more clearly than John Locke who, in his "Essay Concerning Human Understanding", published in 1690, made a careful examination of the philosophical bases involved in this question.

E. C. Millington (1944-5, 68)

22. Introduction.

In this chapter we are going to see, negatively, why it is impossible to identify talk about substance in general in Locke's philosophy with talk about what Locke calls the underlying real essence of things. As indicated in the last chapter, this is a suggestion made by some commentators. It would have the advantage of rendering less mysterious Locke's

reference to something apparently mysterious in his talk about substance. Positively, we are going to see that what Locke has in mind is closely connected, if not to be identified, with what he himself regards as a deep mystery, namely, cohesion, even though it is something to which commentators tend to give little attention. (I speak of "what Locke calls" the underlying real essence of things. Limiting our attention to the case of material substance, in a sense, I agree with Michael Ayers that Locke's talk about the underlying substance of objects, of which we have only a general idea, can be regarded as talk about nothing more than the real essence of matter. But that, as Ayers points out, is not how Locke himself uses the term real essence. However, where I go beyond Ayers is in identifying the problem of the underlying real essence of matter with the problem of cohesion.)

What Locke calls real essence, as opposed to nominal essence, is always the real essence of some particular body or species of body, not of, for example, matter. It is the internal corpuscular constitution or structure, composed of particles making up that body, which accounts for the body's powers to appear in experience as it does, and to affect other things as it does. Thus what Locke calls real essence is

something that builds on or presupposes basic particles or corpuscles, taken as ultimate constituents of a body. But Locke makes it very clear that the need to suppose a general substance underlying bodies is present even in the case of the most basic particles or corpuscles themselves. What he has to say about this turns out to be identical with the problem of cohesion.

Locke raised three problems of cohesion.

- (1) How are the solid parts or corpuscles of a body united, or how do they cohere together to make a single body composed of a number of corpuscles?
- (2) How are the very parts of any single corpuscle united, or how do they cohere together to make any solid portion of extended matter in the first place?

The second question is frequently overlooked, although Locke himself emphasizes it. It is probably overlooked because commentators overlook Locke's insistence that even the most basic particle or corpuscle itself consists of "parts," and those parts of further parts, *ad infinitum*. Locke explicitly classifies this problem as a problem concerning the underlying substance of bodies.

The third question is probably the one that most readers

associate with Locke's talk about an underlying substance of bodies:

- (3) How are the several qualities of a thing tied together or how do they cohere to make up the qualities of a single thing?

Of course this is a question that can be asked about either an observable body or a corpuscle. It is different from the other questions because it is a question about the qualities of a thing rather than the parts or particles that make it up. Locke frequently puts his talk about substance in terms of this question. This is misleading. What it is necessary to see is that this raises a much deeper problem on the level of observable qualities. The real problem of (material) substance is only indicated or suggested by (3). We are closer to it with (1), and closest with (2).

We also need to bring in another concept that Locke did not explicitly connect with his talk about substance. This is the concept of power or force, specifically cohesive power or force. To some extent, this goes beyond what Locke himself says. Locke did not explicitly formulate the problem of cohesion in terms of the possible need for acknowledging an underlying cohesive power or force, that is, "underlying" in

the sense that he emphasizes for his notion of underlying substance. He, in fact, tended to regard physical powers as qualities of either corpuscles or aggregates or configurations of corpuscles, therefore, not as something underlying them. To formulate this problem precisely we need to clarify Locke's account of power in order to see whether his use of the term "power" is compatible with this more dynamic conception. I shall argue that the problem of cohesion is in fact closely connected with both the concept of power and that of substance. (Another related question is: how does Locke's thinking about the problem of cohesion relate to his thinking about the problem of solidity? Locke seems to regard these as two different problems. Or does he? In any case, are they?)

It is possible to think that power makes even the smallest portion of extended matter possible in the first place, the same power that holds together several qualities in a single thing. But the question is: is it possible for Locke? Perhaps the problem is only that Locke does not have an adequate language to deal with this problem of cohesion and substance. Locke states the problem by using the term "substratum" and by talking about the need for something for qualities to inhere in. This is misleading. He is really

using the term "substratum" to cover more than what the term usually covers in its traditional (Aristotelian) sense. The term is appropriate because it suggests something underlying.

That is what needs to be emphasized. But the emphasis on "inhering in" focuses attention too much on question (3). Thus it causes us to overlook what is supposed to be common to all three questions, and what reaches its deepest level in question (2).

It is also very interesting to compare the problem of cohesion and its relation to power or force in Locke's philosophy with Newton's and Leibniz' conceptions of force. Leibniz introduced a notion of force as something on which even the most minimal extension depends and which therefore can be said to underlie extension itself; moreover he described this force as the very substance of extended things. On the other hand Newton gave eight definitions of the concept of force, but all of them in the scientific sense, not to pursue the underlying substance of material extension. However, Newton used the concept of force to explain the cohesion of matter. Newton and Locke are frequently compared. However, comparison with Leibniz, in this area, is a neglected aspect of Locke's philosophy. In fact the whole issue of

cohesion is neglected among Locke's commentators. In a new volume published recently under the title *The Cambridge Companion To Locke* (1994, ed. Vere Chappell), which contains ten specially commissioned essays by an international team of scholars and Locke experts, not one of these essays is devoted to the issue of cohesion. Furthermore, the word "cohesion" does not even appear in the index of this volume.³⁸

23. Locke and Stillingfleet: Substance not Identified with Real Essence.

Locke himself was very clear in his correspondence with Stillingfleet against the identification of substance and real essence. Locke begins by noting that:

Your Lordship, in this paragraph, gives us two significations of the word nature: 1. That it is sometimes taken for essential properties, which I easily admit. 2. That sometimes it is taken for the

³⁸Cohesion is indeed a neglected subject in Locke scholarship. Though Yolton (1970), Ayers (1975 and 1991), and McCann (1994) do mention cohesion, none of them consider it on the deeper level that is the focus of my study.

thing itself in which these properties are, and consequently for substance itself. And this your Lordship proves out of Aristotle. (*Works* IV, 70)

However, Locke makes it clear that he thinks that this leads to confusion:

I must then confess to your lordship, 1. that I do not clearly understand whether your lordship, in these two paragraphs, speaks of nature, as standing for essential properties; or of nature, as standing for substance... 2. Your lordship's saying, in the first of these paragraphs, "that the nature of a man, as in Peter, is distinct from the same nature as it is in James and John;" and in the second of them, "that however the same nature may be in different individuals, yet the nature itself remains one and the same;" does not give me so clear and distinct an apprehension concerning nature. (*Works* IV, 73)

Locke also makes it clear that he himself was concerned with two different things, one of them related to a particular

substance and the properties constituting the real essence of that individual thing, and something common to every subject or to every distinct real essence, that is, substance in general. In his third letter, Locke replies to Stillingfleet's appeal to Boyle's suggestion of an identification of substance and real essence:

Mr. Boyle says the word essence is of great affinity to nature, if not of an adequate import; 'to which your lordship adds, 'but the real essence of a thing is a substance.' So that, in fine, the authority of this excellent person and philosopher amounts to thus much, that he says that nature and essence are two terms that have a great affinity; and you say, that nature and substance are two terms that have a great affinity.

For the learned Mr. Boyle says no such thing, nor can it appear that he ever thought so, till it can be shown, that he has said that essence and substance have the same signification. (*Works* IV, 364)

The whole passage, although it only states explicitly that Boyle didn't identify them, certainly at least suggests

Locke's own resistance to the identification of the concept of real essences and that of substance in general. In fact, Locke goes on to suggest that different real essences are no more than different modifications of some underlying substance:

that internal constitution, or frame, or modification of the substance, which God in his wisdom and good pleasure thinks fit to give to every particular creature, when he gives a being. (*Works IV*, 82)

However, the word "modification," might not be the best word for what Locke is trying to get at. It is not much better than the word "inhere". Locke's concern is some kind of cohesive power or force that functions as an underlying substratum, which cannot be identified with real essence because it is responsible for unifying the parts of a corpuscle, thus making its existence possible in the first place.

24. Some Approaches to the Problem of Cohesion.

The question about the cohesion of the parts of body is

a concern of many modern philosophers. Gassendi (1592-1655) thinks that the cohesion results from atoms hooking together.³⁹ Some others think that cohesion results from the pressure of surrounding material. Both theories are rejected by Locke, Newton, and Leibniz, as we will see below. Descartes in his *Principles of Philosophy*, Part II, Section 54, and Part III, Sections 121-124, tried to offer an explanation of the cohesion of the parts of bodies, or their firmness, by his concept of rest; firmness consists in parts being at rest relative to one another. Descartes assumes here that there is nothing that joins the parts of hard bodies excepting that they are in relative repose. Of course this relative rest of the parts needs to be considered in connection with Descartes' general law of inertia. Neither

³⁹Gassendi in fact gave more than one reason in explaining the problem of cohesion (as E.J.Dijksterhuis [1961] noticed): in the form of hooks and eyes, by means of which the atoms interlock, or a pressure exercised from the outside, or the absence of globular and smooth particles. Gassendi's method of explanation changes according to the shifting of the problem from the macrocosm to the microcosm. Gassendi "thinks that bodies firmly cohere when there are few interstices between the particles, because in that case there is little possibility of motion, and he assumes it to be created in the melting process precisely by penetration of atoms of heat into the *vacuola*" (Dijksterhuis [1961], 428).

Locke nor Leibniz was satisfied with this simple consideration of such a central problem regarding bodies.

Leibniz rejected Descartes' theory because it failed to account for the difference between contiguous parts and cohering parts (*New Essays*, Note XXXIV). Leibniz also rejected both Gassendi's and the pressure theory, because both of them presuppose the firmness of the cohering parts.

Leibniz used the concept of "conatus" (effort or striving, or endeavor) to explain the cohesion of parts. In his 1670 "letter to Thomas Hobbes" (in Loemker [1956], 162), in the context of rejecting Hobbes' idea that "reaction is the sole cause of cohesion," Leibniz argued as follows: reaction is a motion of the parts of a body from its center outward toward its circumference. This motion is either unimpeded or impeded. If it is unimpeded, then the parts of the body will move outward and so depart from the body to which they belong, which contradicts our experience. If it is impeded, then the motion of reaction will stop unless it is revived by an external agent. Leibniz thinks "that the conatus of the parts toward each other, or the motion through which they press upon each other, would itself suffice to explain the cohesion of bodies" (Leibniz 1670 in Loemker 1956, 165). Bodies which

press upon each other are in conatus to penetrate each other, for to press is to strive into the place hitherto occupied by another body, i.e. to penetrate it. Of course this idea involves the idea of pressure, thus Leibniz concludes that "The conatus is the beginning; the penetration is the union... Therefore pressure is the conatus of penetration" (Leibniz 1670 in Loemker, 1956; 165, also p. 219, Leibniz's "New Physical Hypothesis" 1671). It is this pressure to which Leibniz appeals to account for the cohesion of the parts of a body.

Boyle in his 1661 *History of Fluidity and Firmness*, (*Works I*, ed. Thomas Birch [1965]) considers the corpuscles of a fluid substance as in motion. On the other hand, the firmness of the parts of a solid body involves rest:

It being the chief requisite of a fluid body that its small parts are in motion, there seems not anything necessary to keep a body from being fluid, and consequently to keep it a firm body, than that its contiguous parts be in state of rest. (*Fluidity and Firmness, Works I*, 411)

Boyle's idea here is more Cartesian than we would expect. However his conception of rest should not be understood as an absolute rest; rather, it is relative. Boyle suggested in his 1669 *Absolute Rest in Bodies* some kind of very slow motion to account for the cohesion of bodies, in other words the amount of motion determines the amount of cohesion:

Since, without granting such rest in the component particles of some kind of bodies, as diamonds, iron, porphyry, &c. it will be (I conceive) very hard to explain, how there can be such solid masses (as those minerals are) made up of small and separable particles. Which being said, I added, that I saw no reason, why such a kind of firmness, where the inward motion of the insensible particles is almost infinitely slow, may not suffice to give an account of as great a firmness as we use really to find among consistent bodies. (*Works* I, 444)

His attempt was to explain cohesion on a mechanical basis without considering the substantial form:

As to what is very confidently, as well as plausibly pretended, that a substantial form is requisite to keep the parts of a body united, without which it would not be one body; I answer, That the contrivance of conveniently figured parts, and in some cases their juxtaposition, may without the assistance of a substantial form, be sufficient for this matter.
(*Origin of Forms and Qualities* 1666, *Works* III, 45)

In his 1675 *Mechanical Origin of Volatility and Fixedness*, Boyle suggested another basis for cohesion: "usually it is on the roughness and the irregularity of corpuscles, that their cohesion depends" (*Works* IV, 306, quoted by M. Boas [1952, 474]).

Boas commented:

BOYLE never quite discarded the notion of there [diamonds, iron, porphyry] being a physical linkage between some of the particles of solid bodies, but he more and more inclined to emphasize variation in motion as the cause of variation in solidity. (1952, 475)

As we will see in this chapter, Boyle's account of cohesion is not satisfactory to Locke, despite the fact that Locke accepted some of Boyle's account of matter.

25. Locke's Response to Prior Approaches.

It is clear from the *Essay* that Locke's consideration of the problem of cohesion is different from other philosophers. We must distinguish in Locke the problem of the cohesion of the basic particles or corpuscles constituting a body from the problem of cohesion -- every bit as real -- regarding the very "parts," ad infinitum, of a corpuscle itself. In this sense Locke's approach to cohesion is unique. It is different from that of Leibniz in spite of the fact that both rejected the Cartesian solution. Both Locke and Leibniz rejected material extension as the ultimate reality: there must be something substantial more fundamental than material extension. Still Locke and Leibniz have different points of view regarding that fundamental thing; for Leibniz that is infinitely many monads, for Locke it may be something that is one or many. This is an agnostic view. Also, Locke didn't deal with this problem in

terms of pressure or God or any active power, or even in terms of divinely superadded qualities. As Millington comments rightly on this issue, none saw this problem of cohesion more clearly than Locke, who examined carefully its philosophical basis. In this sense his position is unique and different from many philosophers and scientists, and even from that of Boyle. Commentators usually present Locke as a follower of Boyle's philosophy; this is true to a certain extent. Although both of them accept the corpuscular hypothesis as an explanatory system of the natural phenomena, Locke's consideration of the problem of cohesion is different from that of Boyle.

According to Locke the issue of cohesion is divided into two questions: First, the most basic particles or corpuscles themselves are questionable. What makes those extended, solid particles particles as such in the first place? Second what is the cement or the cause of the union that joins them, and ties them together? Locke in fact seems to go farther to question even the quality of extension itself, also to consider qualities such as motion and rest as mysterious as that cause of union itself, as in II.XXIII.28. In fact to Locke material substance is not more comprehensible than spiritual substance. If we do not know how a thinking thing

thinks we also do not know how the parts of a solid extended thing cohere together to make extension itself. The very fact that matter exists is mysterious:

If any one says, he knows not what 'tis thinks in him; he means he knows not what the substance is of that thinking thing: No more, say I, knows he what the substance is of that solid thing. Farther, if he says he knows not how he thinks; I answer, Neither knows he how he is extended; how the solid parts of Body are united, or cohere together to make Extension.

(II.XXIII.23)

Since Locke is looking for an explanation for extension itself, he is looking for an answer that goes beyond the traditional accepted hypothesis of pressure. The theory of pressure which simply stated that the cohesion of several parts of matter was made by the pressure of the particles of air or aether; thus "the pressure of the Particles of Air, may account for the *cohesion of several parts of Matter*, that are grosser than the Particles of Air" (II.XXIII.23).

This explanation according to Locke is an inadequate one

for three reasons:⁴⁰

1. We can ask how the particles of air themselves cohere. The "pressure of the Air, will not explain, nor can be a cause of the coherence of the Particles of Air themselves" (II.XXIII.23). If the explanation of the cohesion of air's particles is given in terms of pressure from aether or any subtler matter than the air, then still the cohesion of aether itself (or of anything else) is unexplained. The more subtle matter in questions presumably cannot make that bond. From this Locke concludes that this

Hypothesis, how ingeniously soever explained, by showing, that the parts of sensible Bodies are held together, by the pressure of other external insensible Bodies, reaches not the parts of the Aether it self; ...and can have no other conceivable cause of their cohesion and union, by so much the more it leaves us in the dark, concerning the cohesion of the parts of the Corpuscles of the Aether it self. (II.XXIII.23)

⁴⁰Yolton (1970) gave two reasons, thinking that "Locke recognized that explanations of cohesion are, in a limited sense, possible," (49) where Locke thinks it is not only impossible but also even incomprehensible to us.

it self. (II.XXIII.23)

2. Locke gives a second reason for saying that "*the pressure of any ambient Fluid, how great soever, can be no intelligible cause of the cohesion of the solid parts of Matter*" (II.XXIII.24). Locke demonstrates the inadequacy of the external pressure hypothesis and the lack of explanation of the separation of particles of matter in his discussion of the "Experiment of two polished Marbles":

But in truth, *the pressure of any ambient Fluid, how great soever, can be no intelligible cause of the cohesion of the solid parts of Matter.* For though such a pressure may hinder the avulsion of two polished Superficies, one from another in a Line perpendicular to them, as in the Experiment of two polished Marbles: Yet it can never, in the least, hinder the separation by a Motion, in a Line parallel to those Surfaces... Therefore, if there were no other cause of cohesion, all parts of bodies must be easily separable by such a lateral sliding motion. (II.XXIII.24)

Locke continued showing the inadequacy of the external pressure hypothesis by saying:

For if the pressure of the Aether be the adequate cause of cohesion, where-ever that cause operates not, there can be no cohesion. And since it cannot operate against such a lateral separation,...therefore in every imaginary plain, intersecting any mass of Matter, there could be no more cohesion, than of two polished Surfaces, which will always, notwithstanding any imaginable pressure of a Fluid, easily slide one from another. (II.XXIII.24)

3. Locke recognizes the problem of cohesion on a deeper level when he makes it clear that he is talking about not only the cohesion of the particles or corpuscles of a body, but also even the cohesion of the parts of a single corpuscle. When Locke discussed the hypothesis of pressure and talked about aether he said:

concerning the cohesion of the parts of the Corpuscles of the Aether it self: which we can neither conceive

without parts, they being Bodies, and divisible; nor yet how their parts cohere, they wanting that cause of cohesion, which is given of the cohesion of the parts of all other Bodies. (II.XXIII.23)

Also the pressure of aether or any subtler matter than the air

may unite, and hold fast together the parts of a Particle of Air, as well as other Bodies; yet it cannot make Bonds for it self, and hold together the parts, that make up every the least corpuscle of that *materia subtilis*. (II.XXIII.23)

Thus we need to distinguish more clearly (as Locke did in the *Essay*) between the lack of an explanation of the cohesion of the basic particles or corpuscles comprising the aether (reason 1) and the lack of an explanation of the cohesion of the "parts," ad infinitum, of any single such corpuscle to make its own material extension possible in the first place (reason 3).⁴¹

⁴¹Some commentators such as Yolton (1970) did not notice such a crucial distinction in Locke's approach to the

Locke himself emphasizes the divisibility of matter ad infinitum in II.XV.9: "Every part of Duration is Duration too; and every part of Extension is Extension, both of them capable of addition or division *in infinitum*." Also in II.XVII.12: "And since in any bulk of Matter, our thoughts can never arrive at the utmost *Divisibility*, therefore there is an apparent Infinity to us." In II.XXIII.31 Locke talks about "the divisibility in infinitum of any finite Extension" as something impossible to be explicated. In II.XXIX.16 Locke seems to take the divisibility of matter ad infinitum for granted:

when we talk of the divisibility of Matter *in infinitum*, though we have clear *Ideas* of Division and Divisibility, and have also clear *Ideas* of Parts, made out of a whole, by Division; yet we have but very obscure, and confused *Ideas* of Corpuscles, or minute Bodies, so to be divided.

These passages suggest how Locke saw the problem of cohesion

problem of cohesion. Thus Yolton's talk is only on the corpuscular level.

as needing to be confronted, not simply in the connection among distinct corpuscles, but among the "parts," ad infinitum, of any single corpuscle. It is the problem of cohesion within corpuscles, and not just between corpuscles.

The explanation of cohesion by the pressure hypothesis, along with some other hypotheses, has been rejected not only by Locke, but also by some scientists. Newton in his *Opticks* (1704) mentioned the following hypotheses:

The Parts of all homogeneal hard Bodies which fully touch one another, stick together very strongly. And for explaining how this may be, some have invented hooked Atoms, which is begging the Question; and others tell us that Bodies are glued together by rest, that is, by an occult Quality, or rather by nothing; and others, that they stick together by conspiring Motions, that is, by relative rest amongst themselves. (Newton, 1979, 388-389)

Newton rejected these three explanations of cohesion of the particles of a hard body, offering a different explanation based basically on his theory of gravitation:

I had rather infer for their Cohesion, that their Particles attract one another by some Force, which in immediate Contact is exceeding strong, at small distances performs the chemical Operations above-mention'd, and reaches not far from the Particles with any sensible Effect. (Newton 1979, 389)

We may ask why Locke did not accept this explanation in terms of force, since it might seem to be very close to his own concept of power.

Perhaps the reason is that Newton thinks of the force whose operation he supposes might account for cohesion as operating between distinct solid particles of matter, or what Locke calls corpuscles. The word "Parts," when Newton refers to "The Parts of all homogeneal hard Bodies," stands for such particles. Thus he suggests that "that their Particles attract one another by some Force." As we have seen, however, Locke sees the problem of cohesion as raising a deeper and more fundamental question, namely, a question about the cohesion of the "parts," ad infinitum, even of a single corpuscle or bit of solid matter. For Locke, the problem of cohesion raises the very question as to what makes solidity

and (physical) extension possible in the first place. Thus we can understand, as a consequence of the fact that for Locke cohesion is a question of the internal coherence even of a single corpuscle, why power could not be the explanation for Locke. Power is a quality in Locke's philosophy. Therefore it is grounded in the real essence of a body; it presupposes a corporeal coherent structure that already exists, from which it flows. In this sense power cannot stand for such an explanation.

We may conclude this discussion by noting that since in Locke's view cohesion is not only a problem between corpuscles but also within corpuscles, cohesion seems to constitute (material) extension for Locke, and therefore does indeed look like a strong candidate for the underlying substratum of body. Locke's view of the problem of cohesion leads (although Locke himself rarely suggests it) to the suggestion that cohesion might indeed be regarded as the ultimate substratum of material bodies. Further discussion of the implications of cohesion -- so far as regards the underlying substratum -- will be reserved for later.

26. Solidity as the Substratum of Bodies.

According to Locke extension can not be, as it was for Descartes, the ultimate substance of bodies. Solidity is also required:

Qualities thus considered in Bodies are,...in what estate soever it be;...Take a grain of Wheat, divide it into two parts, each part has still, *Solidity, Extension, Figure, and Mobility.* (II.VIII.9)

Locke uses the word "solidity" interchangeably with the word "impenetrability": "if any one think it better to call it *Impenetrability*, he has my Consent" (II.IV.1).

The idea of solidity finds its ultimate source, as an idea, in sensation:

THE *Idea of Solidity* we receive by our Touch; and it arises from the resistance which we find in Body, to the entrance of any other Body into the Place it possesses, till it has left it. There is no *Idea*, which we receive more constantly from Sensation, than *Solidity.* (II.IV.1)

Locke devoted Chapter Four of Book Two to the idea of solidity. The chapter speaks to what Locke presents as two distinct questions: "what [solidity] is and wherein it consists." Locke concludes the chapter:

If any one asks me, *What this Solidity is*, I send him to his senses to inform him: Let him put a Flint, or a Foot-ball between his Hands; and then endeavor to join them, and he will know. If he thinks this not sufficient Explication of Solidity, what it is, and wherein it consists; I promise to tell him, what it is, and wherein it consists, when he tells me what thinking is, or wherein it consists; or explain to me, what Extension or Motion is, which, perhaps, seems much easier. (II.IV.6)

It seems odd to address this issue as two distinct questions. Nevertheless, what Locke is suggesting here is that, while in one sense we do know, namely, from the senses, "what solidity is," in another sense we may be very ignorant as to what it is, that is, ignorant as to its underlying essence ("wherein it consists"). The skeptical question seems

to be directed here both against materialists who might suppose questions about the essence of matter to be unproblematic in comparison with questions concerning some presumed spiritual substance, and also against the Cartesians who, equally mistakenly, suppose it as easy to explain the essence of matter, i.e., in terms of pure extension, as to explain the essence of mind, i.e., in terms of thinking. For Locke himself, discussion of the topic of solidity eventually becomes inseparable from discussion of such mysterious topics as cohesion, power, and substance.

Locke's introduction of the idea of solidity as a primary quality already indicates that our knowledge of it involves reasoning that goes beyond what is evident to the senses:

The Mind, having once got this *Idea* from such grosser sensible Bodies, traces it farther; and considers it, as well as Figure, in the minutest Particle of Matter, that can exists; and finds it inseparably inherent in Body, where-ever, or however modified. (II.IV.I)

This passage expresses clearly that Locke based the idea of solidity as a primary quality on two bases, empirical and non-

empirical: empirical to the extent that we to some extent know what it is from the senses; non-empirical in that we are led then to trace it further in supposing it present even in those bodies too small to be evident to our senses. The suggestion that "what it is" and "wherein it consists" may be two distinct questions might be a reflection of this distinction.

Whether or not "what it is" and "wherein it consists" are two distinct questions, Locke is drawing a distinction between an epistemological and an ontological question. For he is distinguishing in effect between questions about the idea of solidity, which we do get from the senses, and questions about solidity as such. Locke is quite confident that solidity as an idea is derived from sense experience; he relies upon this as a fact against any one who may wonder what this solidity is or wherein it consists. Against such a skeptic, Locke will "send him to his senses to inform him" (II.IV.6) simply by asking him to put a foot ball between his hands and then asking him to join them. He will know that there is something solid, and this will give him the idea of solidity. However, this confidence on the epistemological level concerning our idea of solidity suddenly vanishes with the ontological

question which Locke proceeds to ask; it is a question parallel to the deepest ontological questions that might be asked of any Cartesian by a materialist skeptical about the existence of spiritual substance. It is not a question that Locke tries to answer; he leaves the problem of solidity as something incomprehensible lying beyond our capacity for knowledge.

Locke does not only suggest that mystery in the present passage. It becomes even more clear when he discusses the concept of solidity in connection with the problem of cohesion, that is, the cohesion required even for the existence of a single solid body as small as a corpuscle. I want to suggest that this is also where we are led back to the concept of substance. For in asking what makes solidity possible in the first place (wherein it consists) he is also asking what underlies or is the substratum of the smallest solid corpuscles that make up observable bodies. Any Cartesian answer in the term of pure extension is not satisfactory to Locke. Locke went deeper trying to find the secret, or at least to expose the mystery, of the cement that makes not only corpuscles cohere together in bodies that are solid to our touch (as in II.XXIII.26: "He that could find the

Bonds, that tie these heaps of loose little Bodies together so firmly; he that could make known the Cement, that makes them stick so fast one to another, would discover a great, and yet unknown Secret"), but also the very parts of corpuscles themselves, ad infinitum, that is, what makes solidity and thus physical as opposed to pure geometrical extension possible in the first place. However, before returning to the connection of this question with the question of material substance as substratum, there are some other important issues to comment on.

In II.IV Locke spoke also of "resistance":

THE *Idea of Solidity* we receive by our Touch; and it arises from the resistance which we find in Body, to the entrance of any other Body into the Place it possesses, till it has left it. There is no *Idea*, which we receive more constantly from Sensation, than *Solidity*.

(II.IV.1)

The word "resistance" is introduced to help define solidity. But resistance implies power. Is Locke suggesting that solidity is the appearance to our senses of some underlying

power? Locke did not in fact say this. However, it raises an interesting question. We have already seen why it might be tempting to try to explain cohesion in terms of some underlying cohesive force, and solidity depends on a cohesion among the parts, ad infinitum, of even the smallest corpuscle. So is Locke suggesting that solidity in fact must stem from some, to us (ontologically) unknown, power?

The answer might be yes and no. Locke considered power, as we saw in Chapter One, as a secondary or tertiary quality, while solidity here is considered as a primary quality. It is impossible for power here to be the cause of solidity because primary qualities are fundamental to matter and secondary qualities result from them. Maybe someone will suggest that qualities in the third or tertiary sense may be relevant here, since Locke points out that such qualities are considered as a cause of the change in the structure of matter and not simply in our ideas of matter. But this is not possible either. In every case power for Locke is dependent on the primary qualities of bodies. Thus he says in speaking of qualities of the third sort that they involve "*The Power that is in any Body, by Reason of the particular Constitution of its primary qualities, to make such a change in the Bulk,*

Figure..." (II.VIII.23). Furthermore, if Locke were prepared to consider power in any sense as what underlies solidity, then it would be mysterious why he did not respond more favorably to Newton's discussion of cohesion in terms of force. Nevertheless, Locke himself introduces the term "force" when he speaks of the idea of solidity arising from resistance. The idea of solidity "arises from the resistance which we find in Body, to the entrance of any other Body into the Place it possesses" (II.IV.1). "This Resistance, whereby it keeps other Bodies out of the space it possesses, is so great, That no force, how great soever, can surmount it" (II.IV.3). As we will see below (in the discussion of hardness, and cohesion as substance), Locke considers resistance as a basic concept that could be used not only to define solidity, but also to make a clear distinction between matter and pure space. In any case, "Whether we move, or rest, in what Posture soever we are, we always feel something under us, that supports us, and hinders our farther sinking downwards" (II.IV.1). The word "feel" may refer to a kind of sense experience, but how could we feel that thing X that is "under us, that supports us" without somehow feeling its power or force of resistance, that is, a power that goes beyond mere

sensation? In fact what we feel, as Locke used the word "feel," is the power of resistance. That is the only thing we can feel if we appeal to sense experience. What follows is that there are degrees of resistance, some bodies resisting more than others.

But Locke will not easily accept such an interpretation because it leads to the idea that solidity cannot be considered as the cause of resistance but rather vice versa, and that solidity, rather than being a primary quality, itself stems from or is supported by some underlying reality or force. For Locke: "Upon the solidity of Bodies also depends their mutual Impulse, Resistance, and Protrusion" (II.IV.5). However, in saying this Locke most probably means that the power of resistance on the part of observable bodies must be grounded in the solid particles composing those bodies. But that still leaves open the question as to "what solidity is" for the very particles themselves and "wherein it consists." If Locke were willing to use the term "power" in a broader sense than he does, then he could in fact suggest that there is an underlying cohesive power on which the solidity of even the smallest corpuscle must depend, in which it could be said to inhere and by which it could be said to be supported.

However, this requires a special notion of power to be understood in the term of an underlying substratum, and not as a mere secondary quality existing in something else.

Does Locke in fact suggest that the term "power" has more than one meaning? Actually, Locke talks about active and passive powers, but neither one is qualified, as we saw in Chapter Two, to be considered as the sort of power that cohesive power would have to be, if it were to be regarded as the underlying "substance" of solid matter. We may consider the distinction further now.

Locke considered power as twofold: "as able to make, or able to receive any change: The one may be called *Active*, and the other *Passive Power*" (II.XXI.2). In the strictest sense, active power is considered to be part of the essence of spirit or at least one of its basic qualities. Locke thinks that there are "two primary Qualities, or Properties of Spirit, viz. Thinking, and a power of Action; i.e. a power of beginning, or stopping several Thoughts or Motions" (II.XXIII.30); this power is inseparable from spirit. While he considered solidity and extension as the essential qualities of body in addition to those powers which are a body's secondary qualities, it also has other powers, e.g.,

when it is moving. However, both sorts of powers in a body are passive.

Locke said:

Let us suppose any parcel of matter eternal, great or small, we shall find it, in it self, able to produce nothing. (IV.X.10)

A similar point is made in II.XXI.4: "A Body at rest affords us no *Idea* of any active Power to move." Also "Bodies,..., do not afford us so clear and distinct an *idea* of active power."

Also in II.XXIII.28:

And if we consider the active power of Moving, or, as I may call it, *Motivity*, it is much clearer in spirit than Body; since two Bodies, placed by one another at rest, will never afford us the *Idea* of a power in the one to move the other, but by a borrowed motion: whereas the Mind, every day, affords us *Ideas* of an active power of moving of Bodies; and therefore it is worth our consideration, whether active power be not the proper

attribute of Spirit, and passive power of Matter....Pure Spirit, viz. God, is only active; pure Matter is only passive.

This however raises the problem of motion, i.e., how one body moves another. Locke discussed this through his example of the billiard ball in II.XXI.4. However, the situation is somewhat complicated by the fact that as we saw in Chapter One, Locke seems to talk sometimes about bodies in terms of active and passive powers, Locke himself is not clear. He thinks that a body at rest affords us no idea of any active power to move, but this is based on his conception of motion "Motion is rather a Passion, than an Action" (II.XXI.4). It is an obscure idea, as Locke himself admitted. In any case, it is obvious from the *Essay* that in the strictest sense he relates the word "active" to spirit and finally reserves it for God. "God, is only active; pure Matter is only passive" (II.XXIII.18), "GOD is truly above all passive Power" (II.XXI.2).

Can power or force be an appropriate explanation of cohesion, without facing inconsistencies in Locke's philosophy? In particular, can there be a force of cohesion, fundamental

to all bodies, and yet it be a passive power? Of course, it couldn't be a power which has been passed on to one body from another "by a borrowed motion." Why couldn't it be a power passed on by God? It may be again because we would have to be talking about a power connecting the parts even of the smallest corpuscle, ad infinitum, with other parts; therefore, the power of cohesion in question would not be a power, in this case, possessed by *bodies* at all, since corpuscles are the smallest bodies. However, why suppose in fact that only bodies, and not the underlying parts of bodies, ad infinitum, possess powers? Maybe precisely because Locke says only that the "moving forces" of *bodies* involve merely passive power, this does not in fact rule out supposing that there is a fundamental power of cohesion which *is* an active power. After all, if there is such a power, it would not be an example of the moving forces of bodies. So even if the kind of power a body has, by virtue of the fact that it is able to affect the movement of other bodies through its own movement, is merely passive power borrowed from some original active source, that would be compatible with supposing that every part of a corpuscle, ad infinitum, has an active power, namely, a power of cohesion.

Perhaps Locke saw that he had in fact no argument for supposing that, if there is a power of cohesion underlying all bodies, that power of cohesion could not involve active power and he didn't want to face up to this. For it would then be compatible with supposing that matter is ultimately just as active as God (albeit not through its *motion*, but on a more fundamental level.

In the end, solidity often seems to be what is most fundamental for Locke. He seems to regard solidity as what constitutes the difference between material and pure extension. In II.XIII.11 Locke said: "*Space is not Body, because it includes not the Idea of Solidity in it; Space and Solidity being as distinct Ideas, as Thinking and Extension, and as wholly separable in the Mind one from another. Body then and Extension, 'tis evident, are two distinct ideas.*" However, we have also seen that solidity suggests the problem of cohesion. On the other hand, there is another concept that is actually defined by Locke in terms of cohesion and yet distinguished clearly from solidity; that is hardness. In fact the ambiguous status of hardness, which Locke himself emphasizes is not to be confused with solidity, must be clarified before going any further in discussing cohesion.

27. Solidity, Hardness, and Cohesion.

Solidity as such is distinguished by Locke from hardness: "our *Idea of Solidity* is distinguished...from the ordinary *Idea of Hardness*" (II.IV.3). The distinction between solidity and hardness is made according to that "in" which each one consists. "Solidity consists in repletion, and so an utter Exclusion of other Bodies out of the space it possesses" (II.IV.4), whereas hardness consists in something completely different, namely, "in a firm Cohesion of the parts of Matter, making up masses of a sensible bulk, so that the whole does not easily change its Figure" (II.IV.4). Thus solidity is related to the ideas of exclusion and impenetrability, whereas hardness consists in a certain sort of cohesion of the parts of matter. On the other hand, at II.XXIII.23-4, it seems as if Locke is (perhaps not in so many words) in effect equating solidity itself with cohesion: since Body is no farther, nor otherwise extended, than by the union and cohesion of its solid parts" (II.XXIII.24).

Perhaps, on the most fundamental level cohesion constitutes the very solidity that makes (physical) extension possible in the first place, whereas more specific modifications of this cohesion constitute the various degrees

of hardness. This perhaps could be a reason for thinking of cohesion as the very substance of matter, namely, because it is something that, in being variously modified, constitutes all of the possible states of matter. If it is plausible to suppose that hardness consists in various modes or modifications of cohesion, then would it not indeed be plausible to suppose that all physical phenomena consist in such modes? After all, since Locke refers specifically to sensible bulk, the cohesion in question in the case of hardness is presumably a matter of how the various corpuscles relate to one another so as to form a single configuration, and Locke thinks that all properties of observable bodies are ultimately due to the ways in which their corpuscles enter into some particular configuration or other.

This may suggest that while solidity is, as we have seen, a primary quality, hardness is to be regarded in a way similar to that of secondary qualities in relation to the constitution of our bodies. Locke in fact says: "Hard and Soft are Names that we give to things, only in relation to the Constitution of our own Bodies" (II.IV.4). Locke in fact think that hardness is a secondary quality? Scholars and commentators have disagreed in answering this question. Thomas Reid (1710-

1796) in his 1785 *Essays on the Intellectual Powers of Man*, Book II, Chapter XVII, thinks that Locke classified hardness as a primary quality:

Every one knows that extension, divisibility, figure, motion, solidity, hardness, softness, and fluidity, were by Mr. Locke called *primary qualities of body*.
(Reid 1967, 313 b)

On the other hand, Hamilton, in note D appended to his edition of Reid, found difficulty in classifying hardness as either a primary or a secondary quality. He thinks that Locke never asserted clearly that hardness is a primary quality; at the same time Locke did not assert that it is not. Therefore Hamilton suggests a new scheme of qualities: primary, secundo-primary, and secondary. He classifies hardness in the secundo-primary category. Hamilton is quite confident that Locke thinks that hardness is not a primary quality, even though there are no passages in the *Essay* that assert either this, or that it is a secondary quality. However, I have difficulty considering Hamilton's secundo-primary classification as anything more than a matter of terminology,

rather than contributing to an understanding of the status of hardness itself.

Hamilton does offer a way to argue against the idea that hardness is a primary quality. He thinks that from Chapters 2 and 3 of Book II, we can conclude that Locke considers hardness as a sensible quality, and Hamilton thinks that there are passages in the *Essay* to support the idea that all sensible qualities are secondary qualities. He cites Book II, Chapter VIII, Sections 14 and 23. In fact more support for Hamilton's idea can be derived from the passage quoted above from Book II, Chapter IV, Section 4: "hard and soft are names that we give to things in relation to the constitutions of our bodies." In any case, if Locke thinks that all sensible qualities are secondary qualities then hardness would in consistency have to be considered as a secondary quality.

Hamilton has been convincingly criticized in a recent article by David Sanford entitled "Does Locke Think Hardness is a Primary Quality": "Hamilton's argument might have some plausibility if these passages were our total evidence. But additional evidence refutes it" (Sanford 1970, 24). Sanford points out that, in considering our complex ideas of substance as composed of ideas of sensible qualities (together, of

course, with the obscure idea of a substratum for them), Locke clearly intends this to include primary qualities:

Our Faculties carry us no further towards the knowledge and distinction of Substances, than a Collection of those sensible *Ideas* which we observe in them.

(III.VI.9)

'tis evident, that 'tis their own Collections of sensible Qualities, that Men make the Essences of their several sorts of Substances. (III.VI.24)

Sanford also points out that from Book II, Chapter 23, Sections 4,6, and 16, it is clear that some sensible qualities are primary. Sanford concludes that "Although 'insensible secondary quality' may be, for Locke, a contradiction in terms, 'sensible primary quality' is not" (Sanford 1975, 25).

A similar disagreement on the same issue may be found between C.J.F. Williams and Jonathan Bennett. Bennett (1965) lists hardness among primary qualities: "Locke distinguishes between 'primary' and 'secondary' qualities. A thing's primary qualities are its shape, size, spatial location,

velocity, and degree of hardness" (Bennett 1965, 8). Williams criticized Bennett, affirming that "Locke distinguishes his solidity from hardness, which is no doubt a secondary quality" (1969, 318).

Why is hardness difficult to classify? Perhaps it is mainly a problem in how Locke makes the distinction between primary and secondary qualities in the first place. In Book II, Chapter VIII, Section 9, Locke says, as we saw, that primary qualities are those which are utterly inseparable from body, in whatever state that body might be. Locke illustrated this with his famous thought experiment regarding a grain of wheat that could be divided into two parts, and then so on till the parts became insensible. Each part has still solidity, extension, figure, and mobility:

For division ... can never take away either Solidity, Extension,...from any body, but only makes two, or more distinct separate masses of Matter ... These I call *original* or *primary Qualities* of Body, which I think we may observe to produce simple *Ideas* in us. (II.VIII.9)

Secondary qualities, on the other hand, are only powers to

produce various sensations in us by their primary qualities. That very definition, of course, makes it impossible to attribute such qualities to insensible particles.

However, it may be that Locke has more than one way of defining primary qualities. The official definition is that they are qualities that could be possessed by an observable object, and also possessed by the smallest particle. Now Locke seems to mean by hardness, as opposed to solidity, a macroscopic property. Therefore it follows automatically that it could not be a primary quality: a single corpuscle couldn't be described as hard, because hardness has to do with the firm cohesion of a body that we perceive as resistance. The reason to exclude hardness from being a primary quality may be found in the passage quoted above from II.IV.4 which defines hardness in terms of "masses of a sensible bulk." On the official definition of primary qualities, the only way to read this passage as allowing hardness to be a primary quality would be if we supposed that Locke were speaking loosely, and that he did not mean to exclude the possibility of a single corpuscle being hard, namely, insofar as it "does not easily change its figure" either. But perhaps Locke has more than one idea as to the meaning of "primary quality."

Perhaps sometimes by "primary" qualities simply Locke means "real" qualities of things as opposed to *their* powers, that is, the very qualities of things that *underlie* or *explain* their powers in the first place. In that case all we would have to do is decide whether hardness is a mere power, or rather the sort of quality in which certain powers of an object are *grounded*. On this approach, we might then regard hardness as a "primary" quality (so long as it is not a mere power) even if we do not suppose it to be a quality possessed by single corpuscles. It might simply be defined as a certain sort of cohesion, manifesting itself *among* the corpuscles of observable bodies. On the second approach to primary qualities, this would still let us class hardness as a primary quality -- so long as we do not regard cohesion as one among the mere powers of bodies, but rather as part of the underlying reality in which the powers of bodies are grounded.

In any case, Locke in fact defines hardness, as we have seen, in terms of cohesion. Perhaps this very fact may also help to explain the difficulty in classifying cohesion, even on Locke's official definition of primary qualities. For it seems that sometimes when Locke talks about cohesion -- apart from the question of hardness, and just as a general problem

-- what he has in mind is the problem of what holds various corpuscles together into (eventually) observable configurations. But other times it is clear that the problem of cohesion for Locke is a problem that arises even *within* any single corpuscle. If Locke defines hardness in terms of cohesion, then even if, in the definition quoted earlier, he does so by reference to the shape of observable bodies, he may have intended for us not to exclude the possibility of that very same quality also being a characteristic of corpuscles themselves (namely, insofar as they do "not easily change [their] figure." However, we would have to suppose that Locke is not being very clear in that passage.

Furthermore, as Sanford also points out, even if we call something "hard" only relative to a certain way of perceiving, as Locke does, that may be no more significant than the fact that we call something "long" only relative to a certain way of perceiving. Even if things are called Long or short, only in relation to our sensation, that is compatible with maintaining that the qualities in question are only variations of a primary quality, length (Sanford 1970, 26).

Another complication may be due to the fact that Locke defines hardness in terms of cohesion of parts and of matter

but solidity in terms of the resistance, not of mere matter but of bodies: hardness consists "in a firm Cohesion of the parts of Matter, making up masses of sensible bulk, so that the whole does not easily change its Figure" (II.IV.4), while "Solidity consists in repletion, and so an utter Exclusion of other Bodies out of the space it possesses" (II.IV.4). At III.X.5, Locke makes it clear that the conception of matter is different from that of body:

Yet *Matter* and *Body* stand for two different Conceptions, whereof the one is incomplete, and but a part of the other. For *Body* stands for a solid extended figured Substance, whereof *Matter* is but a partial and more confused Conception, It seeming to me to be used for the Substance and Solidity of *Body*, without taking in its Extension and Figure: And therefore it is that speaking of *Matter*, we speak of it always as one, because in truth, it expressly contains nothing but the *Idea* of a solid Substance, which is every where the same, every where uniform.

From this passage it seems evident that body is

individuated matter, and matter is more general. Therefore if hardness is defined in terms of cohesive matter, then it seems to be hardness on the deepest level, as a cohesive power that underlies "Substance and Solidity." On the other hand, the same passage itself may suggest that solidity is the very essence of matter, since Locke says that Matter "expressly contains nothing but the *Idea* of a solid Substance, which is every where the same, every where uniform." If we followed this interpretation, then we would have to accept the result that solidity, as *the* very essence of body -- in the sense of constituting the essence of the very matter composing bodies (even corpuscles) -- could not be a mere *quality* (even if an essential quality) of bodies.

This is in fact Alexander's view, as we saw in Chapters One and Two. Solidity is not a primary quality of body; rather, it is the essence of a general stuff common to all bodies. His interpretation does not lack some support from the *Essay*. In III.X.5 Locke talks about matter as "a solid Substance, which is every where the same, every where uniform." One reason for dissatisfaction with Alexander's view is that it seems to me that, despite initial appearances, cohesion is more fundamental than solidity for Locke. My point might be

justified on the ground that Locke explicitly defines hardness in terms of cohesion, whereas he does not do this for solidity. However, as I have already suggested, there are deeper reasons.

One possibility might be to distinguish two notions of solidity: the absolute solidity that Alexander regards as the very stuff of all bodies, and which is not observable by the senses, and the observable quality of solidity that Locke says is a primary quality. However, I still think that solidity in the absolute sense, as essential to all bodies because it is the essence of their very matter, is nothing but that same cohesive power that, on an observable level, ties parts together making a sensible bulk. Perhaps the latter is what Locke is emphasizing when he talks about hardness. This would allow us to define hardness in terms of cohesion, as Locke does, and still distinguish it in a way from solidity without denying that the same cohesion is what underlies solidity as well.

28. Cohesion as the Substance of Bodies.

What really underlies hardness and solidity?

I have suggested that cohesion is really what underlies not only hardness (as according to the official definition) but

solidity itself. On this question, however, commentators have different points of view. Hamilton thinks that cohesion "is not a character necessarily involved in our notion of body" (Note D on Reid 1967, 841 b) and "Cohesion ... is not necessary to think as condition or attribute of matter at all" (Note D on Reid 1967, 843 a). Right after that Hamilton says that "Roughness and Smoothness, are modifications, not only of Cohesion, but of Figure" (Note D on Reid 1967, 843 b). It seems to me that Hamilton takes cohesion to be essential only to *observable* bodies. Hamilton did not appreciate the status of cohesion as a problem even on the level of single corpuscles. It is just that this is a more general issue, to be treated apart from the specific issue of hardness.

Hamilton says that "for though Cohesion, ... in all its modes, necessarily supposes the occupation of space, the occupation of space while it implies a continuity does not necessarily imply a cohesion of the elements (whatever they may be) of that which occupies space" (Note D on 1967, 841 b). Hamilton thinks that cohesion is even less than gravity or than the force by which matter in general attracts matter.

From what Hamilton is saying it seems to me that he does not have a clear conception of cohesion. On page 851a he spoke

of the cohesion "by which the particles of individual bodies tend to approach, and to maintain themselves in union." The expression "to maintain themselves in union" means that Hamilton grasps the general idea of cohesion, where cohesion is considered the ultimate explanation of the unity. But to consider cohesion as cohesion of particles of an individual body, may also mean that Hamilton missed the point, i.e. the essence of cohesion, because the very extension and solidity of any single corpuscle was supposed by Locke to depend on cohesion as well.

There is one passage, in fact a little note, in which Hamilton may have paid some attention to the fact that cohesion is a problem that concerns the parts of body in a broader sense (including the parts, ad infinitum, even of a single corpuscle), and not only the union of particles in the sense of corpuscles,⁴² but he did not put much weight on it: "I may notice parenthetically, that I speak of cohesion only as between the ultimate elements of body, whatever these may be" (Note D on Reid 1967, 852 a). "Whatever these may be"

⁴² Locke himself perhaps sometimes also use the term "particles," and not simply the term "parts" in that broader sense. Does "particle" for Locke always mean "corpuscle"? Perhaps it isn't so clear.

Hamilton may of course simply mean whatever sorts of bodies the corpuscles might turn out to be. His use of this phrase may not suggest that he was in fact allowing for the problem of cohesion as concerning the need for unification *within* a corpuscle. In any case, he concludes, as we have seen, that cohesion is not necessarily involved in our notion of body, which would seem to indicate that we should not in fact read this passage as indicating recognition of the need for cohesion on a more fundamental level.

The question whether cohesion is essential to matter (or body) should of course be related to the question ~~whether~~ it should be classified as a primary quality for Locke. This is how, for example, David Sanford formulates the issue when he comments on a point made by Leibniz, similar to the point that we have just been discussing in Hamilton:

It is indeed rather hard to explain cohesion. But this cohesion of parts appears not to be necessary to make an extended whole, since perfectly rarefied and fluid matter may be said to make up an extended thing, without its parts being joined to one another.

(Leibniz *New Essays* II.XXIII.23)

Sanford points out that this seems to be directed against the fact that Locke clearly regards cohesion as a primary quality throughout Sections 15-32 of Chapter 23, Book II. However, Sanford also points out that the concept of "primary quality" is in a certain way relative for Locke. For Locke also speaks of the primary qualities of spirit. Therefore "A primary quality is primary to a substance of a certain sort" (Sanford 1975, 28), even if we usually mean qualities of bodies when we talk about Locke's distinction between primary and secondary qualities. For Sanford, bearing this observation in mind, the following "sort of reply is thus open to Locke in the face of the Leibniz-Hamilton point that cohesion is not a primary quality of space-occupying matter: Cohesion is nevertheless a primary quality of body" (Sanford 1975, 28). In other words, Sanford suggests that we concede the Leibniz-Hamilton point that cohesion is not essential to, and therefore not a primary quality, of matter, but nevertheless still maintain Locke's view that it is a primary quality of body.⁴³ (Which I do not

⁴³ Sanford's argument is based on two assumptions: first, that there is an identification between hardness and cohesion, where hardness is understood as hardness on the observable level, not on the deepest level as I argued above; and second, that there is something that can exist as matter without being individuated in this or that body. However, Sanford's conclusion, that Locke can not

agree that cohesion is not essential to matter but only to bodies, I do agree that hardness is a primary quality of bodies but not essential to matter as such. In fact Sanford says that cohesion is essential to body, but presumably means that it is essential to bodies. Perhaps he could grant that it is not essential to body except insofar as body is individuated into bodies.)

We might try to approach Locke's view by starting with his criticism of the Cartesian philosophy regarding space and extension. In Book II, Chapter XIII, he offers several

consistently deny that hardness is a primary quality of body could be supported only if Locke holds that cohesion is a primary quality. Sanford does think that Locke does hold that point of view: "And he [Locke] does hold that cohesion is a primary quality of body" (Sanford 1975, 29), basing his idea on Sections 26 and 27 of Chapter XXIII, Book II, where Locke identifies the extension of body with the cohesion of solid parts. Locke said: "Extension of Body, (which is nothing but the cohesion of solid parts)" (II.XXIII.27), and because extension is considered by Locke as a primary quality, thus cohesion must be, as Sanford thinks, a primary quality too.

In spite of the fact that Locke identified the extension of body with the cohesion of the solid parts, in Section 26 and 27, it is clear that there are many passages in the *Essay* where Locke himself holds the view that extension is totally different from cohesion. In some of them this may be because he is distinguishes between the pure extension of space and specially material extension. However, in others it seems to be because cohesion is what makes material extension possible in the first place.

reasons for denying Descartes's view that extension is the essence of body. However, Locke also distinguishes (as in II.IV.5) between "material extension," or the "extension of body," and "pure extension." For example when Locke says that "Extension includes no Solidity, nor resistance to the Motion of Body, as Body does" (II.XIII.12) he is speaking of pure extension. When he is speaking of pure extension, the suggestion seems to be that something more is required for matter in the sense of something *additional, along with* extension (e.g., solidity). This does not seem to lead to the suggestion that the something more in any sense underlies the qualities of bodies. But if we are talking about material extension, then we can suggest that this is *constituted* by cohesion and therefore that cohesion is indeed something that underlies the qualities of bodies, including the very quality of extension.

Locke argues as follows against the Cartesian view, which of course regards the pure extension of space as one and the same with the extension of bodies:

1. The parts of body are separable, while those of space are inseparable.

The Parts of pure Space are inseparable one from the other; so the Continuity cannot be separated, neither really, nor mentally. (II.XIII.13).

Therefore, the parts of body are movable simply because they are separable, while the parts of space are immovable because they are inseparable. "The parts of pure Space, are immovable, which follows from their inseparability" (II.XIII.14).

(Locke's idea of the immovability of space is based on specific understanding of the concept of motion as a change between distance: "Motion being nothing but change of distance between any two things" [II.XIII.14].)

2. Extension has no resistance to bodies. Thus it includes no solidity: "Extension [Locke means extension as such] includes no Solidity, nor resistance to the Motion of Body, as Body does" (II.XIII.12).

3. There is the possibility of an empty space or vacuum. If so then there is space where we cannot find body. Therefore, body and space are not identified:

those who assert the impossibility of Space existing without Matter, must not only make Body infinite, but

must also deny a power in God to annihilate any part of Matter...there is no necessary connexion between Space and Solidity, since we can conceive the one without the other. (II.XIII.21)

In fact much of Locke's discussion of the distinction between (pure) extension and body seems to imply that like Descartes, he holds a view of space as a being in its own right. It may be worth commenting on this point. How exactly does Locke think of space?

Locke realized that there is a central question that might be raised about the nature of space. The characteristics given above define space only negatively. However, we find Locke, as usual, not offering a positive definition of his own. Instead he simply offers a challenge to the Cartesian:

If any one asked me, *What this space, I speak of, is?* I will tell him, when he tells me what his Extension is. For to say, as is usually done, That Extension is to have *partes extra partes*, is to say only, That *Extension is Extension*. (II.XIII.15)

The fact is that it is difficult to suggest whether Locke thinks of space as a kind of being in its own right (as an absolute concept), or whether he thinks of it, in one way or other, as purely relational. It seems to me Locke himself did not affirm either one clearly, but was more inclined to leave the issue open for more discussion or speculation. For example, in II.XIII.17 Locke raises the question whether space is a substance or an accident and answers "I know not: nor shall be ashamed to own my Ignorance." Because he couldn't say without getting clear as to what that would mean. In any case he doesn't deny it (or affirm it). But he is leaving open the possibility that space is a substance in some sense.⁴⁴

What might be considered here as surprising is that no Leibinzian conception of space appears in Locke's discussion. Both Locke and Leibniz oppose the Cartesian idea that the essence of matter is extension. Leibniz's "Hypothesis Physica Nova" or "The New Physical Hypothesis" was written in 1670 and published in 1671 in two parts: 1. "Theoria motus abstracti" or "The theory of Abstract Motion," which was presented in the same year to the Academy of Science in Paris; 2. "Theoria motus concreti" or "The Theory of Concrete Motion," which was

⁴⁴For Locke's account of space see J. Gibson 1960, 248-53.

presented in the same year to the Royal Society in London. In this paper Leibniz held the view that space is distinct from body: "A body is something in space (that is, something not apart from some space), which we perceive we cannot think of without space, though we can think of space without it...space and body are distinct" (Loemker 1956, 224). Furthermore, the essence of body consists rather in motion, whereas the concept of space involves nothing but magnitude and figure, or extension. Concentrating on the idea of motion here as the essence of body reflects clearly that Leibniz's idea of force was not developed at this time, not until the writing of "Specimen Dynamicum" published in 1695, where he presents very well a theory of force of which motion, as well as extension itself, is only a manifestation.

Leibniz holds a relational theory of space. In his correspondence with Clark, Leibniz said: "Space is nothing other than an order of the existence of things which is observed when they exist simultaneously"; "I hold space to be something merely relative, as time is; that I hold it to be an order of coexistence, as time is an order of successions," (Correspondence with Clark 1965, 25).

However in comparing Locke and Leibniz, it is important

to remember the distinction between pure and physical extension. For example; we compared (a) Locke's views about *physical extension* with (b) Leibniz's views about space, then we could perhaps say that Locke took things to a deeper level: Leibniz regards our idea of space as derivative from that of *bodies*, whereas Locke supposes that what underlies extension is something deeper than bodies themselves, namely, cohesion. But then we're simply not comparing their respective views about space, but rather Leibniz's view about space with Locke's view about something other than space, namely, physical extension.

On a deeper level, there is much more similarity between Locke and Leibniz. This is because what underlies physical extension for Leibniz is what he calls "monads." They are what constitute the substance of bodies themselves (to whatever extent they could be regarded as substantial at all), and that is certainly on a level as deep as what Locke considered in his talk about cohesion as what constitutes physical as opposed to pure extension. Leibniz will take the relation of monads to each other as ultimate, though relations, according to Leibniz, are not given empirically.

Relations and orderings are to some extent 'beings of reason', although they have their foundations in things; for one can say that their reality, like that of eternal truths and of possibilities, comes from the Supreme Reason. (Leibniz 1981, II.XXV.1)

Locke does not appeal to things such as monads in order to distinguish the extension of body from that of space. As we have seen, sometimes he simply appeals directly to what seems to be a certain quality, namely, solidity. But in the end it is to cohesion that he appeals:

The Extension of Body [emphasis mine] being nothing, but the cohesion or continuity of solid, separable, moveable Parts; and the Extension of Space, the continuity of unsolid, inseparable, and immoveable Parts. (II.IV.5)

Of course, this is not the only passage in the *Essay* where Locke talks about extension of body in terms of the cohesion of its solid parts. There are some other passages such as in II.XXIII.23 Locke questioned the coherence that make extension

possible in the first place: "how the solid parts of Body are united, or cohere together to make Extension."

In the same passage Locke talks about

the cohesion of the parts of the Corpuscles of the Aether it self: which we can neither conceive without parts, they being Bodies, and divisible; nor yet how their parts cohere, they wanting that cause of cohesion, which is given of the cohesion of the parts of all other Bodies.

In II.XXIII.24: *"the pressure...can be no intelligible cause of the cohesion of the solid parts of Matter."*

In the same passage Locke equated the physical extension with the cohesion of solid parts: "how clear an *Idea* soever we think we have of the Extension of Body, which is nothing but the cohesion of solid parts,...." In the same passage Locke says that understanding of extension is impossible without understanding of cohesion:

For since Body is no farther, nor otherwise extended, than by the union and cohesion of its solid parts, we

shall very ill comprehend the extension of Body, without understanding wherein consists the union and cohesion of its parts; which seems to me as incomprehensible, as the manner of Thinking, and how it is performed.

In II.XXIII.26:

He that could find the Bonds, that ties these heaps of loose little Bodies together so firmly; he that could make known the Cement, that makes them stick so fast one to another, would discover a great, and yet unknown Secret: And yet when that was done, would he be far enough from making the extension of Body (which is the cohesion of its solid parts) intelligible.

Also in II.XXIII.27: "So far is our Extension of Body, (which is nothing but the cohesion of solid parts,)." "

In II.XXIII.32: "or discover in things without us, the cohesion and separation of solid Parts, which is the Extension and Motion of Bodies."

Here I would like to point out that, since Locke is referring to the extension of solid parts, somebody might

suggest that Locke is here only talking about the extension of observable body, thus presupposing solidity itself, as a quality of unobservable corpuscles, and not regarding cohesion as underlying the solidity in question. We may reponed to this suggestion as follows: (a) It is clear from II.XXIII.23 that Locke is talking about the cohesion of even the parts of a single corpuscle or particle:

And if the pressure of the Aether, or any subtiler Matter than Air, may unite, and hold fast together the parts of a Particle of Air, as well as other Bodies; yet it cannot make Bonds for it self, and hold together the parts, that make up every the least corpuscle of that *materia subtilis*....the cohesion of the parts of the Corpuscles of the Aether it self: which we can neither conceive without parts, they being Bodies, and divisible; nor yet how their parts cohere, they wanting that cause of cohesion, which is given of the cohesion of the parts of all other Bodies.

Also in II.XXIII.26 Locke makes it clear that he is talking about the cohesion of a single particle:

He that could find the Bonds, that ties these heaps of loose little Bodies together so firmly; he that could make known the Cement, that makes them stick so fast one to another, would discover a great, and yet unknown Secret: And yet when that was done, would he be far enough from making the extension of Body (which is the cohesion of its solid parts) intelligible, till he could shew wherein consisted the union, or consolidation of the parts of those Bonds, or of that Cement, or of the least Particle of Matter that exists.

Since Locke in these passages is concerned with the cohesion of the least particle or corpuscle of matter, it is the cohesion within particles and not simply between particles. For Locke the problem of cohesion that constitute the "extension of bodies" is a problem that applies even to the parts of unobservable corpuscles. (b) Also in II.XXIII.17:

The primary Ideas we have peculiar to Body, as contradistinguished to Spirit, are the cohesion of solid, and consequently separable parts, and a power of communicating Motion by impulse.

Locke says here that the "primary ideas" peculiar to body are the cohesion of solid parts and motion, also he speaks here of these as what are peculiar to body precisely as distinguished from spirit: in other words, he is not just talking about body on the observable level, in speaking of the cohesion of solid parts, but of body as opposed to spirit. The reason why he sticks in the word "solid" repeatedly may be (i) that the cohesion in question is what constitutes solidity; (ii) we have some sort of knowledge of what solidity is (at least through the senses), whereas we really have no idea what the cohesion is that constitutes solidity.

Locke's concerns with cohesion is his concern with substance in the first place. In II.XXIII.23 Locke begins by speaking of the unknown substance of body; then he refers to the questions how the soul thinks and how body is extended; and then he continues apparently including in this ignorance of substance our ignorance of the cohesion that makes even the smallest particles possible. Locke says:

If any one says, he knows not what 'tis thinks in him; he means he knows not what the substance is of that thinking thing. Farther, if he says he knows not how he

thinks; I answer, Neither knows he how he is extended; how the solid parts of Body are united, or cohere together to make Extension. For though the pressure of the Particles of Air, may account for the *Cohesion of several parts of Matter*, that are grosser than the Particles of Air, and have Pores less than the Corpuscles of Air; yet the weight, or pressure of the Air, will not explain, nor can be a cause of the coherence of the Particles of Air themselves. And if the pressure of the Aether, or any subtiler Matter than Air, may unite, and hold fast together the parts of a Particle of Air, as well as other Bodies; yet it cannot make Bonds for it self, and hold together the parts, that make up every the least corpuscle of that *materia subtilis*. So that that Hypothesis, how ingeniously soever explained, by shewing, that the parts of sensible Bodies are held together, by the pressure of other external insensible Bodies, reaches not the parts of the Aether it self; and by how much the more evident it proves, that the parts of other Bodies are held together, by the external pressure of the Aether, and can have no other conceivable cause of their cohesion and union, by so much the more it leaves

us in the dark, concerning the cohesion of the parts of the Corpuscles of the Aether it self: which we can neither conceive without parts, they being Bodies, and divisible; nor yet how their parts cohere, they wanting that cause of cohesion, which is given of the cohesion of the parts of all other Bodies.

Locke also mentions in II.XXIII.24 the question how the soul thinks, how body is extended, and his answer was that body is extended by virtue of the cohesion of its solid parts, and since the questions "how the soul thinks, how body is extended" were equated with questions as to the substance of a thinking or solid thing.

how the Soul thinks, as how Body is extended. For since Body is no farther, nor otherwise extended, than by the union and cohesion of its solid parts, we shall very ill comprehend the extension of Body, without understanding wherein consists the union and cohesion of its parts; which seems to me as incomprehensible, as the manner of Thinking, and how it is performed.

This suggests that Locke is thinking of cohesion as the very substance of matter.

29. Appendix: Leibniz on Force.

Leibniz considers that material extension must be an expression of something underlying, something that at least in his earlier phase he described as constituting the very substance of body, although later he did not describe body as substantial at all. This is a significant similarity between Locke and Leibniz. More specifically, Leibniz regards this substance of body in terms of underlying *forces*, and it is reasonable for us to ask why Locke himself did not explicitly consider the problem of underlying cohesion in terms of forces. Of course, even if he did, there would still be a significant difference from Leibniz (in addition to the fact that Leibniz, in his later thinking, did not regard body as substantial at all), namely, that Leibniz regarded the forces in question as actions on the part of incorporeal beings that were substantial in their own right (monads).

Even if Locke were prepared to regard cohesion in terms of some sort of cohesive force, there would presumably be no suggestion in Locke that the activity of this force at every

point of material extension should be regarded as the action of a distinct substantial individual. If there is anything underlying for Locke, it would be cohesive force (if he could allow himself to speak of such) itself, not some substantial individual or individuals that exerts such force. On the other hand, this could be part of the reason why Locke was reluctant to put it in terms of force in the first place. He may have been inclined to think that, if force is active at any point, it must indeed be regarded as the action of a truly substantial individual -- And what individual could this possibly be for Locke? Presumably, nothing other than God, since, as we have seen, God is the only source of active power for him. But then we would be led into a *Spinozistic* conclusion: that God is the underlying substance of body, a conclusion that Locke would obviously have wanted to avoid. So Locke had a problem he couldn't resolve: the underlying substance of body turns out to be what would most naturally be described in terms of some sort of force, yet there seemed to be no way of recognizing this without either (i) giving up the idea that the activity of (at least active) forces are always actions on the part of some substantial individual or individuals or (ii) having to choose between the views of

Leibniz (who ends up -- perhaps inevitably -- regarding body as insubstantial after all, as mere phenomenon) and Spinoza (for whom God is the underlying substance of body).

It may be useful to add a few further comments on Leibniz. In spite of the fact that Leibniz said that his theory of force aimed to establish a theory of motion, and in general a science of dynamics, his theory in its essence is metaphysical, related closely to his idea of substance. Leibniz's discussion of force rests on a metaphysical theory that locates the source of this force in incorporeal substances that (in so far as bodies are substantial at all) constitute the very substance of bodies. Thus it would be very different from anything Locke might be supposed to entertain, even if Locke were prepared to recognize a force of cohesion that underlies all bodies.⁴⁵ Furthermore, it permits Leibniz a view of the active power of bodies which is very different from Locke, who, as we saw regards material forces as only the passing on by bodies in matter of forces received

⁴⁵It is also developed to overcome the difficulty of dualism that is raised by Newton's conception of natural philosophy. Newton thinks that force is an active agent that brings about changes in matter, where matter is conceived of as passive. Even the force of attraction is not an inherent power or essential property of matter.

from other bodies, but ultimately being their source in God, the ultimate source of active power for Locke.

Leibniz thinks that force is inherent in all substances where the ultimate source of the activity is the underlying monads. Because of this underlying reality, however, we can regard matter, on the purely physical level as having both active as well as passive powers. Recognition of the former arises when we see that the motive force of a body cannot be measured in every case by its quantity of motion (mass $\times$ velocity) as the Cartesians conceived it; the Cartesian quantity of motion is not conserved in all mechanical processes. A certain sort of motive force must be measured rather by the product of both the mass and the square of the velocity of a body: mv^2 . This quantity of motion Leibniz calls living force or *vis viva*. After criticizing "Descartes, who held motive force and quantity of motion to be equivalent, to assert that God conserves the same quantity of motion in the world" (Loemker 1956, 456), Leibniz went through an experiment in order to show that these are two different concepts. "In order to show what a great difference there is between these two concepts, I begin by assuming, on the other hand, that a body falling from a certain altitude acquires the

same force which is necessary to lifted back to its original altitude if its direction were to carry it back and if nothing external interfered with it"(Loemker 1956, 456). This led to Leibniz formula mv^2 .

To explain how he measured the motive force, Leibniz appealed to a metaphysical principle, i.e., the law of causality. According to Leibniz, there is always an equivalence between the full cause and the total effect, and this appears clearly in the principle of the conservation of the motive force: "I assert that not the time nor the velocity but only the effect is an absolute measure of force, for, when the force remains the same, the effect remains the same, and neither the time nor other circumstances can vary it" (Loemker 1956, 462). From this Leibniz concludes that it is not surprising that the "forces of two equal bodies are proportional not to their velocity but to the causes or effects of their velocity...or to the squares of their velocities" (Loemker 1956, 462). This is Leibniz's distinction between dead force and living force.⁴⁶ "Hence

⁴⁶Forces according to Leibniz are divided into two kinds; active and passive, each one of these subdivided in turn into primitive and derivative as follows:

1.Active force:

Primitive active

force is also of two kinds: the one elementary, which I also call dead force, because motion does not yet exist in it but only a solicitation to motion... the other is ordinary force combined with actual motion, which I call living force [vis viva]" (Loemker 1956, 717). The relationship between these two kind of forces is that between infinitesimal and finite

Derivative active

2.Passive force:

primitive passive

derivative passive

Leibniz said: "Active force, which may well be called power, as it is by some, is of two kinds. The first is primitive force, which is in all corporeal substance as such... The second is derivative force, which is exercised in various ways through a limitation of primitive force resulting from the conflict of bodies with each other... Passive force is likewise of two kinds-primitive and derivative" (Loemker 1956, 713-714). The derivative active is what Leibniz called "living force," the *vis viva*. The primitive active is something like soul or substantial form, while the primitive passive is "prime matter." Derivative passive force, by contrast, is the manifestation of passive force as measurable in interacting of bodies regarded asof such matter as well as an inner principle of primitive active force its measure is mv.

Leibniz believes that the state of motion is basic in the nature of body: "I believe that a body entirely at rest is contrary to the nature of things" (Loemker 1956, 714). However, motion is only a manifestation of something else which is more essential, and that is force. On other hand, primitive active force, which is nothing but the first entelechy and corresponds to the soul or substantial form, "relates only to general causes which cannot suffice to explain phenomena" (Loemker 1956, 714). Thus the derivative force is the one that needs to be considered in reflecting on the laws of nature.

quantities. Leibniz relates this to the fact that a body cannot change from the state of effort to move or a tendency to motion to the state of actual motion without going continuously through all the infinitely many intermediate levels of motion. In fact Leibniz will take the law of continuity as another metaphysical foundation, besides the principle of causality, of his science of dynamics.

Mere extension is excluded from any explanation of the state of matter: "But granted that there is in matter a force to maintain its state, this force can certainly not be derived in any way from extension alone" (Loemker 1956, 839). The substance of bodies consists in such a force: "the substance of things itself consists in the force of acting and being acted upon" (Loemker 1956, 815). Force, then, is prior to extension, which is not the essence of material substance, but only a manifestation of a more fundamental reality. (In fact in a later stage of his development there is no material substance. The more fundamental reality in question merely appears as body on the phenomenal level.) Thus: "So I believe that our thinking is completed and ended in the concept of force rather than in that of extension. And we need seek no other concept of power or force than that it is attributed

from which change arises, and whose subject is substance itself" (Loemker 1956, 838). The force that is connected with motion and produces motion is derivative force, "by which bodies actually act and are acted upon by each other" (Loemker 1956, 715), while the underlying primitive force is somehow more directly a part of the underlying metaphysical ground of bodies in the first place. Again, this includes an active force which is inherent in every substance: "I say that this power of acting inheres in all substance and that some action always arises from it, so that the corporeal substance itself does not, any more than spiritual substance, ever cease to act" (Loemker 1956, 710).

Here we may note that Locke's position is different not only from Leibniz's earlier view in that he denied active force to bodies (although of course this did not prevent Locke from considering them substances), but also from Leibniz's later view in that Locke was apparently unwilling to say that active force is even to be found in what underlies bodies. Nevertheless, it is interesting to consider that, in his reflection on the problem of cohesion, there may be more of a similarity between Locke and Leibniz than first is apparent concerning the underlying substance of body.

30. Conclusion.

In Locke's discussion of substance as that in which the qualities of body inhere, it is not simply a question of what such a quality as, for example, extension inheres in, but the very nature of the quality itself. Reflection on this problem leads to the conclusion that it is impossible to distinguish the extension of a body from solidity. In the case of pure space, the quality of extension and that of solidity are reasonably distinguished, because in space we can talk about extension without solidity, but in the case of physical extension it is a very different matter. Furthermore, the substratum in Locke's view becomes more than what we normally think about it. It is that thing "wherein they [qualities] do subsist, and from which they do result" (II.XXII.1), thus it is more than just the thing that has the qualities; in fact it is the thing that makes them qualities in the first place, something that makes extension and makes solidity.

What I would like to emphasize here is that for Locke there must be "something" more than qualities, but he did not speculate about it at all. For example, he was not willing to use a language of force or power to explain it. Then why does

he think that there must be something more than qualities? And why does he use the traditional language of substratum and inherence to talk about it? One reason for this might be that, as for traditional philosophers, he was concerned with the question of what is ontologically most fundamental. However, for Locke it must be fundamental in the sense that it is what constitutes the very qualities that inhere in it in the first place. In fact Locke has no theory about what that is, but whatever it is, it something that would in effect make the quality of extension, make the quality of solidity, and constitute them in the first place, not only something that just has these qualities. It is very interesting that Locke did not even bring in the notion of power or force here; one may think that this is exactly the place where he should bring it in.

The word "in" in his phrase "what is it, that that Solidity and Extension inhere in" (II.23.2), is misleading. The "inherence" language is not appropriate to discuss this issue, although it is appropriate to speak of something that underlies the qualities of matter. I have suggested that this underlying substance of matter, and therefore of bodies, is cohesion. One might suppose that there is a hint of inherence

in what Locke said after he discussed the hypothesis of pressure: "For since Body is no farther, nor otherwise extended, than by the union and cohesion of its solid parts, we shall very ill comprehend the extension of Body, without understanding wherein consists the union and cohesion of its parts" (II.23.24). However, the word "wherein" has a broadly grammatical use and does not stand for inherence here; it is another way to ask what constitutes cohesion. So we cannot put much weight on the "in" in that particular passage.

In addition to talking about what underlies the qualities of matter, Locke also talked about qualities mysteriously "superadded" to matter, I will discuss the issue of superaddition in the epilogue on The Mystery of Nature and The Divine. In his discussion of the mystery of the cohesion of matter, however, Locke did not suggest anything that indicated that superaddition could explain the cohesion of matter. It is interesting to ask why he does not suggest that. For example, Locke is willing to say it may be possible that a purely material thing can think, but not without having a superadded faculty given to it by God. However, he never suggests that matter might be able to cohere only because of something superadded to it by God. Rather, he insists on

using the "underlying" metaphor. Why is that? One reason might be that he is not just talking about particles cohering. If he were, then he might have given a solution similar to that of Newton. In fact Newton made a suggestion of superaddition when he suggested that maybe attraction and some other qualities were really added by God. Newton questioned the cause of cohesion of hard particles in his *Opticks*, Query 31, page 390:

how such very hard Particles...can stick together, and that so firmly as they do, without the assistance of something which causes them to be attracted or press'd towards one another, is very difficult to conceive.

it may be also allow'd that God is able to create Particles of Matter of several Sizes and Figures, and in several Proportions to Space, and perhaps of different Densities and Forces, and thereby to vary the Laws of Nature, and make Worlds of several sorts in several Parts of the Universe. At least, I see nothing of Contradiction in all this. (1979, 403-404)

Obviously, Locke does not avoid such a suggestion because he has some difficulty with the notion of superaddition: he introduces the notion himself when he talks about mind. So what is the explanation here? Again, the explanation may be that we are not talking only about the cohesion of solid particles one with another, but something that makes solidity itself possible in the first place. If we are talking about something superadded to solid particles, then we are presupposing the existence of something solid and extended. Locke's problem concerns the very qualities of solidity and (physical) extension themselves.

Epilogue

The Mystery of Nature and The Divine

what a darkness we are involved in, how little 'tis of Being, and the things that are, that we are capable to know. And therefore we shall do no injury to our knowledge when we modestly think with our selves, that we are so far from being able to comprehend the whole nature of the Universe, and all the things contained in it, that we are not capable of a philosophical Knowledge of the Bodies that are about us, and make a part of us: Concerning their secondary Qualities, Powers, and Operations, we can have no universal certainty. (IV.III.29)

"Darkness", "uncertainty", "incurable ignorance", "unknowability" are words that occur in the Essay many times in addition to the phrase "we know not what." Most of Locke's commentators associate "we know not what" with substance.

However, "incurable ignorance" and "we know not what" may also refer to something else, including an explanation of phenomena in terms of miracles or the divine. As a matter of fact, in the *Essay* "we know not what" might be associated with numerous subjects, such as those of the causal relation between secondary qualities and primary qualities and between ideas and qualities or powers, the nature of motion, and the possibility of thinking matter, in addition to the topics that have occupied us concerning power, solidity, cohesion, and the very existence of matter. (In the later case, at least, "we know not what" might better be put as "we know not how," So as to avoid suggesting the standard view of Locke's substance as an underlying "thing.") For example, in Book IV, Chapter III, Section 12, after talking about our "Ignorance of the primary Qualities of the insensible Parts of Bodies, on which depend all their secondary Qualities" Locke mentioned

yet another and more incurable part of Ignorance, which sets us more remote from a certain Knowledge of the co-existence...of different *Ideas* in the same Subject; and that is, that there is no discoverable connection between any *secondary Qualities*, and those *primary*

Qualities that it depends on.

Locke also talked about God as making that connection:

'Tis evident that the bulk, figure, and motion of several Bodies about us, produce in us several Sensations, as of Colours, Sounds, Tastes, Smells, Pleasure and Pain, etc. These mechanical Affections of Bodies, having no affinity at all with those Ideas, they produce in us, (there being no conceivable connexion between any impulse of any sort of Body, and any perception of a Colour, or Smell, which we find in our Minds) we can have no distinct knowledge of such Operations beyond our Experience; and can reason no otherwise about them, than as effects produced by the appointment of an infinitely Wise Agent, which perfectly surpass our Comprehensions. (IV.III.28)

Consider also the case of motion. Locke brings God in here too. This is because Locke regards matter as totally lacking in causal power. Thus in Book IV, Chapter X, Section 10, in the course of talking about God's existence,

Locke asked: "Is it possible to conceive it can add Motion to it self, being purely Matter, or produce any thing?" This seems to imply that, apart from some sort of divine addition, material things are incapable of real interaction, not to mention motion. And, as we have previously seen, Locke holds that bodies are in fact incapable of real action. Through their motion, they are incapable of doing anything more than passing on a power received from elsewhere, and ultimately from the only original source of active power, God:

the Motion it [Matter] has, must also be from Eternity, or else be produced, and added to Matter by some other Being more powerful than Matter; Matter, as is evident, having not Power to produce Motion in it self. (IV.X.10)

Locke also talks about the possibility of a power in matter to perceive and think. In Book IV Chapter III, Section 6, Locke said: "We have the idea of Matter and Thinking, but possibly shall never be able to know, whether any mere material Being thinks, or no," clearly asserting that it is impossible for us, by the contemplation of ideas independently of revelation to discover "whether Omnipotency has not given

to some System of Matter fitly disposed, a power to perceive and think":

It being, in respect of our Notions, not much more remote from our Comprehension to conceive that God can, if he pleases, superadd to Matter a Faculty of Thinking, than that he should superadd to it another Substance, with a Faculty of Thinking; since we know not wherein Thinking consists, nor to what sort of Substance the Almighty has been pleased to give that Power, which cannot be in any created Being, but merely by the good pleasure and Bounty of the Creator. (IV.III.6)

That God can "superadd" thinking to matter is a suggestion along the same lines as that "God added motion to matter." Both reflect the fact that there is no Lockean appeal to the Boylean corpuscular hypothesis or mechanism for an explanation even of what are (or might be) purely material events. (Whatever must be added to it to make it possible, motion is presumably a material event for Locke. Similarly, as Ayers has argued in his [1981, 218] what Locke is considering in the case of thinking is not the superaddition of non-material

phenomena to a part of the material body, but rather the very power of the latter to engage in a physical activity of thinking.)

The issue of superaddition is very important in considering Locke's philosophy. It has been the subject of a recent debate between Michael Ayers and Margaret Wilson. Wilson in her paper "Superadded Properties: The Limits of Mechanism in Locke" (1979), attempts "to show that Locke's official position is in conflict with another set of views that he espouses in the Essay, the Correspondence with Stillingfleet, and elsewhere." (144) Wilson takes Locke's official position to be "not just that a body's secondary and tertiary qualities derive from its primary qualities." Rather he holds specifically that the former qualities--and indeed all of a body's Powers and Operation--flow from the primary qualities of the body's insensible corpuscles or inner constitution, in other words, from its real essence. (143) Notwithstanding Locke's official, or Boylean, position--which Ayers will call a "dogmatic" Boylean position--Wilson argues that Locke does not consistently maintain that all of a body's properties stand in comprehensible relations to its Boylean primary qualities or can be said to flow from them. In fact

"At the minimum Locke claims that some presumed properties of matter...cannot be the natural consequences of the operation of Boylean corpuscles. We must rather regard them as 'Superadded' or 'annexed' to such operation by God" (144). This indicates , according to Wilson, two things. First, it shows the extent to which Locke grasped the limitations of the explanatory capacities of Boylean mechanism, from both philosophical and scientific points of view. Wilson sees that the capacities of Boylean principle are not restricted to areas implicated in the "mind-body problem," "but also extend to phenomena that unequivocally fall within the range of physics. The most explicit case is that of gravity" (1979, 148). Second, the superaddition makes the phenomena in question miraculous rather than natural.

In his *Essay* Locke maintained that impulse is the only way in which bodies operate: "bodies operate by impulse, and nothing else" (II.VIII.2). Thus action at a distance is impossible. However, Wilson rightly notes that after reading Newton's *Principia* Locke became convinced of the reality of gravitational attraction. Thus Locke wrote in *Some Thought Concerning Education*:

It is evident, that by mere matter and motion none of the great phenomena of nature can be resolved: to instance but in that common one of gravity, which I think impossible to be explained by any natural operation of matter, or any other law of motion, but the positive will of a superiour Being so ordering it. (184)

Also in his correspondence with Stillingfleet Locke said:

It is true, I say, 'that bodies operate by impulse and nothing else.' And so I thought when I write it and yet can conceive no other way of their operation. But I am since convinced by the judicious Mr. Newton's incomparable book, that it is too bold a presumption to limit God's power, in this point, by my narrow conceptions. The gravitation of matter towards matter, by ways inconceivable to me, is not only a demonstration that God can, if he pleases, put into bodies powers and ways of operation, above what can be derived from our idea of body, or can be explained by what we know of matter, but also an unquestionable and every where visible instance, that he has done so. And therefore in

the next edition of my book I shall take care to have that passage rectified. (*Works* IV, 467-68)

Based on these passages, Wilson says: "I take this pronouncement about gravity to be an indication that the powers of a body are not fully derivable, even in principle, from the primary qualities of its insensible particles" (1979, 148). Also for Wilson, the first passage indicates that "gravity is just an illustration of the general truth that the phenomena of nature are not in general intelligible through Boylean concepts alone" (1979, 148) and "it follows from Locke's account that a body has its powers to produce ideas only *because of* the divine acts of annexation" (147). Thus gravity as a non-natural power, or as Locke said a power "impossible to be explained by any natural Operation of Matter," cannot be derived from the real essence of any material body. Thus it might be considered a standing miracle.

Two kind of interpretation might be considered here as opposing Wilson's: Ayers and Nicholas Jolley. I will briefly discuss the latter and then discuss Ayers account of this problem. Jolley pointed out that the suggestion of a

"standing miracle" was first ascribed to Locke by Leibniz. Jolley also thinks that "such an interpretation, however, does not square very well either with Locke's rationalistic model of explanation or with his own conception of miracles" (Jolley 1984, 61). He remarks that Leibniz (and I assume he is implying here Wilson too) misrepresents Locke's treatment of the two cases, i.e., the case of gravity and thought as Superadded to matter. The fact that Locke himself does suggest a parallel, Jolley asserts, stems from Locke's purpose to stress that God's omnipotence transcends our finite capacities of understanding. Thus Locke's consideration of "the case of gravity is strictly epistemological: it gives one grounds for caution in asserting what God can and cannot do. But Leibniz writes as if Locke is saying that the fact of God's annexing attraction to matter allows us to infer that he could similarly annex thought, and this is a misreading" (1984, 65). According to Jolley, the two cases need to be considered separately for a better understanding of Locke's philosophy: gravitational attraction is an established fact, while nothing that Locke says implies that the superaddition of thought to matter is even metaphysically possible. Here Jolley refers to a passage, already quoted by Ayers (1981),

from Locke's apologist Samuel Bold, who said that for Locke "there is no demonstrative proof either that (God) can, or that he cannot Superadd a power of thinking to some system of matter fitly disposed" (Jolley 1984, 65 footnote # 25, quoted from Ayers 1981, 224). More generally, Jolley suggests that we need to distinguish several possible situations:

1. God has miraculously Superadded thought to matter.
2. God could miraculously superadd thought to matter.
3. It is epistemically possible (i.e. for all we know) that God has miraculously Superadded thought to matter.
4. It is epistemically possible that God has non-miraculously Superadded thought to matter.
5. It is epistemically possible that God could non-miraculously superadd thought to matter.

Jolley thinks that Leibniz attributes (2) and sometimes (1) to Locke, whereas Jolley says that "Locke's position is best represented by (4)" (1984, 66), although some of Locke's remarks suggest the weaker (5). Thus Jolley concludes that Leibniz was doubly wrong in his reading of Locke: in introducing the issue of the miraculous, and in mistaking an epistemic for a metaphysical possibility.

In fact the first reply to Wilson's suggestion might be

by Ayers. Ayers argues that what Locke means is only that we may be unable to conceive the rational, purely mechanical, connection between primary qualities and sensory ideas, matter and thought, motion, gravity, etc., but not that there is no such connection as a wholly natural fact:

When Locke says of a causal power unintelligible to us that 'we are fain to quit our reason, go beyond our ideas, and attribute it wholly to the good pleasure of our Maker', he means, not that we have to postulate a miracle, 'arbitrary' in the modern sense and so unintelligible to any intellect, but that we can say no more about it than what is true of every power whatsoever: its exercise is thanks to God. (Ayers 1975, 100)

in other words, Ayers thinks that commentators have mistaken an epistemological point for an ontological one.

In his 1981 paper, in order to maintain Locke's naturalism and mechanism, Ayers criticizes Wilson. He argues that the act of superaddition shouldn't be taken in terms of what is miraculous.

Speaking of the causality of sense perception, for example, Ayers holds that for Locke there is no reason to regard the causality in question as other than direct and natural; indeed, "Locke in general seems to think, not just that it is more impressive when God brings things about without contravening the order of nature, but that, whatever God does, he cannot really bring about what is naturally impossible" (Ayers 1981, 220). This is because bringing about the naturally impossible, according to Ayers, means to break a necessary connection, where Locke's paradigm for impossibility and necessity is geometrical: bringing about the physically impossible would be like bringing about a triangle the angles of which do not equal two angles. There would be a contradiction in it. However, in the case of thinking matter, Locke says:

I see no contradiction in it, that the first eternal thinking Being should, if he pleased, give to certain Systems of created senseless matter, put together as he thinks fit, some degrees of sense, perception, and thought. (IV.III.6)

Thus Ayers concludes, against Wilson, that Locke's talk of superaddition does not detract from his naturalism and mechanism. Also, Ayers thinks that Locke carefully avoids defining a miracle as an event contrary to the nature of things, because according to this definition we should never know when a miracle has taken place. Thus Locke "prefers to understand a miracle as an event contrary to the normal course of our experience, such that in its context it is a purposive manifestation of divine power" (1981, 221). According to this notion of a miracle, no conflict arises in the first place between a belief in miracles and a belief that God cannot do the naturally impossible.

According to Ayers, all the properties or powers of a body are supposed by Locke to flow from its essence in a way similar to that in which the properties of a triangle flow from its definition. This is precisely what makes this existence natural. Thus bringing about the physically impossible would be like bringing about a triangle the angles of which do not equal two right angles. In fact, however, the necessary connections in question are by Ayers' own admission divinely superadded to mere matter. So how does Ayers understand terms such as "natural, possibility," and

"necessary connection" here? Apparently, Ayers thinks that God's acts of superaddition define what is natural in the first place. That is why God's action can not contradict what is natural. But why should we say that God's action define what is natural?

Locke does not in fact talk about what is contrary to nature. However, he does talk about what is contrary to reason. This might be relevant to Ayers' position, especially since Ayers speaks of connections which are "natural" and even "mechanistic" in Locke as connections which are rationally intelligible. Now Locke thinks that if we have come to the conclusion that something is contrary to reason then we should not in fact suppose it to be true even in the face of the suggestion that it is a matter of revelation; if we judge it is contrary to reason then we are entitled to reject it:

Because the natural ways of Knowledge could settle them there, or had done it already, which is the greatest assurance we can possibly have of any thing, unless where GOD immediately reveals it to us: And there too our Assurance can be no greater, than our Knowledge is, that is a Revelation from GOD. But yet nothing, I

think, can, under that Title, shake or over-rule plain Knowledge; or rationally prevail with any Man, to admit it for true, in a direct contradiction to the clear Evidence of his own Understanding. For since no evidence of our Faculties, by which we receive such Revelations, can exceed, if equal, the certainty of our intuitive Knowledge, we can never receive for a Truth any thing, that is directly contrary to our clear and distinct Knowledge,...And therefore, no Proposition can be received for Divine Revelation, or obtain the Assent due to all such, if it be contradictory to our clear intuitive Knowledge. (IV.XVIII.5)

Our judgment that something is contrary to reason is sufficient to judge that it is not a revealed truth; this may be why Ayers thinks that if something is contrary to nature then it is not imputable to God.

Nature seems to be defined for Ayers by the real essences of things, comparable to the essence of triangle in the sense that the ways in which those things are able to operate flow from or follow from the essence in the way that the properties of a triangle flow from its essence. This can also be a way

that Ayers could arrive at the conclusion that, in bestowing on bare matter certain "Superadded" powers (such as motion or gravity) or perhaps bestowing on organized bodies certain "Superadded" properties (such as the power to think), God could not be acting contrary to nature, namely, because by those actions he is actually *creating* the natures of things (for example, physical bodies as opposed to bare matter). Thus Ayers emphasizes Locke's talk about the supposedly miraculous phenomena in question as surpassing our *ideas* of things, rather than going beyond the their actual natures or real essences. Thus even in Locke's reply to Stillingfleet quoted by Wilson:

The gravitation of matter towards matter, by ways inconceivable to me, is not only a demonstration that God can, if he pleases, put into bodies powers and ways of operation, above what can be derived from our idea of body, or can be explained by what we know of matter, but also an unquestionable and every where visible instance, that he has done so. (*Works* IV, 467-68)

As for the concept of a "miracle," as we saw, Ayers

considers only two possibilities:

- a. A miracle is what contradicts the order of nature.
- b. A miracle is what seems to contradict the order of nature.

According to Ayers: Locke "carefully avoids defining a miracle as an event contrary to the nature of things...He prefers to understand a miracle as an event contrary to the normal course of our experience" (Ayers 1981, 221). In fact in the opening paragraph of his *A Discourse of Miracles* Locke said that to talk about miracles without defining what one means by this word "is to make a show, but in effect to talk of nothing" (*Works IX*, 256). Then he gave his definition:

A miracle then I take to be a sensible operation, which, being above the comprehension of the spectatore, and in his opinion contrary to the established course of nature, is taken by him to be divine. (*Works IX*, 256).

The first thing that needs to be emphasized is that Locke's account of miracles here is in a context that is primarily not metaphysical but epistemological. Therefore, although the quote above is considered by some commentators and offered by

Locke himself as a *definition*, in fact we need not actually consider it as a definition. Instead it emphasizes a condition under which someone would call something a miracle, namely, when it *seems* to contradict the course of nature. This emphasis is perhaps also taken wrongly by J.J. MacIntosh in his article "Locke and Boyle on Miracles and God's Existence" (1994, 203). MacIntosh lists as necessary conditions of some event actually *being* (and not simply being taken to be) miraculous:

1. a 'sensible operation',
2. 'above the comprehension of the spectatore',
3. in the observer's 'opinion contrary to the established course of nature', and
4. taken by the observer to be divine.

What Locke said about a miracle as 'contrary to the established course of nature' might be held as clear evidence against Ayers' view. However, the fact that Locke suggests that what is in question is dependent upon the observer's opinion, may seem to fit Ayers' view of a miracle as only what *seems* to contradict the established course of nature. But there is a passage where Locke clearly said that a miracle does contradict the established course of nature, namely, in

his *Reasonableness of Christianity*: "For though it be as easy to omnipotent power to do all things by an immediate overruling will, and so to make any instruments work, even contrary to their nature, in subserviency to his ends; yet his wisdom is not usually at the expense of miracles" (*Works VII*, 84-85). Ayers explains away this passage by saying that even here, where the context is theological rather than philosophical, Locke stresses that God does constantly "bring about his purposes by means operating according to their [thing's] natures" (*Works VII*, 85, quoted by Ayers 1981, 221).

A stronger point that might be raised against Ayers' interpretation is that the passage on which he relies is from a context in which Locke was talking about miracles used to support revelation after God had already established a particular order of nature:

To know that any revelation is from God, it is necessary to know that the messenger that delivers it is sent from God, and that cannot be known but by some credentials given him by God himself. Let us see then whether miracles, in my sense, be not such credentials, and will not infallibly direct us in the search of divine

revelation. (*Works IX*, 257)

This context is completely different from the context in which Locke talks about the act of superaddition, because talk about superaddition in Locke is part of his view regarding certain divine actions involved, or that might have been involved, prior to the existence of bare matter to bodies of various kind, or from the existence of certain kinds to other kinds, thus establishing a particular order of nature in the first place. Thus:

The idea of matter is an extended solid substance; wherever there is such a substance, there is matter, and the essence of matter, whatever other qualities, not contained in that essence, it shall please God to superadd to it. For example, God creates an extended solid substance, without the superadding anything else to it, and so we may consider it at rest: to some parts of it he superadds motion, but it has still the essence of matter: other parts of it he frames into plants, with all the excellencies of vegetation, life, and beauty, which are to be found in a rose or a peach-

tree, &c. above the essence of matter in general, but it is still but matter: to other parts he adds sense and spontaneous motion, and those other properties that are to be found in an elephant. Hitherto it is not doubted but the power of God may go, and that the properties of a rose, a peach, or an elephant, Superadded to matter, change not the properties of matter; but matter is in these things matter still. (*Works* IV, 460)

Ayers concludes that Locke's official position is neither a dogmatic Boylean mechanism, as Wilson asserts, nor an appeal to standing miracle. Rather, it is an agnosticism shared with Newton and Gassendi. This is because, again, Locke's primary analysis is on the contrast "between reality and our ideas of it" (1981, 222) rather than between what is natural and supernatural. In any case Ayers' interpretation of Locke does not offer much consideration of the problem of cohesion. In fact it would seem that superaddition, as Ayers understands it, is not relevant to that, problem, since cohesion makes matter possible in the first place, whereas superaddition adds something to the existing matter. Perhaps, however, Ayers missed that point because he tended to think of cohesion as a

problem only between corpuscles that are made of matter, rather than as a problem that concerns the very existence of that matter in the first place. The explanation of that cannot be in terms of a "real essence" produced by God, i.e., in terms of God modifying the essence of matter into a real essence, because we are talking of getting to matter in the first place. If as I have argued, the question of how matter is possible in first place is the same as the question of the internal cohesion within every corpuscle, and not only between them, then the question couldn't possibly be answered in the way that Ayers responds to the problem of the other phenomena he was dealing with, namely, by trying to show that, even though they involve an act of the divine will, nevertheless they are perfectly natural. The strategy that he uses to show that even though they involve the divine will, they are perfectly natural phenomena, couldn't be extended to the problem of internal cohesion, because the problem of internal cohesion is the problem of how matter is possible in the first place. That problem cannot be dealt with in terms of supperaddition, because supperaddition presupposes that we already have matter, and God modifies that matter into a more specific essence. In that case, we might insist that the

phenomena in question are natural precisely because they flow logically from the nature or essence thus created, just as certain things flow logically from the nature or essence of triangle. However, this is nothing in Locke's philosophy for cohesion to flow from, beyond the divine will in its action of bestowing it upon something (inconceivable to us) that would somehow be spread out in space without yet being anything material at all. In any case, the fact is Locke did not explicitly appeal to the divine will to explain cohesion. Why not, when he was so willing to appeal to God in the case of other mysteries? An answer might be that in fact Locke did have something like Ayers' general strategy in mind for reconciling the natural with the supernatural, realized the strategy would not apply to the problem of internal cohesion, and just didn't want to have to admit that the very existence of matter is already a miracle.

Bibliography

Bibliography

- Aaron, Richard I. 1971: *John Locke*. Oxford, Clarendon Press.
- Adams, E.M. 1948: "Primary and Secondary Qualities." *Journal of Philosophy* 45: 435-42.
- Alexander, H.G. (Ed.) 1965: (Ed) *Leibniz-Clark Correspondence*. Manchester, Manchester University Press.
- Alexander, Peter. 1974: "Curley on Locke and Boyle." *Philosophical Review* 83: 229-37.
- Alexander, Peter. 1974: "Boyle and Locke on Primary and Secondary Qualities." *Ratio* 16: 51-67.
- Alexander, Peter. 1977: "The Names of Secondary Qualities." *Proceedings of the Aristotelian Society*, 87: 203-21.
- Alexander, Peter. 1985: *Ideas, Qualities and Corpuscles*. Cambridge, Cambridge, University Press.
- Allaire, Edwin B. 1963: "Bare Particulars," *Philosophical Studies*, Vol. XVI. In Loux, Michael J. (1976: 280-290.)
- Allaire, Edwin B. 1965: "Another Look At Bare Particulars," *Philosophical Studies*, Vol.XVI. Reprinted in Loux, M.J. (1976): 296-303. In this article Allaire replies to Chappell, V. C. (1964).

- Anscombe, G. E. M. 1981: "Substance," in her *Metaphysics and Philosophy of Mind*. Minneapolis, University of Minnesota Press: 37-43.
- Ayers, M. R. 1975: "The Ideas of Power and Substance in Locke's Philosophy," *Philosophical Quarterly*, XXV: 1-27. Reprinted in I. C. Tipton (1977): 77-104.
References are to the reprint.
- Ayers, M.R. 1981: "Mechanism, Superaddition, And The Proof of God's Existence in Locke's Essay", *The Philosophical Review*, XC: 210-51.
- Ayers, M.R. 1991: *Locke, Epistemology and Ontology*. 2vols. Routledge, London and New York.
- Bennett, Jonathan. 1965: "Substance, Reality and Primary Qualities." *American Philosophical Quarterly* 2, no. 1 (Jan.): 1-17.
- Bennett, J. 1971: *Locke, Berkeley, Hume, Central Themes*. Oxford, Clarendon Press.
- Bennett, J. 1987: "Substratum," *History of Philosophical Quarterly*, Vol 4: 197-215.
- Bergmann, G. 1967: *Realism*. Madison, University of Wisconsin Press.

- Boas, Marie. 1953: "The Establishment of the Mechanical Philosophy." *Osiris*, X.
- Bolton, Martha Brandt. 1976: "The Origins of Locke's Doctrine of Primary and Secondary Qualities." *Philosophical Quarterly* 26: 305-16.
- Bolton, Martha Brandt. 1983: "Locke and Pyrrhonism: The Doctrine of Primary and Secondary Qualities." In Myles Burnyeat. (1983): 353-75. Reprinted in Vere Chappell 1992, 255-77. References are to the reprint.
- Bolton, M. B: (1976) "Substances, Substrata, and Names of Substances in Locke's *Essay*." *The Philosophical Review*, 85: 488-513.
- Boyle, R. 1965: *Works*, 6 vols. Ed. Thomas Birch. London.
- Brandt, R. (Ed.) 1981: *John Locke*. Symposium Wolfenbuttel 1979, Walter de Gruyter. Berlin. New York.
- Burnyeat, Myles. (Ed.) 1983: *The Skeptical Tradition*. Berkeley, University of California Press.
- Campbell, John. 1980: "Locke on Qualities." *Canadian Journal of Philosophy* 10: 567-85.
- Campbell, Keith. 1972: "Primary and Secondary Qualities." *Canadian Journal of Philosophy* 2: 219-32.

- Chappell, Vere. (Ed) 1992: *Essays on Early Modern Philosophers*. vol(8) John Locke, *Theory of Knowledge*. New York, Garland publishing, Inc.
- Chappell, Vere. (Ed.) 1994: *The Cambridge Companion To Locke*. Cambridge, Cambridge University Press.
- Cummins, Robert. 1975: "Two Troublesome Claims about Qualities in Locke's *Essay*." *Philosophical review*. 84: 401-18.
- Curley, E.M. 1972: "Locke, Boyle and the Distinction between Primary and Secondary Qualities." *Philosophical Review* 81: 438-64.
- Danaher, J. P. 1991: "Did Locke Believe that Real Essence Would Someday Be Knowable?" *Gonsis*, 3(4): 35-48.
- Davidson, Arnold. 1984: "The Primary/Secondary Qualities and the Foundation of Corpuscularian Science." *Dialogue (Canada)* 23: 281-304.
- Descartes, R. 1983: *Principles of Philosophy*. Translated with Explanatory Notes by: Miller, V.R and Miller, R, D. Boston, Reidel Publisher Company.
- Dewey, John. 1926: "Substance, Power and Quality in Locke." *Philosophical Review* 35. Followed by a discussion by Gregory D. Walcott: 465-72.

- Dicker, Georges. 1977: "Primary and Secondary Qualities: A Proposed Modification of the Lockean Account." *Southern Journal of Philosophy* 15: 457-71.
- Dijksterhuis, E. J. 1961: *The Mechanization of The World Picture*. Oxford, The Clarendon Press.
- Galileo, G. 1957: *Discoveries and Opinion of Galileo*. Trans. Stillman Drake. Garden city: Doubleday.
- Gibson, James. 1960: *Locke's Theory of Knowledge and Its Historical Relations*. Cambridge. The university Press.
- Hunter, Michael (Ed.) 1994): *Robert Boyle Reconsidered*. Cambridge, Cambridge University Press.
- Jackson, Reginald. 1929: "Locke's Distinction between Primary and Secondary Qualities." *Mind* 38: 56-76.
- Jolley, N. 1984: *Leibniz and Locke: A Study of the New Essay on Human Understanding*. Oxford, Clarendon press.
- Joske, W.D. 1967: "Primary and Secondary Qualities." In *Material Objects*: 38-58. London, Macmillan.
- Kienzle, Bertram. 1990: "Locke's Qualitaten." *Studia Leibniz* 22: 199-202.
- Leibniz, G. W. 1981: *New Essays on Human Understanding*, Trans and Ed by Peter Remnant and Jonathan Bennett.

- Cambridge, Cambridge University Press.
- Locke, John. 1693: *Some Thought Concerning Education*. London.
- Locke, John. 1823: *The Works*. Ed. by Thomas Tegg, London.
- Locke, John. 1988: *An Essay Concerning Human Understanding*.
edited with an introduction by Peter H. Nidditch.
Oxford, Clarendon Press.
- Loemker, L. E. (Ed.) 1956: *Leibniz, Philosophical Papers and Letters*, 2 vols. Chicago, The University of Chicago Press.
- Loux, M. J. (Ed.) 1976: *Universals and Particulars: readings in Ontology*. London, The University of Notre Dame Press.
- MacIntosh, J. J. 1994: "Locke and Boyle on miracles and God's existence." In *Robert Boyle reconsidered*, (Ed) Michael Hunter (1994: 193-214). Cambridge, Cambridge University Press.
- Mackie, John L. 1976: *Problems from Locke*. Oxford, Clarendon Press.
- Mandelbaum, M. 1966: *Philosophy, Science, and Sense Perception*, Historical and Critical Studies. Baltimore, The Johns Hopkins Press.
- McCann, Edwin. 1994: "Locke's Philosophy of Body." In *The*

- Cambridge Companion To Locke*, (Ed) Vere Chappell (1994: 56-88).
- Millington, E. C. (1940-5): "Studies in Cohesion From Democritus to Laplace", *Lychnos* (annual of the Swedish history of science society): 55-78.
- Newton, I. 1952: *Optics*. New York, Dover publications, Inc.
- Odegard, Douglas. 1969: "Locke and the Unreality of Relations." *Theoria* 35: 147-52.
- O'Connor, D. J. 1967: *John Locke*. New York, Dover Publication, Inc.
- Palmer, David. 1976: "Boyle's Corpuscular Hypothesis and Locke's Primary-Secondary Quality Distinction." *Philosophical Studies* 29: 181-89.
- Reid, Thomas. 1967: *Essays on the Intellectual Powers of Man*. With notes and supplementary dissertations by Sir William Hamilton, With an introduction by Harry M. Bracken, Georg Olms Verlagsbuchhandlung, Hildesheim, (7th edition.)
- Russell, B. 1959: *My Philosophical development*. New York, Simon and Schuster.
- Sanford, David, H. 1970: "Does Locke Think hardness is

- Primary Quality." *The Locke News Letter*, Vol 1.
- Sellars, W. 1952: "Particulars," *Philosophy of Science*. 20.
- Tipton, Ian C.)Ed.) 1977: *Locke on Human Understanding: Selected Essays*. London, Oxford University Press.
- Valberg, Eugene. 1980: "A Theory of Secondary Qualities." *Philosophy* 55: 437-53.
- Williams, C. J. F. 1969: "Are Primary Qualities Qualities?" *Philosophical Quarterly* 19: 310-23.
- Wilson, M. 1979: "Superadded Properties: The Limits of Mechanism in Locke." *American Philosophical Quarterly*, 16: 143-50.
- Wilson, M. 1982: "Superaddition properties: A reply to M. R. Ayers." *The philosophical Review*, XCI: 247-52.
- Woolhouse, Roger S. 1971: *Locke's Philosophy of Science and Knowledge*. Oxford, Blackwell.
- Woolhouse, R.S. 1981: "Locke, Leibniz, and the Reality of Ideas." In Brandt (1981: 193-207).
- Yolton, John W. 1956: *John Locke and the Way of Ideas*. Oxford, Oxford University Press.
- Yolton, J. W. 1970: *Locke and the Compass of Human Understanding*. Cambridge, Cambridge university Press.

Yolton, John W. 1993: *A Locke Dictionary*. Oxford, Blackwell.

VITA

Mashhad Sa'adi Al-Allaf was born in Nineveh, Iraq, in 1957. He attended Aumer Ibnul Khatab High School. In 1977 he moved to Baghdad to attend the Philosophy Department, College of Arts, at the University of Baghdad. He graduated in 1981 with a B.A. in philosophy with first honors. In 1985 he attained his Master's degree, writing his thesis in the philosophy of science titled "Operationalism: in Bridgman's Philosophy." After that he lectured at the Philosophy Department, University of Baghdad, and worked at AL-Mustansiriya University at Baghdad. During 1988-1990 he published some books and articles, organized two workshops on philosophy of science, and contributed to the establishment of a department of philosophy of science at AL-Mustansiriya University. In 1991 he began his doctoral studies at the University of Tennessee, Knoxville graduating with a Ph.D. in philosophy in 1995.