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Locke's scepticism concerning natural science

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LOCKE'S SCEPTICISM CONCERNING
NATURAL SCIENCE

by

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Abstract

Locke's Scepticism Concerning  
Natural Science  
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Locke was a sceptic about the possibility of scientific knowledge of corporeal substance. Scientific knowledge is knowledge which is certain, universal, and instructive. According to Locke, to have certain and instructive knowledge of natural kinds (universal knowledge about species of corporeal substances) requires knowledge of the real essence of natural kinds. Since a real essence is the foundation for the properties a thing has, it must be known before a deduction of the properties can be done. Locke did not believe that it was possible for humans to know the real essence of corporeal substances. In my thesis, I provide an explanation for why he held these views.

As my work shows, knowledge of the real essence of a natural kind is an involved process that requires first knowing the nominal essence of the natural kind, and then knowing the inner constitution of each member of the kind, knowing which aspect of the inner constitution of each member correlates to the overlap of properties used to delineate the natural kind, and finally, knowing how that aspect, which is the real essence of the natural kind, produces the properties it does. Without knowledge of the mechanics of how the physical real essence produces the mental ideas we cannot know whether the connection between the real essence and the properties is a necessary connection or a mere correlation. Unless we
know why there is a connection, we cannot know, with certainty, that the connection will hold in the future or for other like configurations. Locke relies on the mind-body problem to explain why we cannot know the mechanics behind the connections.

The mind-body problem has not been given appropriate emphasis in Lockean study. And yet it is uniquely capable of handling the two claims Locke makes about natural science: 1) our knowledge of corporeal bodies can never qualify as scientific knowledge and 2) our knowledge of corporeal bodies can be improved in ways that are useful to human life.
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CHAPTER ONE
Ideas of Substances and Scientific Knowledge

The issue in Locke's work that I am concerned with is his scepticism about the possibility of scientific knowledge of corporeal bodies. My primary goal in this dissertation is to understand why Locke was sceptical about this and the connection his scepticism has to his views on natural science.

Scientific knowledge, for any area of study, requires knowledge that is certain, universal, and instructive. Locke allows the possibility of scientific knowledge for ideas of modes such as mathematical and moral concepts but denies the possibility for ideas of substance. Understanding why this separation occurs is the focus of this chapter. In this first chapter, therefore, I have the following goals: 1) to examine Locke's basic epistemology for the differences between concepts of mathematics and morals and ideas of substances, and 2) to understand what it is about this difference that allows for scientific knowledge of ideas of modes but not for ideas of substances.

Two disclaimers before I begin. One, as I talk about Locke's views on substances I ask to be understood as referring only to corporeal substances, those natural bodies in the external world such as bears, gold, and man. Because my focus is on natural science I will not consider what Locke says about spiritual substances.1 Two, while the first chapter deals with Locke's epistemology in a general way and covers many different areas, it is not intended to be a complete account of his views.

The first issue I want to take up is the difference Locke holds between ideas of modes and ideas of substances. An idea itself, for Locke is,

... whatsoever is the Object of the Understanding when a man thinks, I have used it to express whatever is meant by Phantasm,
Notion, Species, or whatever it is, which the Mind can employ'd about in thinking . . . (1.1.8)²

In 2.1 of the Essay,³ Locke makes his famous empirical claim that all ideas come into the mind by experience, either external sensation or internal reflection. Locke then divides ideas into two general categories, simple ideas and complex ideas. (2.2.1) Simple ideas are "each in it self uncompounded, contains in it nothing but one uniform Appearance, or Conception in the mind, and is not distinguishable into different Ideas." (2.2.1) Simple ideas that are obtained through sensation, while "united and blended" in the subject still enter the mind "by the Senses simple and unmixed." By this I take Locke to mean that each idea, as a simple, is perceived by the sensory organ uniquely designed to receive it, although several organs may perceive an object with multiple qualities at the same instant.

Though the Qualities that affect our Senses, are, in the things themselves, so united and blended, that there is no separation, no distance between them; yet 'tis plain, the Ideas they produce in the Mind, enter by the Senses simple and unmixed. For though the Sight and Touch often take in from the same Object, at the same time, different Ideas; as a Man sees at once Motion and Colour; the Hand feels Softness and Warmth in the same piece of Wax: Yet the simple Ideas thus united in the same Subject, are as perfectly distinct, as those that come in by different Senses. The coldness and hardness, which a Man feels in a piece of ice, being as distinct Ideas in the Mind, as the Smell and Whiteness of a Lily, or as the taste of Sugar, and smell of a Rose: And there is nothing can be plainer to a Man, than the clear and distinct Perception he has of those simple Ideas; which being each in it self uncompounded, contains in it nothing but one uniform Appearance, or Conception in the mind, and is not distinguishable into different Ideas. (2.2.1; underlining mine)

Also, all simple ideas are passive ideas, in that "the mind can neither make nor destroy them."⁴ The passivity of the mind in the reception of simple
ideas applies whether the simple ideas are obtained through sensation, as in the above quote, or through reflection. (2.2.2)

Locke then discusses the difference between simple ideas and complex ideas.

We have hitherto considered those Ideas, in the reception whereof, the Mind is only passive, which are those simple ones received from Sensation and Reflection before-mentioned, whereof the Mind cannot make any one to itself, nor have any Ideas which does not wholly consist of them. But as the Mind is wholly Passive in the reception of all its simple Ideas, so it exerts several acts of its own, whereby out of its simple Ideas, as the Material and Foundations of the rest, others are framed. (2.12.1)

Complex ideas occur when the mind "exerts several acts of its own" upon the different simple ideas that the mind had passively received. The ways in which the mind actively applies itself to simple ideas, and uses them as the "Material and Foundation" by which all other ideas are framed, are 1) by bringing together two or more simple ideas in one idea called the compound or complex idea, 2) bringing two ideas, either simple or complex, together without combining them, for the purpose of comparing them, thus giving the mind the complex idea of a relation between ideas, and 3) separating from compound ideas all the extraneous ideas that exist along side them in their external existence, which gives the idea of abstraction and thus allows for general or universal ideas. (2.12.1)

Locke draws a distinction between a complex idea and a compound idea. A complex idea is any occurrence of an idea in the mind where the mind actively does something with ideas, either simple or compound, such as combining them, comparing them, or abstracting from several compound ideas to determine what is common to all of them. Under this interpretation of
the distinction, compound ideas are a subset of complex ideas. Accordingly, a compound idea is the class of complex ideas where two or more simple ideas are actually joined together to form one idea.

Locke then goes on to divide complex ideas into three categories: ideas of relations, ideas of modes, and ideas of substances. Ideas of relations consist "in the consideration and comparing one Idea with another." (2.12.7) Although I will most commonly refer to mathematical and moral concepts as modes, there are instances of ideas of relations in connection with mathematical and moral concepts. Since the comments that I have to make in terms of the difference from ideas of substances will apply equally well to ideas of relations, as to ideas of modes, I will not discussed ideas of relations as a separate category.5

Modes, either simple or mixed, are "complex ideas which, however compounded, contain not in them the supposition of subsisting by themselves, but are considered as Dependences on, or Affections of Substances." (2.12.4)6

Simple modes are "only variations, or different combinations of the same simple Idea, . . . which are nothing but the Ideas of so many distinct Unites added together." (2.12.5) Simple modes are complex ideas such as the idea of a dozen, which occurs by "putting twelve Unites together." (2.16.2)7 Mixed modes are made up of several simple ideas of different kinds joined together into one idea, such as "Beauty, consisting of a certain composition of Colour and Figure, causing delight in the Beholder." (2.12.5) Other examples of mixed modes are "the Ideas signified by the Words Triangle, Gratitude, Murther, etc." (2.12.4)
About simple and mixed modes, Woolhouse claims that "Often the distinction between them is not taken to be important, and reference is made simply to 'modes' (II.xxxi.3,14)." I shall accept this and likewise only refer to modes, although for the most part I will be talking about mixed modes.

Woolhouse claims that ideas of modes are best understood in contrast to ideas of substances and that the major difference between ideas of modes and ideas of substances is that ideas of substances are complex ideas whose "component parts do 'have a Union in Nature' [III.v.ii]" and refer to an externally existing body while ideas of modes are "voluntary collections. . . of scattered and independent Ideas which are made by the mind" and are not intended to be representations of externally existing bodies. Modes "are not looked upon to be the characteristic Marks of any real Beings that have a steady existence, but scattered and independent Ideas, put together by the Mind, are thereby distinguished from the complex Ideas of Substances."

(2.22.1)

Ideas of substances are complex ideas caused by the mind's observance that in the external world certain simple ideas "go constantly together."

(2.23.1) Ideas of substances are collections of simple ideas (2.23.3) and the collections are "such combinations of simple Ideas, as are taken to represent distinct particular things subsisting by themselves." (2.12.6) Always included in our idea of substances is the idea of substratum.

. . . 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 . . . (2.23.1)
Even though we cannot, says Locke, imagine the qualities of substance without this substratum, we know nothing about it other than that it is the "supposed, but unknown support" of qualities.

So that if any one will examine himself concerning his Notion of pure Substance in general, he will find he has no other Idea of it at all, but only a Supposition of he knows not what support of such Qualities... The Idea then we have, to which we give the general name Substances, being nothing, but the supposed, but unknown support of those Qualities... (2.23.2)

... yet because we cannot conceive, how they should subsist alone, nor one in another, we suppose them existing in, and supported by some common subject; which support we denote by the name Substance, though it be certain, we have no clear, or distinct Idea of that thing we suppose a Support. (2.23.4)

Although Locke does refer to the complex idea of substance as being composed of simple ideas, the ideas contained in the complex idea need not actually be simple ideas.

Thus if to Substance [substratum] be joined the simple Idea of a certain dull whitish colour, with certain degrees of Weight, Hardness, Ductility, and Fusibility, we have the Idea of Lead;... (2.12.6)

Locke admits that his terminology is not completely accurate.

... I have reckoned these Powers amongst the simple Ideas, which makes the complex ones of the sorts of Substances; though these Powers, considered in themselves, are truly complex Ideas. And in this looser sence [sic], I crave leave to be understood, when I name any of the Potentialities amongst the simple Ideas, which we recollect in our Minds, when we think of particular Substances. (2.23.7)

The major distinguishing feature that separates ideas of substances from ideas of modes is that ideas of substances refer to, and are intended to
represent, bodies that have a "real Existence" whereas ideas of modes do not intend to represent anything in the external world.

...we have not the liberty [with substances], as in mixed modes, to frame what combinations we think fit, to be the characteristical notes to rank and denominate things by. In these we must follow nature, suit our complex ideas to real existences, ... (2.31.3)

The notion that ideas of substances refer to, and are intended to represent, an object which has real existence introduces the Lockeian notion of archetypes. That which the mind follows in forming its idea of a particular substance, which the mind intends to represent by its idea, is the archetype of that idea found in nature. The archetype is the pattern or standard in nature from which the idea is taken and of which the idea is meant to represent.

... here [in substances] he has a Standard made by Nature; and therefore being to represent that to himself, by the Idea he has of it, even when it is absent, he puts in no simple Idea into his complex one, but what he has the Perception of from the thing it self. He takes Care that his Idea be conformable to this Archetype, and intends the Name should stand for an Idea so conformable. (3.6.46)\(^2\)

Archetypes for substances are those objects out in the world functioning as patterns for the combinations of real particulars to represent natural kinds concepts. Archetypes for modes are the ideas themselves that the modes are ideas of.\(^3\)

To better understand the notion of archetypes and how they apply differently to ideas of substances than to ideas of modes, Locke's classification of ideas as real or fantastical, and adequate and inadequate will be examined.
A real idea, for any type of idea, is one which has "a Foundation in Nature; such as have a Conformity with the real Being, and Existence of Things, or with their Archetypes." (2.30.1) As the passages examined below will support, Locke allowed two ways that ideas could be real. In general, an idea is real if it conforms to its archetype, but what this means differs between the complex ideas of modes and relations and all the simple ideas and the complex ideas of substances.

Locke says that all simple ideas must be real because the mind is passive in receiving them from external objects and so cannot add anything to or subtract anything from the simple ideas; "the reality lying in that steady correspondence, they have with the distinct Constitutions of real Beings." (2.30.2) Therefore simple ideas must match exactly that external object which caused them in the mind and so are real.

Simple Ideas are all real and true, because they answer and agree to those Powers of Things, which produce them in our Minds, that being all that is requisite to make them real, and not fictions at Pleasure. (2.30.2)

When the mind becomes active in forming its ideas this conformity between the idea and the external object that caused the idea is no longer guaranteed. Nevertheless, Locke claims that man is assured that one more group of his ideas will be real, and that is the group of ideas of modes and the ideas of relations (when the complex idea is consistent). The reason that ideas of modes and ideas of relations are guaranteed real is that these ideas "having no other reality, but what they have in the Minds of Men, there is nothing more required to those kind of Ideas, to make them real, but that they be so framed, that there be a possibility of existing conformable to them." (2.30.4) The ideas which modes and relations are meant to be representations of are the
ideas that they themselves already are. "These Ideas, being themselves Archetypes, cannot differ from their Archetypes, and so cannot be chimerical, unless any one will jumble together in them inconsistent Ideas." (2.30.4)

All our complex Ideas, except those of Substances, being Archetypes of the Mind's own making, not intended to be the Copies of any thing, nor referred to the existence of any thing, as to their Originals, cannot want any conformity necessary to real Knowledge. For that which is not designed to represent any thing but itself, can never be capable of a wrong representation, nor mislead us from the true apprehension of any thing, but its dislikeness to it . . . (4.4.5)

Locke does allow that ideas of modes and ideas of relations might be other than real, but only if they are inconsistent, by which he seems to mean that there is no possibility for the combination to exist in nature. This inconsistency is caused by combining simple ideas together to make up the complex idea in such a way that the simple ideas put together are logically incompatible.

Locke is not talking about fantastical ideas such as unicorns or centaurs, ideas which are consistent ideas of substances but which do not actually exist in nature. Instead, he is referring to inconsistent groupings of ideas, such as a chocolately taste of a pineapple, a four-sided triangle, or fratricide of animals. The notion of fantastical ideas seems to be reserved for the complex ideas of substances where the grouping of ideas never did exist in nature, making our idea of that particular union of simple ideas a fantasy, a creation of the mind that has no foundation in nature, no conformity to an actually existing being. Ideas of modes and relations are not real only when they are inconsistent.
Our ideas of substances are "intended to be Representations of Substances, as they really are."

Complex Ideas of Substances being made all of them in reference to Things existing without us, and intended to be Representations of Substances, as they really are, are no farther real, than as they are such Combinations of simple Ideas, as are really united, and co-exist in Things without us. (2.30.5; underlining mine)

All the simple ideas are real, but that is not sufficient to make the complex idea, composed of real simple ideas, itself real. If our complex idea is not intended to represent an actually existing external combination, a "union found in nature" then the complex idea is fantastical, even though all of its component simple ideas will themselves be real ideas. When we have an idea of a bear we intend our idea to match the way that bears really are in the external world; we intend our idea to conform to an externally existing object. If we intend no conformity, as with centaurs and unicorns, then our ideas are fantastical. Adequate ideas are those "which perfectly represent those Archeyptes, which the Mind supposes them taken from; which it intends them to stand for, and to which it refers them." (2.31.1) It is important to notice that Locke places emphasis on the word "perfectly." In contemporary usage the word "adequate" means sufficient; "He made an adequate living as a philosophy professor, but it was nothing to shout about." Locke uses the term to mean a complete or perfect representation of the object. "Inadequate Ideas are such, which are but a partial, or incomplete representation of those Archetypes to which they are referred." (2.31.1)

All simple ideas are adequate because
... each Sensation answering the Power, that operates on any of our Senses, the Idea so produced, is a real Idea, (and not a fiction of the Mind, which has no power to produce any simple Idea;) and cannot but be adequate, since it ought only to answer that power: and so all simple Ideas are adequate. (2.31.2)

Ideas of modes and relations are adequate because,

... being voluntary Collections of simple Ideas, which the Mind puts together, without reference to any real Archetypes, or standing patterns, existing any where, are, and cannot but be adequate Ideas. Because they not being intended for Copies of things really existing, but for Archetypes made by the Mind, ... cannot want any thing; they having each of them that combination of Ideas, and thereby that perfection which the Mind intended they should: So that the Mind acquiesces in them, and can find nothing wanting. ... being Archetypes without Patterns, and so having nothing to represent but themselves, cannot but be adequate, every thing being so to it self. (2.31.3)

But with ideas of substances, none of the ideas are adequate.

For there [with ideas of substances] desiring to copy Things, as they really do exist; and to represent to our selves that Constitution, on which all their Properties depend, we perceive our Ideas attain not that Perfection we intend: We find they still want something, we should be glad were in them; and so are all inadequate. (2.31.3)

Ideas of substances do not copy their archetypes perfectly; there are ideas lacking in our complex idea of substances that we would need to include if our complex idea were to perfectly represent the substance as it really exists in nature. Locke identifies two areas where our ideas of substances fail to conform to the archetype. First, the idea of a substance can never contain all that there is in a substance in terms of its observable properties. We do not represent in our ideas of substances all that really does exist in substances. The type of ideas that Locke means here are the observable properties.
nor do those Copies, exactly, and fully, contain all that is to be found in their Archetypes. 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. . . . we can never be sure that we know all the Powers, that are in any one 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. (2.31.8)

Second, even if all the observable properties were contained in the complex idea, the idea of a substance can never contain the idea of the unobservable, the real essence of that substance. As will be shown later in this chapter, it is this second way in which our ideas of substances are inadequate that is most significant in terms of Locke's scepticism.

Locke claims that it is clear the mind does intend a reference to the real essence with its idea of substances. "That men do suppose certain specifick Essences of Substances, which each Individual in its several kind is made conformable to, and partakes of, is so far from needing proof, that it will be thought strange, if any one should do otherwise." (2.31.6) Further, that we have no idea of such a real essence is evidenced by the fact that no one seems to know what the real essence is. "And yet if you demand, what those real Essences are, 'tis plain Men are ignorant, and know them not." (2.31.6)

Locke allows for some sort of corpuscularian hypothesis to function as an explanation for what the real essence might be but denies that even that hypothesis, while more understandable than any other theory posited so far, will aid him in knowing enough about the real essence to deduce the properties of the object.
This Essence, from which all these Properties flow, when I enquire into it, and search after it, I plainly perceive I cannot discover: the farthest I can go, is only to presume, that it being nothing but Body, its real Essence, or internal Constitution, on which these Qualities depend, can be nothing but the Figure, Size, and Connexion of its solid Parts; of neither of which, I having any distinct perception at all, I can have no Ideas of its Essence, which is the cause that it has [the properties it has]. . . .

If any one will say, that the real Essence, and internal Constitution, on which these Properties depend, is not the Figure, Size, and Arrangement [sic] or Connexion of its solid Parts, but something else, . . . I am farther from having any Idea of its real Essence, than I was before. (2.31.6)

That the real essence is not contained in the ideas of substances that we do have is supported by the fact that our ideas of substances are made up of collections of observable simple ideas that have always been found to go together and yet, we cannot, from any complex idea of a substance that we have, deduce the properties of that substance. (2.31.8) Since Locke holds that the essence is the cause of all the properties of a kind, the fact that the properties cannot be deduced from the complex idea of substances that we do have, implies that that idea cannot be the essence.\(^{17}\)

Since ideas of modes are their own archetype, and are therefore adequate, they must contain within themselves their real essence. That they do is evidenced from the fact that the properties of modes can be deduced.

The complex Ideas we have of Substances, are, as it has been shewn, certain Collections of simple Ideas, that have been observed or supposed constantly to exist together. But such a complex Idea cannot be the real Essence of any Substance; for then the Properties we discover in that Body, would depend on that complex Ideas, and be deducible from it, and their necessary connexion with it be known; as all Properties of a Triangle depend on, and as far as they are discoverable, are deducible from the complex Idea of three Lines, including a Space. But it is plain, that in our complex Ideas of Substances, are not
contained such Ideas, on which all the other Qualities, that are to be found in them, do depend. (2.31.6; underlining mine)

The issues being discussed here, knowledge of the real essence and the connection between the real essence and the deduction of properties, are complicated. I have not at this point in the dissertation developed the different points that are needed to examine these issues in the depth required to understand them. Developing these points is the primary focus of the next two chapters. Fortunately, all that really needs to be noted at this point is that our ideas of substances are inadequate because the idea of the real essence is not included in those ideas and it is intended to be included.

Another way of drawing the distinction between ideas of modes and ideas of substances is to rely on Locke's distinction between archetypes and ectypes. When the idea is a copy of the original, as with simple ideas and ideas of substances, the ideas are ectypes. When the idea and the original are the same, the idea is itself its own archetype.

Ideas of modes and relations are not ectypes, but are themselves archetypes, though not archetypes that have an external existence, a pattern in nature that serves as the standard for the ideas.

Complex Ideas of Modes and Relations, are Originals, and Archetypes; are not Copies, nor made after the Pattern of any real Existence, to which the Mind intends them to be conformable and exactly to answer. These being such Collections of simple Ideas, that the Mind it self puts together, and such Collections, that each of them contains in it precisely all that the Mind intends it should, they are Archetypes and Essences of Modes that may exist; and so, are designed only for, and belong only to such Modes, as when they do exist, have an exact conformity with those complex Ideas. The Ideas therefore of Modes and Relations, cannot but be adequate. (2.31.14)
All simple ideas are perfect copies, perfect ectypes, and because they are perfect they are all adequate.

Simple Ideas, which are . . . Copies, but yet certainly adequate. Because being intended to express nothing but the power in Things to produce in the Mind such a Sensation, that Sensation, when it is produced, cannot but be the Effect of that Power . . . . it cannot but be the Effect of such a Power, in something without the Mind; since the Mind has not the Power to produce any such Idea in it self, and being meant for nothing else but the Effect of such a Power, that simple Idea is real and adequate; the Sensation of White, in my Mind, being the Effect of that Power, which is in the Paper to produce it, is perfectly adequate to that Power; or else, that Power would produce a different Idea. (2.31.12)

Ideas of substances are also ectypes, copies of a pattern that exists in nature and gives rise to the ideas of the substances, but they do not perfectly or completely match the original on which they are based and are therefore inadequate.

The complex Ideas of Substances are Ectypes, Copies too; but not perfect ones, not adequate: which is very evident to the Mind, in that it plainly perceives, that whatever Collection of simple ideas it makes of any Substance that exists, it cannot be sure, that it exactly answers all that are in that Substance . . . . And, after all, if we could have, and actually had, in our complex Idea, an exact Collection of all the secondary Qualities, or Powers in 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 the Qualities, cannot be the real Essence of that Thing. (2.31.13)

Ideas of substances, then, are different from ideas of modes in the following ways: 1) ideas of substances are real when they intend a representation of a combination of simple ideas actually found in nature; ideas of modes are always real so long as they are consistent, 2) ideas of substances
refer to external archetypes that have a real existence in nature and, for the reasons discussed above, fail to perfectly represent those archetypes, making ideas of substances inadequate; ideas of modes function as their own archetype and for this reason are always adequate, 3) ideas of substances do not contain the idea of their real essence and so the properties are not deducible; ideas of modes do contain their real essence and so their properties are deducible, and 4) ideas of substances are imperfect ectypes; ideas of modes are perfect archetypes.

There is one final area that needs to be addressed in this section although it is not directly applicable to the distinction between ideas of modes and ideas of substances and this is the issue of real knowledge. Knowledge in general is the perception of the agreement or disagreement of any of our ideas. (4.1.2) Knowledge is real when it concerns real ideas. "So far as they [our ideas of substances] agree with those [their archetypes in nature], so far our Knowledge concerning them is real." (4.4.12, section summary)

Locke says that our knowledge is real only so far as "there is a conformity between our Ideas and the reality of Things" (4.4.3) But if knowledge is the perception of the agreement between ideas, "How shall the Mind, when it perceives nothing but its own Ideas, know that they agree with Things themselves?" (4.4.3)

There are two separate problems that are attributed to Locke at this point. One concerns scepticism about the real existence of external objects; the other concerns the issue of conformity or agreement between the idea of the object and the object itself.

About the first I have little to say although I will later defend a related point by claiming that sensitive knowledge counts as actual knowledge and
that Locke could not have been sceptical about the existence of the external world given his basic epistemology. It is of course quite possible Locke’s epistemology is wrong and that scepticism of the external world is a very viable position. However, I think it is clear that this type of scepticism cannot be claimed to have been held by Locke himself. For a very rich discussion of the issue of scepticism about the external world I refer the reader to the cited works by Squadrito, Yolton, and Woolley.18

The second issue has more direct impact on my work. If the mind can never go beyond its ideas to the world itself then how can it know whether there is in fact agreement between the idea and its archetype; how can the mind know if its ideas are real or not? This is the standard veil of perception problem. The reason that the veil of perception problem is directly relevant for my work is that Locke seems to be ambiguous about the exact requirements for real ideas, thus making the requirements for real knowledge ambiguous. At times Locke says that if the idea is intended to be a representation of the archetype existing in nature then the idea is real. At other times Locke says the idea is real only so far as it is a representation of the archetype in nature, implying that there would need to be an actual conformity, rather just the intention of conformity, before the idea would be a real idea.

Herein therefore is founded the reality of our Knowledge concerning Substances, that all our complex Ideas of them must be such, and such only, as are made up of such simple ones, as have been discovered to co-exist in Nature. (4.4.12; underlining mine)
Since it does not seem possible to go beyond our ideas to discover if there is such a conformity, no ideas, even if by chance they did conform to the world, could be known to be real.

Locke answers this troublesome question in a very pragmatic way. Our ideas of simples cannot be false when what is at issue is the conformity between the idea and the cause of the idea. The reason for this is that all that is necessary for truth to obtain in this case is that the simple ideas are the result of something out in the world being the cause of them. Since the mind cannot create simple ideas, they must always be the result of something out in the world causing them, and so they will always be true.

As to the Truth and Falshood of our Ideas, in reference to the real Existence of Things, when that is made the Standard of their Truth, . . . Our simple Ideas, being barely such Perceptions, as God has fitted us to receive, and given Power to external Objects to produce in us by established Laws and Ways, suitable to his Wisdom and Goodness, though incomprehensible to us, their Truth consists in nothing else, but in such Appearances, as are produced in us. . . . And thus answering those Powers, they are what they should be, true Ideas. (2.32.13-14; underlining mine)

That our simple Ideas can none of them be false, in respect of Things existing without us. For the Truth of these Appearances, or Perceptions in our Minds, consisting, as has been said, only in their being answerable to the Powers in external Objects, to produce by our Senses such Appearances in us, . . . it cannot upon that Account, or as referr’d to such a Pattern, be false. (2.32.16; underlining mine)

All that is necessary for the ideas to be true is that they are "answerable" to the power of the external object to produce the idea. To be answerable does not mean to conform, to be an accurate representation, but just to be related in a causal manner. The idea of blue is a simple idea and so could not be created
by the mind and yet there is nothing out in the world which conforms to our idea of blue in the sense of being a pattern of the idea we have of blue.

We are fitted, according to God's wisdom and goodness, to receive certain ideas from certain objects out in the world. Were we fitted differently, our ideas of the world would probably be quite different.

All the simple Ideas we have are confined to those we receive from corporeal Objects by Sensation, and from the Operations of our own Minds as the Objects of Reflection. But how much these few and narrow Inlets are disproportionate to the vast whole Extent of all Beings, . . . What other simple Ideas 'tis possible the Creatures in other parts of the Universe may have, by the Assistance of Senses and Faculties more or perfecter, than we have, far different from ours, 'tis not for us to determine. . . . What other Faculties therefore other Species of Creatures have to penetrate into the Nature and inmost Constitutions of Things; what Idea they may receive of them, far different from ours, we know not. (4.3.23; underlining mine)

The analysis of complex ideas of substances is more complicated than the simple ideas but the same basic idea can be applied to the complex ideas of substances as well. Although the complex idea is true, in Locke's sense, so far as it is composed of true simple ideas, it may be false when, included in it, are ideas which we do not experience as joined in nature, to the extent that we are capable of experiencing the union. Also, a complex idea of substance will be false when it intends to include the unknown real essence. (2.32.18)

The resolution of the ambiguity of what is required for real ideas, and thus for real knowledge, is that real knowledge of substances only extends as far as we have experienced the agreement between the ideas united in the complex ideas of substances in the way that we are capable of experiencing the world. Our intention alone that there be some conformity is not sufficient to qualify the complex ideas as real. We must have actually experienced, to
the extent that we are capable, the combination of those ideas. However, there need not be an actual conformity between the world and our ideas of the world for the ideas to be real. The extent to which there must be conformity is to the extent that we are capable of determining such a conformity. Granted, our experience of a combination does not guarantee that there is such a combination in nature and therefore we cannot know with certainty that our idea of the archetype, obtained through the experience of certain simple ideas, actually exists as we have experienced it, but such knowledge is not necessary for ideas, and hence knowledge, to be real.¹⁹

With the distinctions between ideas of modes and ideas of substances laid out, I am ready to evaluate the two types of ideas in terms of the requirements for scientific knowledge. How is it that modes are capable of scientific knowledge while substances are not? What is it about our knowledge of substances that prevents knowledge of them from being certain, universal, and instructive?

Answering this question requires an understanding of scientific knowledge. Locke's basic view is that in order for knowledge of any area of study to count as scientific knowledge that knowledge must satisfy three requirements. The knowledge must be certain, universal or general, and instructive. As I will discuss in what follows all three must be met before the knowledge is to be considered scientific.

Locke refers to the members of the triad, at times, as general, instructive, and unquestionable.
yet whilst we want the later [adequate ideas], we are not capable of scientifical Knowledge; nor shall we ever be able to discover general, instructive, unquestionable Truths concerning them [the several sorts of Bodies that fall under the Examination of our Senses]. (4.3.26; underlining mine)

Louis Loeb uses slightly different terminology in referring to the same requirements for scientific knowledge. "Locke's principal interest was in 'scientifical' knowledge--knowledge that is instructive, certain, and general."20

The first two members of the triad, certainty and universality, however referred to, are fairly clear and easily understood.

Locke's views on certainty will be discussed in greater detail in chapter three when his views on this issue are compared to Descartes'. For now it is sufficient to understand certain knowledge as indubitable knowledge, knowledge about which there is no question. Part of the meaning of the term 'knowledge' is that when one has knowledge of something they have greater certainty regarding it than they do with mere opinion or judgment. Again, this issue will be discussed in greater detail in the third chapter.

The second requirement for scientific knowledge concerns knowledge of universal propositions. This is general knowledge, knowledge that applies to groups of things, rather than particulars.

Certainty is important for scientific knowledge since it is actual knowledge we want and not mere opinion or judgment. Universality is important for scientific knowledge because we want knowledge beyond the "this thing here and now" variety.

Certainty and universality are connected through the desire for predictions. We want to actually know, to know with certainty, about the
properties of kinds of things. We want to know more than just what this particular piece of matter M does X at time T. We want to know both if the piece of matter M will exhibit X at all times and if pieces of matter similar to M will have the same behavior as M at all times. Scientists want more than a guess at what would happen when, for example, gold was placed in aqua regia. They wanted to be certain that any piece of gold will dissolve when placed in aqua regia withough having to check each piece each time. With certain knowledge of the properties of universals would come accurate predictions of what properties members of a kind will have.

At any one time Locke allows that we can conduct an experiment and have certain knowledge at that time that, e.g., gold does dissolve in aqua regia. But whether this will happen again we cannot have certain knowledge.

... nor can we be assured about them [the properties and ways of Operation of the minute particles of bodies] than some few Trials we make, are able to reach. But whether they will succeed again another time, we cannot be certain. This hinders our certain Knowledge of universal Truths concerning natural bodies: and our Reason carries us herein very little beyond particular matters of Fact. (4.3.25)

Locke does not deny the possibility of certain universal knowledge of substances. Clearly we do make universal statements about substances about which we can be certain. In fact such statements can be made in great, perhaps limitless, numbers. Examples of this are 'A monkey is a monkey', 'Chimps are monkeys', 'Monkeys are primates', and 'Chimps are primates'.

The statements are certain in that we have no doubt about their truth; they are universal or general statements in that they are about a natural kind, rather than just about a particular monkey, e.g., Curious George; and they are real in that they are about complex ideas which are real. The complex idea of
a monkey is a real idea because the simple ideas that are united to make up the complex idea of a monkey are simple ideas which have been actually observed to be so united in nature.

However, we know nothing more about the world when we know statements like 'Monkeys are primates' than we know simply through our understanding of the terms 'monkeys' and 'primates'. Our knowledge about the world is not increased by knowing that 'Monkeys are primates' beyond what it was when we simply knew what a monkey was and what a primate was. Locke refers to propositions which do not advance our knowledge as trifling. Trifling propositions take two forms:

First, All purely identical Propositions. These obviously, and at first blush, appear to contain no Instruction in them. For when we affirm the same Term of it self, whether it be barely verbal, or whether it contains any clear and real Idea, it shews us nothing, but what we must certainly know before, . . . (4.8.2; underlining mine)

Secondly, Another sort of Trifling Propositions is, when a part of the complex Idea is predicated of the Name of the whole; a part of the Definition of the Word defined. Such are all Propositions wherein the Genus is predicated of the Species, or more comprehensive of less comprehensive Terms: For what Information, what Knowledge carries this Proposition in it, viz. Lead is a Metal, to a Man, who knows the complex Idea the name Lead stands for. (4.8.4)

Trifling propositions are contrasted with instructive propositions. What Locke meant by instructive knowledge is fairly clear.

. . . he that would enlarge his own, or another's Mind, to Truths he does not yet know, must find out intermediate Ideas, and then lay them in such order one by another, that the Understanding may see the agreement, or disagreement of those in question.
Propositions that do this are instructive. (4.8.3; underlining mine)

The purpose of doing science is to increase our knowledge about the world. An area of study that never advanced beyond trifling propositions would fail the meet the third requirement for scientific knowledge, viz., that the knowledge be instructive knowledge.

One might go so far as to say that trifling knowledge is not real knowledge since the perception of the agreement, being solely between the idea of monkey and idea of primate and not between the ideas of monkey or primate and their respective archetypes, is not intended to refer to the external world at all. Although the proposition 'Monkeys are primates' is about the agreement between real complex ideas, the knowledge obtained from it does not seem to differ in any significant way from the proposition 'Unicorns are mythological beasts' which is about the agreement between fantastical complex ideas. And yet, to deny that 'Monkeys are primates' is real knowledge flies in the face of Locke's stated view that knowledge is real when it is about real ideas and ideas of substances are real when they are intended to represent an archetype out in the world.

To deny the status of real knowledge to propositions like 'Monkeys are primates' muddies the waters in a way unnecessary since Locke has the term 'instructive' to draw the distinction he actually wants between statements that increase our knowledge about the world and those that do not. I think Locke actually does conflate the two possible uses of 'real' but it is easy to understand why.21

There is no need to include the requirement that knowledge be real in order for the knowledge of corporeal bodies to count as scientific knowledge, since by focusing on corporeal bodies the implicit requirement that knowledge
be real has already been met. The presence of 'real' in the listing of requirements for scientific knowledge does not add anything to the scientific aspect of the knowledge but rather marks out the area that is to be studied. The interest does not lie in knowledge about substances but only in substances which have a counterpart, an archetype, in the external world. In the most precise terminology what Locke was interested in was real knowledge of corporeal bodies that was certain, universal, and instructive.

So how is it that our ideas of corporeal substances do not qualify as scientific knowledge while ideas of modes do qualify?

What is desired is knowledge about the properties of a kind. This knowledge is possible if the real essence is known since it is the real essence which is the cause of the properties a thing has, "that foundation from which all its properties flow." (3.3.18) With knowledge of the real essence we can know all the properties a kind of thing will ever have, and we would be able to know this for all members of the kind, without having to experiment; our knowledge about these properties would be guaranteed. "It is when we know real essences that demonstrative knowledge is possible."22

Given that knowledge of the real essence is required to know the properties of a kind, the most significant distinction between ideas of substances and ideas of modes must be the fact that we do not have knowledge of the real essence of substances but do have this knowledge for modes. With substances the knowledge of the real essence is not a part of our complex idea. All we know about substances is their observable qualities as are found united in nature. Any claims about the properties of substances besides those contained in the nominal essence cannot count as certain propositions, since without knowledge of the real essence there is no way of
knowing why that property is observed in the object. And claims about the properties contained in the nominal essence are Locke's trifling propositions. Therefore, any claim about the properties of substances must either be uncertain or trifling.23

The complex ideas we have of substances, are . . . certain collections of simple ideas, that have been observed or supposed constantly to exist together. But such a complex cannot be the real essence of any substance; for then the properties we discover in that body would depend on that complex idea, and be deducible from it, and their necessary connection with it be known; as all properties of a triangle depend on, and as far as they are discoverable, are deducible from the complex idea of three lines, including a space. But it is plain, that in our complex Ideas of substances, are not contained such ideas, on which all the other qualities, that are to be found in them, do depend. (2.31.6)

. . . because we knowing not what real Constitution it is of Substances, whereon our simple Ideas depend, and which really is the cause of the strict union of some of them one with another, and the exclusion of other; there are very few of them, that we can be sure are, or are not inconsistent in Nature, any farther than Experience and sensible Observation reaches. (4.4.12; underlining mine)

Scientific knowledge is possible with ideas of modes because they do contain the idea of their real essence. Having knowledge of the real essence allows humans to know, with certainty, what properties, which are not a part of the complex idea itself, will necessarily be found. Since the knowledge is not a part of the complex idea itself, the knowledge will be instructive.

What is lacking in the above explanation of why scientific knowledge is not possible for corporeal substance is the reason why knowledge of the real essence for substances cannot be known in such a way as to provide
instructive certain knowledge of kinds. This issue is the focus of the next two chapters.
CHAPTER TWO
Scepticism and Qualities

As explained in the last chapter, our knowledge of corporeal bodies is prevented from being scientific knowledge primarily because we lack knowledge of the real essence. This chapter will explore the reasons why knowledge of the real essence is not possible.

According to Locke what we want in regard to knowledge of substances is knowledge of what qualities co-exist in substances.

When we would know any thing farther [beyond the listing of the properties in the nominal essence] concerning these, or any other sort of Substances, what do we enquire but what other Qualities, or Powers, these Substances have, or have not? which is nothing else but to know, what other simple Ideas do, or do not co-exist with those that make up that complex Idea. (4.3.9)

But it is precisely in regard to knowing what qualities make up the complex idea of a substance that Locke claims we are ignorant. Locke gives a two-part explanation for why the majority of qualities "carry with them, in their own nature, no visible necessary connexion, or inconsistency with any other simple Ideas, whose co-existence with them we would inform our selves about." (4.3.10)

In his explanation of our ignorance of the real essence of substances, Locke discusses two levels of ignorance. One he refers to as "incurable," the other as "more incurable." It might be thought that if an area of our lack of knowledge is incurable no more needs to be said. To speak of degrees of incurability seems to undercut the incurable aspect of the first level of ignorance. But I think what Locke had in mind by talking about degrees of incurableness was a difference in the reasons for the ignorance.
The first lack of knowledge, the one that is merely incurable rather than more incurable, concerns our knowledge of the primary qualities of the corpuscles that make up the real essence or inner constitution.

The Ideas, that our complex ones of Substances are made up of, and about which our Knowledge, concerning Substances, is most empty'd, are those of their secondary Qualities; which depending all (as has been shewn) upon the primary Qualities of their minute and insensible parts; or if not upon them, upon something yet more remote from our Comprehension, 'tis impossible we should know, which have a necessary union or inconsistency one with another: For not knowing the Root they spring from, not knowing what size, figure, and texture of parts they are, on which depend and from which result those Qualities which make our complex Idea of Gold, 'tis impossible we should know what other Qualities result from; or are incompatible with the same Constitution of the insensible parts of Gold; and so consequently must always co-exist with that complex Idea we have of it, or else are inconsistent with it.

(4.3.11)

Locke accepted as a hypothesis the idea that a body was composed of insensible particles which determine its sensible qualities. As Locke says in 4.3.11., if our sensible secondary qualities do not depend on the primary qualities of "minute and insensible" parts of bodies, the corpuscles, then "if not upon them, upon something yet more remote from our Comprehension." How, Locke asks, can we know which qualities are compatible or incompatible with each other, if we do not know the configuration that produces them, the "root they spring from." It is this ignorance of the minute and insensible corpuscles themselves that is the first level of ignorance Locke cites as the reason our knowledge of substances is so slight.

Locke was not adamant that humans would always be kept away from sensing the "insensible" particles. The reason for this is that the particles are
insensible to humans in their present condition. If the condition of humans change either through the presence of advanced technology or a change in the status of the acuteness of their senses, then, since the particles are truly there, humans could observe the particles. The first level of scepticism is of a "for the time being at least and quite possibly forever" variety of incurableness. Locke may have had strong reservations about the possibility of humans ever reaching the advanced level of technology necessary to observe these particles but our lack of knowledge about them is based on practical concerns not theoretical ones.

Daniel Garber has taken up the battle to focus interpretation of Locke's scepticism on this very issue.

Locke himself is not particularly worried about how we can know what things are like on the other side of our ideas, as the veil-of-perception sceptic is. . . . What concerns Locke is something quite different. If the gross bodies of our everyday experience are really made up of parts too small for us to sense, as the corpuscularians tell us, Locke asks, then how could we ever discover the hidden nature and real constitution of things.1

Garber agrees that the scepticism is curable, at least in theory.

If we had more acute senses or powerful enough microscopes, the restrictions would be lifted and the corpuscularian sceptic would be a sceptic no more.2

The second level of ignorance, the "more incurable" lack of knowledge, is theoretical in nature and seems to be absolute. Its incurableness is not dependent upon the lack of technical advances. More importantly, I want to argue that second-level scepticism lies at the heart of Locke's limitations on scientific knowledge of corporeal bodies. Unfortunately, what exactly Locke
meant as this second-level scepticism and what its foundations are in his system are not as clear cut as the first-level scepticism.

About second-level scepticism Locke says,

Besides this Ignorance of the Primary Qualities of the insensible Parts of Bodies, on which depend all their secondary Qualities, there is yet another and more incurable part of Ignorance, which sets us more remote from a certain Knowledge of the Co-existence or Inco-existence (if I may so say) of different Ideas in the same Subject; and that is, that there is no discoverable connection between any secondary Quality, and those primary Qualities that it depends on. (4.3.12; underlining mine)

Locke again refers to the interplay between the two levels of ignorance in a passage closely following the text cited above.

In vain therefore shall we endeavour to discover by our Ideas, (the only true way of certain and universal Knowledge,) what other Ideas are to be found constantly joined with that of our complex Ideas of any Substance: 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. (4.3.14)

In other places in the Essay, Locke puts the point thus,

... it is not to be wondered that 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 ... (4.6.12)
Peter Alexander has interpreted this more incurableness to be the result of the mind-body problem. He says, "[t]he more incurable part of ignorance concerns the relations between those primary qualities and textures and our ideas produced by them and depends on the insolubility of the mind/body problem."³ and "... we cannot conceive how material qualities of things can produce ideas of colours, and so on, in our minds, and that is the mind/body problem."⁴

Garber also addresses this problem but only in a footnote. I will discuss Garber's article more fully in the last chapter, but I would like to note even now that Garber is mistaken in viewing the second level of scepticism as a "sometimes" thing on Locke's part.

For a complete understanding of body, Locke sometimes argues that we need to know more than just the corpuscular substructure, though knowledge of that is certainly necessary. For a complete understanding of body, Locke sometimes thinks that we would need to know how it is that the corpuscles cohere. . . and that we would need an a priori knowledge of the connections between any given configuration of corpuscles and the ideas that it causes in us.⁵

To continue this discussion, clarification in terminology for primary qualities and secondary qualities needs to be made. This distinction is one of the more difficult in philosophy and I do not wish to be sidetracked into a lengthy discussion quite yet. Since my primary concern at this point is to deal with comments made by Alexander, I will accept his distinction. In a separate paper, Alexander makes the following claim:

For Locke, ideas, all of them, are in the mind, and qualities, all of them, are in objects.⁶
Primary qualities then are in the objects and are qualities like shape, size, motion/rest. (Exactly what should be included in the list of primary qualities is an area of significant debate. I will just take the more uncontroversial ones for now, although later I will refer to extension, figure, number of parts, and solidity, based on 4.3.14 and 4.3.15.) "These are qualities both of sensible objects and of the insensible particles of which they are composed."  

According to Alexander, "secondary qualities are just those features of textures that produce such ideas in us." A partial list of the ideas he is referring to are ideas of colors, sounds, tastes and smells. And "colours and tastes are ideas representing the secondary qualities of objects, that is, different textures consisting of different combinations of the primary qualities of the superficial insensible particles of objects." Basically what Alexander is saying is that combinations of the primary qualities of the insensible particles are the producers of the secondary qualities and secondary qualities are the powers in the object to produce the ideas of the secondary qualities in our minds. Secondary qualities are certain features of the textures that are capable of causing ideas in us. The textures themselves are the configurations produced by the primary qualities of the insensible parts. 

In brief then, primary qualities are qualities which the bodies, either the sensible objects we perceive or the insensible corpuscles, have by themselves. The larger sensible objects truly have a size, a shape, and a motion status and the insensible corpuscles also truly have a size, a shape, and a motion status. The secondary qualities are combinations of the primary qualities of the insensible corpuscles that produces ideas in us; secondary qualities are the features of the textures or configurations of the insensible corpuscles.
Presumably the corpuscles themselves do not have secondary qualities, but join together to produce secondary qualities. Also, presumably, the primary qualities of the sensible bodies are produced by configurations of the primary qualities of the corpuscles. Alexander usually talks of primary qualities only in association with the insensible parts of bodies. (There is some question as to whether the ideas cause by the secondary qualities should actually include the traditional primary qualities of sensible bodies. Although I am not ready yet to deal with this issue let me just flag this paragraph for the reader since I will be coming back to this issue later.)

An additional terminological point that needs to be clarified is that I have been using "configuration" and "texture" interchangably. In each case what I mean is the arrangement of the corpuscles with their attendant primary qualities. So I do not simply mean the pattern the corpuscles take, but a pattern composed of a specific number of corpuscles each having a specific size, shape, and locomotion. In short, a configuration or texture is everything one would see if they were to look at the specific microscopic structure of a substance. I believe that "texture" is the more historically correct term since it is the term most associated with Boyle. However, I prefer "configuration" since it seems to me to be a more literal descriptive term. Also, Locke typically uses "configuration" rather than "texture" and I shall follow him. The primary qualities of the corpuscles, their size, shape and motion, are responsible for producing the textures or configurations that make up the body. When speaking of the qualities of a body all we are referring to is the specific feature of the configuration of the corpuscles that is responsible for producing the respective ideas in us. There are textures or configurations of a substance that are responsible for primary qualities of
sensible bodies, as well as for the secondary and tertiary qualities of sensible bodies, making all the sensible qualities of a body dependent upon and explainable in terms of its corpuscularian configuration.

The first level of incurableness concerns our ignorance of the primary qualities of the insensible part of bodies. (4.3.12) This is not ignorance of primary qualities in sensible objects but only ignorance of primary qualities of the corpuscles. The more incurable second-level scepticism is "that there is not a discoverable connection between any secondary Quality, and those primary Qualities [of the insensible corpuscles] that it [the secondary quality] depends on." (4.3.12)

If the first level of scepticism were to be cured we would then know the size, shape, motion/rest of the corpuscles and, correspondingly, the configuration. Locke allows for the possibility of curing this level of scepticism, at least in theory, although he remained doubtful that it could actually be done. The way to cure the first level of scepticism is to have more acute senses or more powerful microscopes, something that would allow us to actually see on the microscopic level.

If the second level of scepticism were to be cured we would then have an understanding of how a physical state could produce a mental state since the second level of scepticism concerns the connection between the configuration which is a result of the size, shape, motion/rest of the corpuscles and the features of the configurations they form that produces ideas in us of color, smell, et al. The connection is not discoverable because "we cannot comprehend how physical textures can have mental effects." 10

Alexander depends on the following quote found in the same citation as 4.3.12 to flesh out what Locke meant.
But our Minds not being able to discover any connexion betwixt these primary qualities of Bodies, and the sensations that are produced in us by them, we can never be able to establish certain and undoubted Rules, of the Consequences or Co-existence of any secondary Qualities, though we could discover the size, figure, or motion of those invisible Parts, which immediately produce them. We are so far from knowing what figure, size, or motion of parts produce a yellow Colour, a sweet Taste, or a sharp Sound, that we can by no means conceive how any size, figure, or motion of any Particles, can possibly produce in us the Idea of any Colour, Taste, or Sounds whatsoever: there is no conceivable connexion betwixt the one and the other. (4.3.13; underlining mine)

Alexander goes on to show how solving the first level of scepticism, while necessary to even think of solving the second level of scepticism, is not sufficient.

If we knew the inner constitutions of bodies we should know their textures, which include their secondary qualities. [Knowing this would solve the first level of scepticism.]

However, there would still be much that we did not know about secondary qualities: we should not know which textures were secondary qualities and which of the third sort [tertiary qualities] since to know that we should have to know which textures, or features of textures, were directly responsible for ideas and that is something we could never know because of the mind/body problem. It might be thought that we could discover this by the elimination of the third sort of qualities [tertiary qualities] since their operation is purely mechanical but this is not so because there may be textures, or features of them, that are neither of the third sort nor produce ideas in us. Suppose we have a body that looks yellow and tastes sour; even if we knew its texture completely we should not know which feature of its texture produced the idea of yellow and which produced the idea of sour because we cannot comprehend how physical textures can have mental effects. We might, of course, be able to establish correlations between texture and ideas by examining other bodies that were yellow but not sour or sour but not yellow but such correlations would not tell us whether the yellow colour and the
sour taste were necessary concomitants. Correlations might just indicate empirical regularities unless we could discover the 'mechanics' by which the ideas were produced [refers to the second level of scepticism] . . . . Thus knowing textures would amount to knowing qualities but in a general and unspecific way; not knowing which particular textures corresponded with particular ideas we should not be able to identify those textures which were secondary qualities. 11

Accepting then Alexander's explanation of the reason for the deeper level of scepticism, that knowledge of necessary connection between a configuration and the idea it produces is impossible because of the insolubility of the mind-body problem, an interesting problem arises in connection with Locke's claims that there are a few, albeit "scarce any at all" instances of knowledge of necessary connection. If the mind-body problem is insoluble, how can there be even a few scarce instances of knowledge of necessary connection? When Locke talks about knowledge of these "scarce any at all" instances I am reading him to mean knowledge in the full sense, knowledge that is certain, not probable opinion. Further, knowledge of a necessary connection would bring in the notion of universalization, for we cannot know that a connection is necessary if we examine only particulars. And since the knowledge is about necessary connections of bodies, we can assume that the knowledge is to be considered instructive knowledge. It is only in these "scarce any at all" instances that Locke allows for the triadic requirement of scientific knowledge to be met, and yet, as laid out so far, the mind-body problem would seem to disallow the possibility of any instances.

The evidence for the existence of the "scarce any at all" instances of knowledge of necessary connection is strong. Most of the textual support comes from 4.3 of the Essay, the chapter entitled "Of the Extent of Humane Knowledge."
As to the second sort, which is the Agreement, or Disagreement of our Ideas in Co-existence, in this our Knowledge is very short, though in this consists the greatest and most material part of our Knowledge concerning Substances. (4.3.9)

This, how weighty and considerable a part soever of Humane Science, is yet very narrow and scarce any at all. (4.3.10)

... some few of the primary Qualities have a necessary dependence, and visible connexion one with another, as Figure necessarily supposes Extension, receiving or communicating Motion by impulse, supposes Solidity. But though these, and perhaps some others of our Ideas have: yet there are so few of them, that have a visible Connexion one with another, that we can by Intuition or Demonstration, discover the co-existence of very few of the Qualities are to be found united in Substances. (4.3.14)

At this point I want to look more directly at what Locke says about the "scarce any at all" instances. The only examples he gives, as quoted above, are that "Figure necessarily supposes Extension, receiving or communicating Motion by impulse, supposes Solidity." (4.3.14) These primary qualities, which he says have a "visible Connexion one with another" are known to us through Intuition or Demonstration (4.3.14) About the "Inco-existence" of qualities, he says,

As to the incompatibility or repugnancy to co-existence, we may know, that any Subject can have of each sort of primary Qualities, but one particular at once, v.g. each particular Extension, Figure, number of Parts, Motion, excludes all other of each kind. The like also is certain of all sensible ideas peculiar to each Sense [secondary qualities]; for whatever of each kind is present in any Subject, excludes all other of that sort, v.g. no one Subject can have two Smells, or two Colours, at the same time. (4.3.15)
All other connections do not fit the "scarce any at all" instance requirements of having a visible connection or repugnance based on the ideas themselves and so those other connections we can only know through "the assistance of our Senses" and thus do not have either certain nor universal knowledge about them.

It must be admitted then that Locke does want to allow the existence of true knowledge of necessary connections. But, if we accept Alexander's explanation of the "more incurable" or second-level scepticism it might seem that we should not be able to have even these "scarce any at all" instances of knowledge, especially knowledge of those connections that refer to secondary qualities.

The solution to this problem is to realize that Locke talks about necessary connection on different levels. The mind-body problem should block any chance for knowledge of connections between the physical and the mental. But notice, the "scarce any at all" instances do not involve the move from the physical (the primary qualities of the corpuscles) to the mental (the sensations produced in us by secondary qualities). The "scarce any at all" instances concern the ideas of primary qualities with other ideas of primary qualities or the repugnancy, or inco-existence, of ideas of primary qualities and other ideas of primary qualities and ideas of secondary qualities with other ideas of secondary qualities. The "scarce any at all" instances of a necessary connection seem to escape the mind-body restriction since the connections there are based solely on the ideas themselves and thus the knowledge of the connection remains entirely in the mental realm.

In fact there are actually three separate types of connections going on when Locke talks about necessary connection. The first, for simplicity's sake
called Type A, is the connection between the primary qualities of the corpuscles and the secondary qualities that are the result of the primary qualities of the corpuscles.

The second type, called Type B, concerns the necessary connection contained in the "scarce any at all" instances of knowledge. It concerns the connections between qualities that man can see as necessary solely because of the ideas themselves. A re-examination of the examples of Type B show them all to be general statements involving determinables but no determinates. Type B connections concern non-containment knowledge of the necessity between ideas of both the primary and the secondary qualities. Of importance is that man can tell by the ideas of the qualities themselves that in certain cases there are qualities that must go together, and in other cases, that qualities of the same kind cannot be in the same subject at the same time, and that man has this knowledge based on something other than experience of the particulars. I am calling this knowledge of the necessary connection and necessary repugnancy 'a priori' because humans can tell the necessity of the connection through reflection on the ideas themselves and does not have to depend on experience of particular connections. These few notions of the necessary non-containment connection between qualities involve the only necessary connection of the ideas themselves, making knowledge of their relation to each other the only necessary universal knowledge we can have of substances. Also, the relationships between these qualities are not contained in the complex ideas of substances, and so our knowledge of the connections is non-containment, or synthetic.

This knowledge should not be understood as knowledge about the connection between real essence and qualities, but rather, knowledge about
the connection between certain primary and secondary qualities themselves. If we had knowledge about the real essence we would have a much greater range of knowledge than just these "scarce any at all" connections of primary and secondary qualities. We might have full knowledge of the connections between the real essence and the qualities that flow from it, giving us knowledge of all connection between qualities, rather than just knowledge of the specific type of connections given in the examples above in 4.3.14-15.

The third type, Type C, is the connection between the determinate properties of an object that make up the nominal essence. Examples of this type would be the standard gold examples. Gold is a substance consisting of the following properties: yellow, heavy, fusible, fixed, malleable, soluble in aqua regia, et al.

I want to take some time and explore this type of connection. About the connections of qualities that make up the nominal essence, Locke says there is nothing to link one quality to any other, that there is no discoverable connection between the simple ideas that make up a nominal essence. Certainly we do say that gold is an object which is yellow, heavy, fusible, fixed, and malleable, and that gold is also soluble in aqua regia, and so in one sense there is a connection of the quality of being soluble in aqua regia to the other qualities that make up gold. But this connection, claimed Locke, is only a verbal connection, only a product of our minds, and as such is not knowledge about the world, not instructive knowledge.

As there is no discoverable connexion between Fixedness, and the Colour, Weight, and other simple Ideas of that nominal Essence of Gold; so if we make our complex Idea of Gold, a Body yellow, fusible, ductile, weighty, and fixed, we shall be at the same uncertainty concerning Solubility in Aqua regia; and for
the same reason. Since we can never, from consideration of the 
Ideas themselves, with certainty affirm or deny, of a Body, 
whose complex Idea is made up of yellow, very weighty, 
ductile, fusible, and fixed, that it is soluble in Aqua regia; And 
so on for the rest of its Qualities. I would gladly meet with one 
general Affirmation, concerning any Quality of Gold, that any 
one can certainly know is true. It will no doubt, be presently 
objected, Is not this an universal certain Proposition, All Gold is 
malleable? To which I answer, It is a very certain Proposition, if 
Malleableness be a part of the complex Idea the word Gold stand 
for. But then here is nothing affirmed of Gold, but that that 
Sound stands for an Idea in which Malleableness is contained: 
And such a sort of Truth and Certainty as this, it is to say a 
Centaur is four-footed. (4.6.9)

The Type C connections involve an analytic or definitional type of 
necessity. For example, one connection we can necessarily know of gold is 
that gold is fusible. We know that gold is fusible in virtue of an analytic 
necessity, since gold just is that substance which has a certain set of 
properties, one of which is that it is fusible. We can know with certainty that 
gold is fusible because of the necessary connection between the idea of gold 
(if it contains the idea of fusibility) and the idea of fusibility. When we know 
the nominal essence of gold, and we have agreed upon qualities that make up 
that nominal essence, then we can know whether or not a piece of substance is 
gold. If a piece of substance has a certain yellow colour, is malleable, fusible 
and heavier than any other known, we know we have gold. If a piece of 
matter does not have these specified qualities it is not gold. What necessary 
connection the qualities in the nominal essence have to each other is a verbal 
or analytic necessity based solely on the meaning of the word 'gold'. The 
concept of gold is formed by constantly finding a certain grouping of 
properties co-existing together in nature in the same subject and then making 
that grouping of qualities stand for an abstract complex idea. There is nothing
about a certain yellow colour that entails malleableness or fusibility but there is an entailment between the complex idea of gold and the idea of a certain yellow colour just in case by 'gold' we mean a substance that has the properties of a certain yellow colour, malleable, fusible, heavier than any other known. The necessity of the connection comes from the fact that if those specific qualities are not joined, then we do not have gold, given an specific definition of gold. This is just the notion of containment.

The necessary connection then of the nominal essence is nothing more than the necessity that comes from the meaning of the term being used. There is no entailment between the ideas of the qualities themselves that make up the complex idea of gold, apart from the idea of gold. The ideas of the qualities are necessarily connected because they are contained in the idea of the object, its nominal essence, but the ideas of the qualities are not necessarily contained, in that a species need not be defined in any specific way since the nominal essence is arbitrary.

The question of course is why Locke denies the possibility of knowing the connections between the qualities in the nominal essence in a way other than the verbal. As the following quotation shows, Locke allows for the possibility that once you know the nominal essence of gold, you know, by definition, the qualities gold has. It is relatively easy to determine whether or not a substance has the qualities gold has by definition. But as cited earlier, what we want to know with substances is what other qualities will necessarily be present when the list of qualities in the nominal essence are all found to be present in a piece of substance.

But if he makes Gold stand for a Species, determined by its nominal Essence, let the nominal Essence, for example, be the
complex Ideas of a Body, of a certain yellow colour, malleable, fusible, and heavier than any other known; in this proper use of the word Gold, there is no difficulty to know what it is, or is not Gold. But yet no other Quality can with certainty be universally affirmed or denied of Gold, but what hath a discoverable connexion, or inconsistency with that nominal Essence. (4.6.8)

It is a desire for Type C connexions that motivates Locke's discussion into necessary connection. The scientists wanted to be able to state with assurance what properties would be together and even to predict what properties should be in a substance where they did not presently have direct knowledge of that connection.

... though we see the yellow Colour, and upon trial find the Weight, Malleableness, Fusibility, and Fixedness, that are united in a piece of Gold; yet because no one of these Ideas has any evident dependence, or necessary connexion with the other, we can not certainly know, that where any four of these are, the fifth will be there also, how highly probable soever it may be. (4.3.14)

The problem is how to get this knowledge of the connections of Type C in a way other than the trifling analytic route. Locke only allowed the co-existence of properties to be known from sensation or from the ideas themselves.

For this co-existence can be no farther known, than it is perceived; and it cannot be perceived but either in particular Subjects, by the observation of our Senses, or in general, by the necessary connexion of the Ideas themselves. (4.3.14)

Only the "scarce any at all" instances, Type B connections, can be known through the necessity of the ideas themselves. But the ideas of the components of substances, except for the "scarce any at all" that he refers to and limits to general ideas, do not carry any necessary connection in
themselves to any other ideas and so cannot be known by the ideas themselves. Nor can the connection be seen except in particular instances and so cannot be known to be universal, and hence not known as necessary. What is needed then to have knowledge of a truly necessary connection for Type C is an explanation as to why those qualities are in the subject that they are in. And the only way to know what other qualities will have a necessary connection or inconsistency with the qualities in the nominal essence is to understand the root from which all the qualities spring, to know the real essence and the mechanism by which it produces the qualities, which in turn produce ideas in our minds. As should be clear, this knowledge can only be had if Type A connections can be known. Type A connections are able to provide a mechanical explanation of why certain properties are found together in the substance because Type A connections just are the link between the configuration the primary qualities of the corpuscles take and what results (Type C connections) from those configurations. If we were able to have knowledge of Type A connections, we could then have a foundation for true knowledge of Type C connections. Since the mind-body problem blocks knowledge of Type A connections there can be no knowledge of Type C connections. (It may appear that I have just committed the fallacy of denying the antecedent but I have not. Logically stated the argument would be as follows: If we are to have knowledge of Type C connections then we must first have knowledge of Type A connections. We do not have knowledge of Type A connections. Therefore we do not have knowledge of Type C connections. The first premise must have Type C connections as its antecedent and Type A as its consequence to correctly reflect the situation that "if we have knowledge of Type C connections, then we must have knowledge
of Type A connections" for we do not want the situation of "if we have knowledge of Type A connections then we must have knowledge of Type C connections." We may have Type A connection knowledge but still not have Type C connection knowledge because there could exist other barriers.)

What follows are two quotes where Locke ties together Type A connections with Type C connections. These quotes are intended to justify my claim that there are the two types of connections, Type A and Type C, and that knowledge of Type C rests on prior knowledge of Type A.

In the following two quotes, Type C connections are referred to by Locke as collections of co-existing simple ideas and Type A connections are referred to as that dependency of the collection of ideas on a real constitution.

The complex Ideas, that our Names of the Species of Substances properly stand for, are Collections of such Qualities, as have been observed to co-exist in an unknown Substratum which we call Substance; but what other Qualities necessarily co-exist with such Combinations, we cannot certainly know, unless we can discover their natural dependency . . . (4.6.7)

'Tis true, there is ordinarily supposed a real Constitution of the sorts of Things; and 'tis past doubt, there must be some real Constitution, on which any Collection of simple Ideas co-existing, must depend. (3.3.15)

The next quote is the most explicit in drawing the link between both Type A and Type C connections. This quote also introduces the issue of what type of qualities should be considered in Type C connections.

. . . 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. (4.3.14)
This quote is important enough that I want to unpack it and look carefully at each part of it. The issue is whether the link between Type A to Type C involves only secondary qualities, or if it involves primary, or even possibly the tertiary qualities of the object. The opening line of the quote is:

In vain therefore shall we endeavor to discover by our Ideas, (the only true way of certain and universal Knowledge,) what other Ideas are to be found constantly joined with that of our complex Idea of any Substance: since we neither know the real Constitution of the minute Parts, on which their Qualities do depend; ... (4.3.14)

The phrase "on which their Qualities do depend" refers to the qualities of substances and these are simply the ideas that are "constantly joined" with the complex idea of substance, which is itself just an already determined collection of simple ideas always found together. Locke's reference to the qualities being joined together to make up a complex idea of a substance has the same denotation as my reference to Type C connections.

Next, in the phrase "nor, did we know them" the "them" refers to the real constitution of the minute parts. Also, the next reference to "them," in the following phrase "could we discover any necessary connexion between them" again refers to the real constitution of the minute parts.

Joining that phrase up with the rest of that section of the quote we get "nor, did we know them, could we discover any necessary connexion between them, and any of the secondary Qualities." Here I think my interpretation of Type A connections is clearly being referred to. This section of the quote is also important because Locke specifically mentions secondary qualities as being the second half of the connection between the real
constitution of the minute parts (the first half) and what results from the real constitution of the minute parts (the second half).

The remainder of the quote establishes for me that there are, at least, two different types of connections going on when Locke talks about necessary connection, for he says, "which is necessary to be done, [establishing the necessary connection between the real constitution of the minute parts on the one hand and the secondary qualities resulting from it on the other hand, which just is the Type A connection] before we can certainly know their [and here Locke is referring to the secondary qualities which he had just mentioned] necessary connection [which is a reference to my Type C connections]." (4.3.14)

Rephrasing the entire quote, what Locke is saying is this: The only way to have certain and universal knowledge of what idea (or secondary quality) will be found to co-exist in addition to the already existing group of ideas (or secondary qualities) that presently make up our complex ideas of a substance is through seeing a connection of the ideas themselves, but this will not work with substances because of the mind-body problem (and here I rely on a quote from the immediately prior section from that quoted above "our Minds not being able to discover any connexion betwixt these primary qualities of Bodies, and the sensations that are produced in us by them, we can never be able to establish certain and undoubted Rules, of the Consequence or Co-existence of any secondary Qualities" (4.3.13)). We do not have knowledge from the ideas themselves (Type C connections) because to do so would require both 1) knowledge of the primary qualities of the insensible particles themselves which result in the secondary qualities that make up the complex idea of a substance, which we do not have although in
theory this could be possible (level-1 scepticism) and 2) knowledge about the (Type A) connection itself that exists between the primary qualities of the insensible particles and the resulting secondary qualities (level-2 scepticism). It is necessary to resolve level-1 scepticism before even considering resolving level-2 scepticism, but Locke holds out only the theoretical possibility of resolving level-1 scepticism. More critically, even if level-1 scepticism were resolved, the mind-body would still prevent the resolution of level-2 scepticism.

From what has been just said one can tell that concerns about the possibility of knowledge of Type A connections and level-2 scepticism just are the same issue. The problem that concerns both Type A connections and level-2 scepticism is one of explaining Type C connections, those qualities that are found in a particular substance, but more particularly, explaining those Type C connections from a physical, corpuscularian hypothesis point of view. The difficulty of course is that any explanation that moves from a physical configuration of corpuscles and their properties to a mental state that has an idea produced in it from the physical corpuscles runs head on into the mind-body problem.

What we want with Type C connections is knowledge of why the qualities of a substance are always (as far as we know) found together. I have shown that the quest for this type of knowledge takes one back to Type A connections, since they are the only available explanation for why a substance has the qualities it does, other than the trifling analytic explanation which is of no value in providing instructive knowledge about the external world. The problem with having to rely on knowledge of Type A connections to know why a substance has the qualities it does, and what other qualities will be
found in it, is that Type A connections run into two areas of scepticism. The first level of scepticism, concerning knowledge of the corpuscles themselves, is in theory curable if only our senses were more acute or our technology more advanced. The second level of scepticism, concerning knowledge of how the configuration of corpuscles produces the ideas in our mind that it does, is utterly insoluble because of the mind-body problem.

I now want to look at the assumption that all the qualities in the nominal essence of a substance, and thus all the qualities that are concerns of Type C connections, are secondary qualities. Certainly, just from the text, as evidenced by the quotes given above, Locke does talk as if secondary qualities are the sole concern of Type C connections, and accordingly, I presented my analysis using only secondary quality terminology. Both Loeb and Alexander, in discussing Locke’s scepticism and the reason for it, have relied on the mind-body problem as an explanation. And both of these commentators have specifically restricted the scope of the mind-body problem, as an explanation for Locke’s scepticism, to secondary qualities.12

But in the examples Locke gives of the type of qualities found in the nominal essences of substances one finds what are commonly supposed to be tertiary qualities. If tertiary qualities were as susceptible to the mind-body problem as are secondary qualities there would be no need to do more than qualify Locke’s and his commentators’ statements about secondary qualities to include tertiary qualities. Perhaps in Locke’s notorious haphazard revising he added the notion of tertiary qualities at a late date and then simply did not
amend the text in all appropriate instances to read "secondary and tertiary qualities." But this would be a possibility only if tertiary qualities were susceptible to the mind-body problem and, at least on the surface, they do not seem to be, since the mind-body problem blocks knowledge of how a physical state, such as the configuration of the corpuscles, can produce a mental state, such as an idea in our mind, whereas tertiary qualities involve the power of a physical state, such as the configuration of corpuscles in one substance, to produce a new physical state, a new arrangement of corpuscles, in another object. Since tertiary qualities seem to be solely in the realm of the physical there would be no apparent application of the mind-body problem. And yet there is the following problem, for Locke seems to be denying the possibility of knowledge of necessary connections between the qualities of a body, except for the rare "scarce any at all" instances, which are known through the meaning of the ideas themselves. The connection between tertiary qualities is not known through the meaning of the ideas themselves, so it would seem that Locke would want to deny the possibility of knowledge of their necessary connection to each other. If the mind-body problem is not applicable to tertiary qualities there must be some other explanation for our ignorance of their necessary connections, and it is not apparent what such an explanation would be.

In order to examine whether there is a connection between tertiary qualities and the mind-body problem, I want to digress somewhat and examine qualities in general in order to build up to an understanding of tertiary qualities. My work on tertiary qualities is intended to resolve the following questions, 1) are tertiary qualities solely physical phenomenon and 2) do tertiary qualities make up "a not inconsiderable part" of our ideas composing
the nominal essences of substances? Finally, if tertiary qualities are solely physical phenomenon and they do make up a significant part of the qualities in the nominal essence, then it would seem that either there is the possibility of knowledge of the necessary connections between more of the qualities a body has than just the "scarce any at all" instances Locke gives, or, if knowledge of the connections between tertiary qualities is intended to be denied, and 1) above holds, so that tertiary qualities are solely physical phenomenon, there must be some explanation for this ignorance other than the mind-body problem.

About qualities Locke says,

\textit{Whatever the Mind perceives in itself, or is the immediate object of Perception, Thought, or Understanding, that I call Idea; and the Power to produce any Idea in our mind, I call Quality of the Subject wherein that power is. 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 . . .}(2.8.8)

From this quote, a quality may be understood as the power of an object to produce an idea in the mind. Given this definition and given the examples he gives of a snowball, including its shape, all qualities, whether primary or secondary, are the power of the object to produce an idea in the mind. Based just on what has been examined so far it seems that the mind-body problem is as much a problem for primary qualities as it is for secondary qualities, since in both cases there is a physical cause, the power of the object, of a mental condition, the idea of the quality. Since tertiary qualities are the power to produce a change in another object it is unclear how they fit into this initial definition of a quality.
Locke goes on to draw distinctions between the different types of qualities. First he gives a condition of primary qualities, that they will always be found in the body itself.

Qualities thus considered in Bodies, are First such as are utterly inseparable from the Body, in what estate soever it be; ... (2.8.9)

I assume that Locke intends this condition to apply to both the primary qualities of corpuscles and the primary qualities of macro objects.

Second, Locke gives a condition of secondary qualities, that they are not, as themselves, in the objects but are the ability of the object to cause the ideas of them in our minds.

2ndly, Such Qualities, which in truth are nothing in the Objects themselves, but Powers to produce various Sensations in us by their primary Qualities, i.e. by the Bulk, Figure, Texture, and Motion of their insensible parts, as Colours, Sounds, Tasts [sic], etc. These I call secondary Qualities. (2.8.10)

The distinction that might be drawn between primary and secondary qualities at this point seems to be that an object actually has a specific size (a primary quality) as well as the ability or power to produce the idea in our mind of that size. (Not to be understood as if we had an idea that itself had a specific size.) But with secondary qualities, the object does not actually have the smell, taste, or color in it that it produces. What the object has is a specific configuration, made up of the primary qualities of the corpuscles, which is itself neither yellow nor sweet smelling. The configuration produces the ideas in our minds of yellow colors or sweet smells. Whether or not one wants to say that secondary qualities are in the object depends on how precise one is being with the Lockean terminology, for strictly speaking, a secondary quality is simply that feature of the configuration that produces a certain idea in our
minds, and, as such, is the same as a primary quality. Under this understanding, secondary qualities most certainly are in the object itself. But if one is less precise and follows the, unfortunately, more common way of speaking then secondary qualities refer to the ideas of yellow or sweet and those ideas are not themselves in the object.

Even being as precise as possible there is still a distinction between primary and secondary qualities. Primary qualities are still the qualities that an object will have no matter how minute the object becomes, even down to the level of just one corpuscle. Secondary qualities depend on there being enough corpuscles to create a configuration. But of course this is also true of the primary qualities on the macro level.

A fairly speculative point that may draw the distinction between primary qualities and secondary qualities further, although not one that I know of to be given by Locke himself, at least explicitly, is that the primary qualities of the object itself, and not just of its corpuscles, are the result of the configuration as a whole, while the secondary qualities of the object are the result of only certain features of the configuration.

What this would imply is that the primary qualities of the macro body are more the result of the primary qualities of the configuration itself rather than the primary qualities of the corpuscles of the configuration, in that the size, shape, weight, mobility, etc. of the configuration as a whole make up the primary qualities of the size, shape, weight, and mobility of the macro body. It may be that the primary qualities of the corpuscles themselves do not influence to any great degree the shape of the macro body. So long as the corpuscles arrange themselves in a certain pattern and are of a specific
quantity, the macro object will have a specific size and shape regardless of the size and shape of the individual corpuscles.

And it may be that Locke's primary-secondary distinction, when applied to the macro, rather than micro, that is, when applied to objects themselves rather than the corpuscles, simply breaks down. Again, I am speculating, and am not really all that concerned with defending his position on primary and secondary quality distinctions anyway, but it may be that while it does make sense to talk of the primary qualities of the corpuscles as inseparable and as a distinct category from secondary qualities, it does not make sense, or at least there is no need, to maintain that distinction on the macro level. A sensible body is necessarily composed of many corpuscles, and since the corpuscles are not necessarily in any certain configuration, no specific determinate quality, primary, secondary, or tertiary, is necessary to that object. A macro object must have a size, but it must also have a color and a certain sensible texture, as well as temperature, smell (even if odorless), etc., although it need not have any specific size, shape, color, smell, or texture. At this point, there is no firm distinction between primary and secondary qualities of macro objects.

What I think was going on in Locke's mind was that there truly were primary qualities on the micro level where there were not secondary qualities, and those primary qualities of the micro objects were the standard ones of determinable size, shape, and motion. Perhaps Locke took that list of primary qualities for the micro level and simply called the same qualities in the macro objects primary qualities as well for the sake of consistency, although the primary qualities on the macro level have a greater kinship with the secondary qualities than they do with the primary qualities on the micro level.
There is however Locke's distinction between primary and secondary qualities concerning resemblance and this distinction does hold up on the macro level. In the following quote, the "Patterns" that "really do exist in the Bodies themselves" are the configurations that the corpuscles take that produce ideas in our minds of that configuration.

From whence I think it easie to draw this Observation, That the Ideas of primary Qualities, are Resemblances of them, and their Patterns do really exist in the Bodies themselves; . . . (2.8.15)

Even though the ideas of the primary qualities of the macro object are also the result of the configuration of the corpuscles, just as are the ideas of the secondary qualities of the macro object, the configuration that produces the ideas of the secondary qualities does not share a resemblance with the ideas it produces while the configuration that produces the ideas of the primary qualities does.

. . . but the Ideas, produced in us by these Secondary Qualities, have no resemblance of them at all. There is nothing like our Ideas, existing in the Bodies themselves. They are in the Bodies, we denominate from them, only a Power to produce those Sensations in us: And what is Sweet, Blue, or Warm in Idea, is but the certain Bulk, Figure, and Motion of the insensible Parts in the Bodies themselves, which we call so. (2.8.15)

And so there is the distinction between primary and secondary qualities on the macro level based on resemblance. Ideas of primary qualities resemble the primary qualities of the pattern or configuration of the corpuscles while ideas of secondary qualities do not resemble the feature of the pattern or configuration of the corpuscles responsible for producing them.

An example may make this clearer. In the chairman's office there is a red wing-back chair. This chair has a specific size, shape, color, and being
leather, a specific smell. The chair is composed of corpuscles. Each
corpuscle has a specific size and shape but does not have color or smell. The
corpuscles combine and produce a configuration. This configuration itself has
a certain size and shape, but the configuration does not have a smell or a
color. The corpuscles are numerous enough to produce a configuration that is
as big as the chair is and the corpuscles have arranged themselves in a wing-
back chair pattern. This large wing-back patterned configuration has the
power to produce in our minds the idea of a large wing-back chair. This large
wing-back patterned configuration also has other powers than just the one to
produce an idea of size and shape in our minds. The configuration has the
additional property of the power to produce the idea of red and the smell of
leather in us. The idea of the color red is not in the object nor is the idea of the
smell of leather. What is in the object is just the configuration of the
corpuscles, that in addition to the pattern the corpuscles take, have additional
qualities such as the different shapes of the individual corpuscles and how
they relate to each other. Perhaps the idea of red is produced by star-shaped
corpuscles that link their points together. So what we have is a configuration
of star-shaped corpuscles that have linked themselves into a large wing-back
pattern. If the corpuscles were gear-shaped and linked in that way, perhaps
we would see a blue wing-back chair. Another way to look at the same issue
is to suppose that the chair is perceived as red because the star-shaped
corpuscles are several layers deep or moving at a certain rate. If the star-
shaped corpuscles were only one or two layers deep or moved at a faster rate
perhaps we would see a pink wing-back chair.13

The point here is that the color that we perceive in the chair is in fact not
in the chair; what is in the chair is a specific arrangement of specific
corpuscles with specific primary qualities. But the shape that we perceive the chair to be in actually matches the shape of the configuration of the corpuscles, backing up Locke's resemblance claim for the primary qualities on the macro level.

Both in the "globule" passage of 4.2.9-13 and in the account I have given here, there is a corpuscularian account for all the qualities that an object has. Its size, shape, temperature, motion status, color, smell, taste, all that it is, is the result of its corpuscularian structure, its corpuscles and what they themselves are like, how many there are of them, what they are doing, and the arrangement they take.

Alexander makes the distinction in a way quite different from what I have presented. He views Locke's work on the primary/secondary quality distinction to be grounded in "conceivable explanations rather than qualitative differences in our sensations." and views the list of primary qualities attributed to the insensible particles to mirror the primary qualities of the macro objects.

Our experience leads us to believe in the independent existence of bodies; this belief may be questioned but why should we reject it unless the superstructure, the total account of the world we erect on it, shows some weakness? Take it as a working assumption and see where it leads. Sense experience apparently shows us various different qualities of bodies. Is there any way of separating these qualities into two groups, one as small as possible and the other as large as possible, such that the smaller group can plausibly be made the basis for the explanation of the larger? . . . The clearest explanations we have are mechanical explanations of such contrivances as watches and they depend upon the specifications of the character and arrangements of component parts which are solid and which move one another. The colours, tastes and odours of these parts do not figure in the explanation. . . . Consider the qualities that bodies appear to
have; does our very conception of body involve some of them and not necessarily others? Well, many bodies have no odour or taste and we can discover the presence of a body without the help of colours, but can we even conceive of a body without some shape and size and some ability to be moved? . . . We can conceive of an explanation of colour in terms of shape, size, and motion/rest . . . But can we even conceive of the explanation of, say, the shape of a body in terms of colours, tastes, or odours? . . . Bodies exist and experience shows them to be divisible. Their observable properties can perhaps be explained by reference to the properties of their insensible parts. How may an empiricist talk about 'insensible parts'? He must attribute to these parts only properties which are like those properties of ordinary middle-sized bodies of which experience gives us accurate ideas.15

I have presented Alexander’s interpretation of the primary/secondary distinction as a counter-position to my interpretation in order to show that I do not intend my interpretation to be taken as definitive. Resolving the primary/secondary distinction is perhaps an endless task. All that is required for my purposes is to have some understanding of what the distinction is and there is enough similarity between my account and Alexander’s to grasp the relevant facts. Primary qualities of both the micro and macro objects are the qualities which we cannot conceive a body as not having. Davidson and Hornstein claim that primary qualities are "part of the very concept of matter."16 Both the primary qualities and the secondary qualities are explained by a mechanical corpuscularian hypothesis. The secondary qualities do not have a resemblance to the configuration whereas the primary qualities do.17

After discussing primary and secondary qualities, Locke immediately adds the following comment about tertiary qualities, (although at no point in the Essay does he refer to the third sort with the term 'tertiary').
To these might be added a third sort which are allowed to be barely Powers though they are as much real Qualities in the Subject, as those [secondary qualities] which I to comply with the common way of speaking call Qualities, but for distinction secondary Qualities . . . (2.8.10)

To clarify what tertiary qualities are Locke gives the following examples,

For the power in Fire to produce a new Colour, or consistency in Wax or Clay by its primary Qualities, is as much a quality in Fire, as the power it has to produce in me a new Idea or Sensation of warmth or burning, which I felt not before, by the same primary Qualities, viz. The Bulk, Texture, and Motion of its insensible parts. (2.8.10)

These examples I think are very enlightening for they reveal the ambiguous use Locke has for the term 'power', and thus for 'quality'. A power, according to the first introduction Locke gives to the word in 2.8.8, is the ability of an object to produce an idea in the mind. But here in 2.8.10 Locke uses 'power' to describe both the ability of an object to produce ideas and the ability of an object to produce a change in another object. He justifies this dual usage by explaining that in both cases the object causes a new state in a second object, making the production of an idea simply a change in the other object, in this case the mind. A tertiary quality is also the ability of an object to produce a change in another object, but the change is limited to another physical object, which excludes tertiary qualities from producing ideas directly (but not indirectly), since an idea may be understood as a change produced in a mental object, namely, the mind. From this I assume that tertiary qualities do not themselves produce ideas in the mind. This assumption is additionally backed by following quote,
Thirdly, The Power [tertiary quality] 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 [the other body] 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. (2.8.23)

There are two interesting points to note in connection with this quote. The first is that Locke seems to be limiting tertiary qualities to active powers only, the power of a body to cause a change in another body. This restriction raises the question of how to refer to the quality a body has to be changed. Locke says a quality is the power to produce a change, but what about the quality of something like gold being fusible in fire? Locke addresses this issue by relying on the classical distinction of referring to the state of being changed, rather than producing the change, as a passive power.

... considers in one thing the possibility of having any of its simple Ideas changed, and in another the possibility of making that change; and so comes by that Ideas which we call Power. Thus we say, Fire has a power to melt Gold, i.e. to destroy the consistency of its insensible parts, and consequently its hardness, and make it fluid; and Gold has a power to be melted; That the Sun has a power to blanch Wax, and Wax a power to be blanched by the Sun, whereby the Yellowness is destroy'd, and Whiteness made to exist in its room. In which, and the like Case, the Power we consider is in reference to the change of perceivable Ideas. For we cannot observe any alteration to be made in, or operation upon any thing, but by the observable change of its sensible Ideas; nor conceive any alteration to be made, but by conceiving a Change in some of its Ideas. ... 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. (2.11.1-2)

Locke does allow then for powers to be either active or passive. And his example of gold in the above quote as having a passive power matches one of the qualities he commonly assigns to gold, that it is fusible. The ability of the
object to produce a change in another object is an active power, an active
tertiary quality, and the ability of an object to be changed is a passive power, a
passive tertiary quality. Locke refers to a passive tertiary quality as "passive
Capacities." (2.23.7) The new changed state is not the actual passive tertiary
quality. The passive tertiary quality is simply the disposition of the
configuration to react in a certain way, not the state it is in after it has reacted.
It is not the disposition to change (which is what a passive tertiary quality is),
but rather the new state, that produces a new idea in our mind. What results
from the interaction between certain bodies is a new state of the object and this
new state, perhaps the new state of being fluid when before the object was
solid, is what produces a new idea in our mind.

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, does, by those new sensible Qualities
introduced into other Subjects, discover to us those Powers,
which do thereby mediately affect our Senses, as regularly, as its
sensible Qualities do it immediately. (2.23.7)

This point raises the second interesting point about tertiary qualities,
that a tertiary quality, the power of a body to cause a change in another body,
does not itself cause ideas in the mind. From the quotes it looks as if tertiary
qualities cause a change in an object and then that object, now changed,
produces a new idea in our minds. The changed (or acted upon) object now
has a power to produce an idea in our minds that it did not have in its prior
state.

Tertiary qualities then do not produce ideas in our mind directly but
only produce new states in other objects and it is the new states that produce
ideas in our minds and therefore tertiary qualities, both passive and active, are
properly considered solely in the realm of the physical. So the answer to the first question is that tertiary qualities belong solely in the realm of the physical.

This status of tertiary qualities is to be distinguished from secondary qualities, which are not solely in the realm of the physical, because secondary qualities depend on the mind to have existence as actual powers rather than just potential powers. Without the mind, secondary qualities are just a (fairly useless) part of the configuration. Secondary qualities are given a status of their own only in relation to what ideas those features of the configuration produce in the mind. Primary qualities waffle between the physical and mental realm. Primary qualities depend on the mind for recognition of what the configuration is, but unlike secondary qualities, primary qualities are what they are, the size and shape of the configuration, independent of being perceived. Primary qualities are in the object whether they are being perceived or not. It does not make sense to say that an object is producing the idea of a secondary quality, like yellow, unless there is a receiver for the production of the idea of yellow. Certainly the feature of the configuration responsible for producing what would be the idea of yellow if there were a mind to be acted upon would exist unchanged by the presence or absence of a mind, but whether or not the idea we receive stays the same could vary. If we were different receivers, the same feature might produce the idea of red rather than the idea of yellow.

Tertiary qualities produce changes in other bodies regardless of whether that change is perceived or not, but tertiary qualities are not like primary qualities, because, like the secondary qualities, there is nothing in the object itself that resembles our idea of the tertiary quality. A tertiary quality like
"dissolvable in aqua regia" is not something that one can see in the object itself. Like the secondary qualities, tertiary qualities do depend on the existence of the object they are interacting with. They are not in the object itself, inseparable from it. But unlike secondary qualities what the tertiary qualities interact with are other physical objects. This requirement is what allows me to claim that tertiary qualities are solely in the realm of the physical. As such, tertiary qualities, as qualities, the power to produce a change, are not susceptible to the mind-body problem.

Based on what has been said then the primary qualities are unique in that they apply to two different groups of things, the corpuscles and the large, sensible objects. For the first group, the insensible corpuscles, their primary qualities are those that they themselves have and must necessarily have; this satisfies Locke's requirement that the primary qualities are utterly inseparable. These are qualities like shape, size, and motion status. For the primary qualities of the large sensible bodies the requirement is two-fold. First, the sensible bodies have the same primary qualities that the insensible bodies have, namely shape, size, and motion status. Second, the sensible bodies have primary qualities that resemble the actual arrangement of the corpuscles. Whatever shape or size the configuration of corpuscles takes is the idea of the shape and size we have of that object.

Secondary qualities do not apply to the individual corpuscles and so are separable from the object. Secondary qualities just are the arrangement, but here includes the thickness or internal patterns that the corpuscles take, as well as the size and shape of the configuration as a whole. This entire arrangement is the cause of our ideas of secondary qualities such as color and smell. There
is no resemblance between our ideas of secondary qualities, for example, yellow, and the specific configuration that produces that idea in our mind.

Tertiary qualities, both the passive and the active, are the power in an object to cause a change in or receive a change from another object. Since tertiary qualities just are the ability to change and be changed, they can be said to be actually in the object and are a result of the configuration. The tertiary qualities do not cause ideas in the mind. There is no discussion of resemblance between the tertiary qualities in the objects and the ideas of tertiary qualities in the mind, since the tertiary do not produce ideas. This claim is supported by the footnotes that Locke provides to summarize sections 24 and 25 of 2.8: "The 1st. are Resemblances. The 2nd. thought Resemblances, but are not. The 3rd. neither are nor are thought so.

The second question that I had wanted to address in this digression is whether the nominal essence is limited to only secondary qualities, or whether primary, and more crucially, tertiary qualities can be included in the nominal essence. Although Locke varies greatly in what qualities go into the nominal essence of, for example, gold, a typical grouping is the following, "Gold is yellow, heavy, malleable, fusible, and soluble in aqua regia." What I now want to do is determine the quality status of each of these qualities.

"Yellow" is by far the easiest; color is a very standard example of a secondary quality.

"Heavy" is more complicated. I think that tertiary may be ruled out since heaviness is not typically thought of as a power in an object to cause a change in another object, although one could stretch things and say that the heaviness of an object is its power to squish another object when dropped on it and thereby cause a change in that second object. But this is not a natural
reading of heaviness. A more natural way to go is to say that heaviness is the weight of the object. Given this reading heaviness seems to be a primary quality. The corpuscles themselves would have a heaviness or weight, no matter how infinitesimal they might be because the corpuscles have a shape, which implies extension and extension would have to have a weight. Here heaviness might seem to belong in the "scarce any at all" type of necessary connection. Also, the configuration that the corpuscles take will have a weight since it is made up of things that have weight. The total weight of the corpuscles in their configuration is the heaviness of the object. Given all this the quality of heaviness can be considered a primary quality. At this point it is established that both primary and secondary qualities are in the nominal essence.

To bring in an outside example to support the idea that primary qualities are to be included in the nominal essence consider the definition of man. Part of Locke's accepted definition of man is the shape. Shape is a readily accepted primary quality. Thus we have a clear example of a primary quality being included in the nominal essence.¹⁹

But what of the other qualities in the nominal essence of gold, those of malleable, fusible, and soluble in aqua regia? Also, if we look at other places in the Essay we see that Locke includes in the nominal essence of gold a variety of other qualities. The list of qualities I have chosen are sufficient to make my point. Are these qualities, malleableness, fusibleness, and solubility in aqua regia primary, secondary, or tertiary qualities?

Malleableness is the state of being able to be hammered or pressed into various shapes without breaking. It is interesting to note that the second definition given in my dictionary states that malleableness is that state of being
capable of being changed. Fusibleness is the state of being able to be melted together with other metals. Soluable in aqua regia means that gold will dissolve in a mixture of HCl and HNO3. Usually more nitric acid than hydrocholoric acid is used.20

What we want to say about these qualities is that they are passive tertiary qualities of gold, what Locke calls the passive capacities of bodies. They are, for example, the quality that gold has to be changed in certain ways. If things could be left at this point the categorization of qualities would be complete and we could simply say that all three types of qualities are to be included in the nominal essence but there is a snarl because the nominal essence is made up of ideas. In the nominal essence we have the idea of malleableness, the idea of fusibility, the idea of solubility in aqua regia, et al. Tertiary qualities, either active or passive, are not suppose to be producing ideas in our minds. And yet we obviously have ideas of passive tertiary qualities. How is this to be explained?

I have given the seeds of the answer earlier when I claimed that the tertiary qualities do not produce new ideas, but rather new physical states, and the new physical states, which are themselves primary or secondary qualities, do the producing of new ideas. In the quote given earlier (2.8.23), Locke said that tertiary qualities are "the power that is in any Body by reason of the particular Constitution of its primary Qualities, to make such a change in the [configuration] of another Body, as to make it [the other body] operate on our Senses, differently from what it did before" (underlining mine). What is operating on our senses differently from what it did before is not the active tertiary quality of fire that produces the change in gold. Nor does the passive quality of gold itself, its ability to be melted, operate on our senses. The only
thing that operates on our senses is the new changed configuration, and this new changed configuration is not itself a tertiary quality, either active or passive.

The nominal essence is made up of sensible ideas. The tertiary qualities do not produce ideas immediately. Therefore the nominal essence cannot be made up of ideas produced by tertiary qualities. But this still leaves us lacking an explanation of how to refer to what certainly look to be ideas of tertiary qualities. For if a tertiary quality is the ability of an object to change another object or to be changed by another object, then gold's ability to be dissolved in aqua regia would qualify as a tertiary quality. For gold this would be a passive tertiary quality and for aqua regia an active tertiary quality. And we certainly do have the idea of gold having this quality. We do have ideas of tertiary qualities. But tertiary qualities themselves do not cause our ideas of them. How then do we come to have the ideas of tertiary qualities?

I have said that the new changed state, for example, gold being now dissolved when before it was solid, is what produces the idea. But it would seem that all that the new changed state would produce in us is the idea of dissolved gold (whether the idea of dissolved gold is a primary or secondary quality is not yet determined) not the idea of gold being soluble in aqua regia.

The only way to answer this question is to rely on Locke's fully developed epistemology and bring in his notion of complex ideas that are actively created by the mind. The basic ideas of primary and secondary qualities are simple ideas and as such the mind is passive in receiving them. For both primary and secondary qualities, though significantly not for tertiary qualities, Locke provides a strongly mechanistic explanation of how the mind gets its ideas and its sensations.
The next thing to be consider'd, is how Bodies produce Ideas in us, and that is manifestly by impulse, the only way which we can conceive Bodies operate in. (2.8.11)

If then external Objects be not united in our Minds, when they produce Ideas in it; and yet we perceive these original Qualities in such of them as singly fall under our Senses, 'tis evident, that some motion must be thence continued by our Nerves, or animal Spirits, by some parts of our Bodies, to the Brains or the seat of Sensation, there to produce in our Minds the particular Ideas we have of them. (2.8.12)

After the same manner, that the Ideas of these original Qualities are produced in us, we may conceive, that the Ideas of secondary Qualities are also produced, viz. by the operation of insensible particles on our Senses. (2.8.13)

Such a mechanistic account of how the external objects produce ideas in our minds requires that the ideas produced are simple ideas. Our minds simply receive what is sent to them through the impulse of the insensible particles. But with tertiary qualities, active or passive, the mind in a passive mode cannot grasp the connection between the object that causes the change and the object that is changed. There is a strong undercurrent of Hume running through here, but Locke takes the same information and develops it in the opposite direction. What the mind perceives in regard to tertiary qualities is three separate sensations, the first is the state of the object (gold as a unified solid) before it is exposed to the second object (fire or aqua regia). The second sensation is the bringing together of the two objects (gold is placed in the fire or gold is placed in aqua regia). The third sensation is the new state in the first object (gold is now liquid or gold is now dissolved).

The idea of being melted by gold or soluble in aqua regia is not a simple idea. Therefore we could not obtain these ideas through passive sensation.
These ideas are tertiary qualities. Hence we do not obtain the ideas of tertiary qualities through passive sensation. The only other way to have ideas of the external world, if not through passive sensation, is to start with the simple ideas and then actively apply the mind to create complex or compound ideas. My claim is that these tertiary qualities are complex ideas made up of our sensation of simple ideas, and the simple ideas are either primary or secondary qualities, plus the idea of relation, such as "gold is placed in the fire" or "gold is placed in aqua regia." Drawing on the above claim, when I talked of the three sensations that go into the making of a complex idea of a tertiary quality, I can now be understood as claiming that the first and third sensations are the old and new primary or secondary qualities, respectively, and the second sensation is the relation between the objects involved, their order.

An objection that might be raised at this point is that Locke at times says that our complex idea of substance is made up of simple ideas received through sensation and the explanation I have just given of tertiary qualities prevents them from being simple ideas. But as discussed already in chapter one, Locke admits that his usage is not precise and that while the complex idea of substance is in fact made up of component complex ideas, he refers to those ideas as simple ideas for the sake of brevity.

For all those Powers, that we take Cognizance of, terminating only in the alteration of some sensible Qualities, in those Subjects, on which they operate, and so making them exhibit to us new sensible Ideas, therefore it is, that I have reckoned these Powers amongst the simple Ideas, which make the complex ones of the sorts of Substances; though these Powers, considered in themselves, are truly complex Ideas. And in this looser sense, [sic] I crave leave to be understood, when I name any of these Potentialities amongst the simple Ideas, which we recollect in our Minds, when we think of particular Substances. (2.23.7)
When Locke talks about qualities he focuses on primary and secondary qualities. He is consistent in referring to the result of primary qualities as ideas but refers to the result of secondary qualities both as ideas and sensations. This is not surprising since he has earlier clarified his usage of idea to be anything that is in the mind. I think it is important to note however that while secondary qualities produce either ideas and sensations Locke never refers to the result of a primary quality as a sensation. I think his usage of sensation and idea simply reflects the linguistic counterpart to the distinction he is attempting to draw. I do not have a sensation of the size and shape of an object in the same way that I do have a sensation of the colour or smell of the same object. Linguistically it is as common to say that I have an idea of red as it is to say I have a sensation of red, but it is not common to say that I have a sensation of roundness. Instead we say that we have an idea of roundness.

The linguistic distinction becomes even more forceful when applied to tertiary qualities. I have claimed that tertiary qualities simply cannot be obtained from sensation, and Locke gives some support, although admittedly rather weak, to this claim by never referring to the sensation of a tertiary quality but only to the idea of a tertiary quality.

So we do have ideas of tertiary qualities in our nominal essence, but we do not get these ideas in the same way that we get our ideas of primary and secondary qualities; we do not get our ideas of tertiary qualities from passive sensation, but from the mind actively forming a complex idea.

The major question that was to be addressed in this section of the digression was what type of qualities make up the nominal essence, and, given that the answer is now rather obvious that all the qualities are in the nominal essence, the question can be rephrased in the somewhat qualified
form, "How do we want to refer to the tertiary qualities that are in the nominal essence?"

So to finally answer the on-going second question we can say that ideas of tertiary qualities, as well as ideas of primary and secondary qualities, are in the nominal essence, but that ideas of tertiary qualities must be understood to be very strange things. The distinction that must be drawn between a tertiary quality and the idea of a tertiary quality is a strong distinction. Just as secondary qualities, if taken literally, are in the object since secondary qualities just are the features of the configuration that produce ideas in our mind, so to tertiary qualities are in the object, in the literal sense as a quality. Taken quite literally, a tertiary quality, dealing only with passive tertiary qualities here for the sake of simplicity, is just the configuration of an object that predisposes the object to react in a certain way when acted upon by another specific object. But the idea of the tertiary quality has even less of a resemblance counterpart than does secondary qualities. The reason for this is that ideas of tertiary qualities are actively created in the mind, through the active process of combining a prior state of the object, its relation to the interacting object, and the resultant new state. There is no one thing in the object, no single configuration, that is capable of producing such an idea in the mind. Even the passive simple ideas that are possible from sensing the prior and after states are insufficient to produce the idea of a tertiary quality. The complete idea of a tertiary quality requires that the mind actively fill in the missing causal link. All that a tertiary quality simpliciter is capable of producing in the mind is the prior state or the after state, and the mind would interpret those as either primary or secondary qualities. The mind cannot
sense a disposition since a disposition is a complex idea and the mind can only receive simple ideas through sensation.

We do say that secondary qualities are in the nominal essence when we actually mean that the ideas of secondary qualities are in the nominal essence. In like fashion we can say that tertiary qualities are in the nominal essence, so long as we realize that we are talking literally about ideas of tertiary qualities and realize all that goes into having an idea of a tertiary quality.

In regards to the mind-body problem, and whether or not it applies to tertiary qualities, the distinction just drawn again becomes crucial. The mind-body problem does not apply to tertiary qualities, since the interaction between the passive body and the active body is purely physical. However, the mind-body problem applies to ideas of tertiary qualities perhaps more so than to ideas of the other two types of qualities. The mind-body problem has special importance for ideas of tertiary qualities since in their case it is not simply the standard mind-body problem question of how the physical that is sensed can produce a mental effect, but a case of how something physical, the causal interaction, that is not sensed, can produce an idea, the causal connection, in our minds.

Again, there is a very strong undercurrent of Hume running through the above discussion. Both Locke and Hume traveled over the very same thin ice, but Locke skated over it while Hume poked holes in it. Because of this Locke did not experience the breakthrough that Hume did.

So the assumption made at the beginning of the digression was incorrect. The nominal essence is not made up only of the ideas of secondary qualities. Ideas of primary and ideas of tertiary qualities are also to be included in the complex idea of substances. On one hand this causes
problems because the Lockean text supports the notion that only secondary qualities are in the nominal essence. But there is good reason to believe that qualities like malleableness, et al., are tertiary qualities and deserve to be in the nominal essence.

There is a Lockean solution to this problem and it concerns Locke's own view as to what the tertiary qualities actually were. At one point Locke actually refers to what are now called tertiary qualities as a type of secondary qualities, specifically secondary qualities that do not produce ideas in the mind directly but only indirectly.

To conclude, beside those before mentioned primary Qualities in Bodies, viz. Bulk, Figure, Extension, Number, and Motion of their solid parts; all the rest, whereby we take notice of Bodies, and distinguish them one from another, are nothing else, but several Powers in them, depending on those primary Qualities; whereby they are fitted, either by immediately operating on our Bodies, to produce several different Ideas in us; or else by operating on other Bodies, so to change their primary Qualities, as to render them capable of producing Ideas in us, different from what before they did. The former of these, I think, may be called Secondary Qualities, immediately perceivable. The latter, Secondary Qualities, mediately perceivable. (2.8.26; underlining mine)

On the other hand, having primary and tertiary qualities in the nominal essence does not cause problems from the point of view of having an explanation for Locke's scepticism via the mind-body problem. All three types of qualities have been shown to involve the mind-body problem, although in different ways and to different degrees. Even the tertiary qualities, when taken literally just as qualities and as such are considered solely in the physical realm, take a bold leap into the real of the mental when producing the idea of themselves in the mind.
Interestingly, the real problem in connection with applying the mind-body problem to the qualities in the nominal essence seems to be with the primary qualities, not the tertiary as it first was thought. While the mind-body problem does apply to primary qualities in the somewhat generic fashion I have described for them, i.e., our ideas of primary qualities are still caused by the physical arrangement of corpuscles, there is a way in which the necessary connections between the corpuscles and the primary qualities can be known and this knowledge is not prohibited by the mind-body problem.\textsuperscript{22}

If level-1 scepticism were cured we would known the arrangement the corpuscles take. This would include knowing the shape and length of the entire arrangement. Once we know the shape and length of the entire arrangement of the corpuscles we would automatically know the primary qualities of the shape and length of the macro body. There is nothing arbitrary about the connection between the entire configuration of the corpuscles of the body and the primary qualities of the body since the primary qualities of the body just are the configurations the corpuscles take.

Our knowledge of the connections between the arrangements of corpuscles and the primary qualities in a body is not based on empirical knowledge. If we knew that the corpuscles were in a circular configuration then we would know that the body was a circular body, without having to perform experimentation. This does not occur with secondary qualities since there is no reason other than God's "arbitrary will" that a particular configuration of corpuscles results in the secondary quality it does.

Suppose the configuration of XOXO OxxO produces yellow. There is nothing about XOXO OxxO that suggests that the idea of yellow will result; there is no discoverable necessary connection between the two. The only way
that we can know that there is a connection is first to solve level-1 scepticism, discover that the corpuscles do have the configuration of XOXO OxxO, and then discover that every time that we find XOXO OxxO in an object we also have the idea of yellowness. But since there is no intrinsic yellowness about XOXO OxxO all that we would know is that there is a correlation between XOXO OxxO and yellowness and that the correlation has held everytime that we are aware of, but since we do not have any reason to associate XOXO OxxO with yellowness, other than the fact that they have occurred together in our past particular experiences of them, we cannot know, with certainty, that they will continue to be associated together in the future. Since we do not see any causal connection between the two but only a constant correlation we cannot know that XOXO OxxO is the cause of yellowness or merely some serendipitous coincidence that either does not hold in all cases, but only the ones we have looked into so far, or will not continue to hold in the future, or both.

But the case is different with primary qualities and the configuration of corpuscles. Suppose the corpuscles take the arrangement of

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We can know without ever having to even experience a single corpuscularian configuration that any configuration of ten corpuscles across and three corpuscles deep that has four right angles will have the primary quality of a specific size and shape, namely a rectangle of length ten-corpuscles and depth three-corpuscles. Thus we would know, with certainty, the primary qualities of the size and shape of any body that had that corpuscularian configuration.
There is still the mind-body problem question of how that configuration as a physical entity produces an idea in our mind, but there is not a difficulty in seeing that there is a necessary connection between the corpuscularian configuration and the primary qualities the body has. This is because the connection between the configuration and the primary qualities can be comprehended on a purely mental level; the idea of the entire corpuscularian configuration is inseparable from the ideas of the primary qualities. Because the relationship between the configuration and the primary qualities is comprehensible purely through the ideas of each, the necessary connection between them can be known with certainty and the mind-body problem has no application. The relationship between the configuration and the secondary qualities, having no such identity or necessary connection, can be comprehended only as a contingent relationship discoverable only through experience.

Applied to tertiary qualities, the analysis works much the same as for secondary qualities. Suppose when we saw the corpuscularian configuration of two substances, such as gold and aqua regia, we saw XOO XooXx and OOXXXO oXo, respectively. There is nothing about XOO XooXx that would indicate that it would dissolve when placed into OOXXXO oXo. The only way to know that this would happen would be to observe the results of placing an object with XOO XooXx into OOXXXO oXo. The same contingency that applied to secondary qualities would apply to tertiary qualities.

It might be thought that such a knowable connection between the corpuscularian configuration and the primary qualities would cause serious problems for my interpretation that the mind-body problem is the real reason
for Locke's scepticism about scientific knowledge of the external world, and even call into question whether Locke was as absolute a sceptic as I have been presenting him. After all, there is now the possibility of knowledge of the necessary connection between the configuration of the corpuscles and the primary qualities.

There are three responses to this objection. The first is to rely on Locke's already drawn distinction between the type of knowledge of the external world we can know and the type we cannot know. Locke never said that all knowledge of the necessary connections is unknowable. He allows for the "scarce any at all" instances of knowledge of the world, what I have called the Type B connections, where the knowledge is the result of the meaning of the ideas themselves. The response to the objection is to include the knowledge of the necessary connection between the corpuscularian configuration and primary qualities into the category of the Type B connections. While this is not a move that Locke took it does not seem to be a move to which he would object. The "scarce any at all" instances are those instances where the knowledge can be known by virtue of the ideas themselves. Locke's list of "scarce any at all" instances, for example that "figure necessarily supposes extension" can be expanded to include the more specific instances discussed above. That such knowledge is not susceptible to the mind-body problem is not troublesome since Locke, had he thought of them, in all probability would not have been sceptical about the certainty of human knowledge concerning those examples.

The second response is to realize that the knowledge of the connection between corpuscularian configurations and primary qualities as a necessary connection is not the type of knowledge that Locke felt the scientists should be
endeavoring to learn. The usefulness of such knowledge to human affairs is quite limited. The area of knowledge that Locke is concerned with is the knowledge of what qualities will always be found to co-exist in a physical substance. The reason he was concerned with this particular area of knowledge is because it is on the basis of such knowledge that species are determined. Knowing the "scarce any at all" instances, even expanded to include instances of the necessary connection between the configuration and the primary qualities, does little to advance our knowledge of kinds, since the size and shape is rarely a part of the nominal essence. In those cases where primary qualities are in the nominal essence, then certain knowledge of at least some of the qualities is possible, but this is not enough knowledge on which to base a natural science. Knowledge of the connection between the configuration and the primary qualities does not tell us that an object having a certain length will have any other qualities besides the other very specific primary qualities of shape and depth. Our knowledge of how a piece of substance, for example, gold, will react in the future is not advanced by knowing the necessary connection between the size and shape of the configuration and the primary qualities of the size and shape of the micro object.

The final response questions the classification of this knowledge as scientific knowledge; it is not clear that this knowledge will count as instructive knowledge. If such knowledge is not instructive, then it fails to meet the triadic requirement for scientific knowledge. The reason that this knowledge may not count as instructive knowledge, while the original instances of the "scarce any at all" types do, is that the connection between the configuration and the primary qualities that is known as necessary is known
as such because there is an identity relationship between the idea of the configuration and the ideas of the primary qualities while no such identity exists between the ideas that make up the "scarce any at all" instances. With the connection between the configuration and the primary qualities what we have is the following identity relationship: any configuration of ten corpuscles across and three corpuscles deep that has four right angles will have the primary quality of a specific size and shape, namely a rectangle of length ten-corpuscles and depth three-corpuscles. Our idea of a configuration that is rectangular and ten corpuscles across and three corpuscles deep simply is the same thing as our idea of an object that is rectangular and ten corpuscles across and three corpuscles deep. Unless the ideas are expressed this way the necessary connection between them will not hold since we could easily have an idea of a rectangular object of a certain length and depth, without having the idea of a configuration made up of corpuscles at all. Having knowledge of the necessary connection between the idea of a corpuscularian configuration and the ideas of the primary qualities that result from the corpuscularian configuration does not tell us that there is such a corpuscularian configuration in nature since the relationship between the two will hold even if there are no corpuscles and never have been. Such knowledge does not increase our knowledge of the external world and as such does not count as instructive knowledge of substances. The knowledge, consisting in identity as it does, is trifling knowledge.

So although these specific types of necessary connections between configurations and primary qualities can be known, having them is not problematic. One, Locke has provisions built into his theory to handle such exceptions to his scepticism. Two, the exceptions do not constitute
advancement into the areas of knowledge with which Locke is concerned. Three, it is not clear that this knowledge counts as knowledge of the real world in a non-trifling sense.

In the rest of this dissertation I shall talk of the mind-body problem as applicable to all three types of qualities, although in different ways and to different degrees. It applies to all three types of qualities in that in each case when we have an idea of a particular body having a quality, primary, secondary, or tertiary, and that idea is caused by our observance of the body, then we are at a loss to explain how the body produces in us the idea it does. It is the mind-body problem which prevents knowledge of the mechanics behind the causal relationship between the configuration of the body and the idea in our mind. Without knowledge of the causal relationship, no connection between the two can be known to be necessary.

The mind-body does not apply to primary qualities however if what is being focused on is the connection between the idea of the configuration and the ideas of the primary qualities which are identical to our idea of the configuration. Since there is no discoverable identity between our idea of the configuration and our ideas of secondary and tertiary qualities, the only way to discover the connections between the two is by observation, which will only lead to knowledge of correlations and not to knowledge of necessary connections. The reason for this is that the correlations between the configuration and the secondary and tertiary qualities are arbitrary, while the connection between the configuration and the primary qualities is necessary.

Throughout the rest of the dissertation when I speak of the mind-body problem prohibiting knowledge of the necessary connection between the corpuscularian configuration and the qualities that make up the nominal
essence of the substance I ask to be understood not as having the comments applied to the "scarce any at all" instances, expanded to include the type of necessary connection that does exist between the idea of the configuration and the idea of the primary qualities. The mind-body problem would still apply to cases of primary qualities where what is at issue is the causal connection between the physical, the actual shape and size of the object out in the world, causing in us the idea of its shape and size, or to phrase it differently, how the physical corpuscularian configuration causes the idea of the corpuscularian configuration.

What is important here is that we can now resolve the question that was the motivation for the digression into qualities; does Alexander's interpretation of the reason for Locke's scepticism apply to all qualities in the nominal essence, being specifically concerned with tertiary qualities because it looked like the nominal essence was significantly composed of tertiary qualities and those did not seem to be susceptible to the mind-body problem. What we now see is that the tertiary qualities themselves are purely physical, and since the tertiary qualities themselves do not produce ideas they are not susceptible to the mind-body problem, but, and this is a crucial but, what appears to be tertiary qualities are actually combinations of prior and after states of primary and secondary qualities and a relation that exists between the two physical objects, and so the mind-body problem is applicable at that stage and that is all I need to have an explanation of Locke's scepticism.
In summary then, Types B and C connections are both concerned with what ideas necessary co-exist in a body. Type A is concerned with the causal connection between the ideas themselves (and not so much their connection to each other) and the inner constitution that the ideas flow from. In order to know the connections of Types B and C we must get it either from "the observation of our Senses, or in general, by the necessary connexion of the Ideas themselves." Only the scarce any at all connections, the Type B, either as Locke's original list or the expanded list to include the connections between the configuration and the primary qualities, are capable of being known by the ideas themselves. Knowledge of their connections is not dependent on Type A connections because their dependency is grounded in the ideas themselves and not on the physical real essence. Therefore they are not susceptible to the mind-body problem. This is quite fortunate since the mind-body problem introduces scepticism and we are not sceptical about knowledge of Type B connections. But the connections of Type B are not the right kind of connections by which we make groupings, and it is the ability to make groupings that can be used for scientific predictons that science is looking for. Type C connections are used for grouping, but the ideas in Type C do not have a visible connection with each other. We cannot tell just by looking at a yellow lump of metal that it will also be malleable or soluble in aqua regia. Type C, if its connections are to be known, must come from the senses. But the ideas of Type C, not having a visible connection to each other cannot depend on the senses directly to tell us what ideas are connected to each other. So to understand what connections are necessary for Type C we would need to understand where the ideas come from, which is to know the connection between the inner constitution (the primary qualities of the corpuscles) and our
ideas that make up Type C. The properties of Type C carry in themselves no connection so our only hope would be to look at Type A and determine the connection there. And this of course is impossible because of the mind-body problem.
CHAPTER THREE  
Loeb and Locke

Now seems like a good time to approach Locke and the science issue from a different angle. I have been working with the assumption that Locke was very much an empiricist and a sceptic concerning scientific knowledge of external bodies. This standard view of Locke has been questioned by different commentators, among them Louis Loeb in Descartes to Hume.¹

I want to examine the claim that Locke was at least something of a rationalist and Loeb is convenient for this. Not only is his book one of the more recent attempts to read Locke as a rationalist, but his work, if correct, would require a significant shift in the standards views on Locke’s overall project in the Essay. A more pragmatic reason for dealing with Loeb is that he presents his argument that Locke was a rationalist by covering exactly the types of cases I want to use to claim that Locke was arguing that an empirical approach to knowledge of external bodies was the only possible way to increase our knowledge in that area. Much of what I say at this end of this chapter goes beyond being a commentary on Loeb’s claims and instead uses Loeb as a vehicle for applying the fully fleshed out interpretation I have of Locke’s scepticism.

While I do not wish to tackle critically the entire project that Loeb has in mind for his book, that of discarding the traditional division of modern philosophy into the two schools of British Empiricism and Continental Rationalism and replacing it with a division based on theories of causal interaction which provides a new criteria for grouping the principle figures of the time, I do want to look closely at how Loeb deals with Locke, for at one point Loeb says about Locke, "... if Descartes is a Rationalist, so is Locke."²
Loeb bases this statement on, first, the number and depth of similarities he finds in the epistemology of both Descartes and Locke. In addition, Loeb bases this statement on his view that Locke's project in the Essay was "... an attempt... [to] establish the theoretical possibility that both truths of morality and laws of nature can be known in a way that satisfies Descartes' standards for knowledge."\(^3\) and that "... on the best overall interpretation, Locke's project in the Essay is to show that Descartes' standards for demonstrative knowledge can in fact be met in morals, and can in principle be met in natural philosophy (if only our perceptual faculties were more acute, or our microscopes stronger.)"\(^4\) and, finally, "[t]he whole point of his doctrine of real essence is to explain the possibility of a priori knowledge."\(^5\)

As I shall discuss in much greater detail in what follows, the support that Loeb offers for the first claim is a textual comparison between Descartes and Locke on several points; the support for the second claim is more involved and concerns Loeb's interpretation of Locke's work on real essences.

Because Loeb bases his claim that Locke is best thought of as a Rationalist on two claims, my evaluation of Loeb must be in two parts. First I will look at the similarities between Locke and Descartes that Loeb draws. There are seven of them; my approach is to show that not all the similarities Loeb draws withstand further examination and those that do hold up are in fact simply those that apply to a rigid definition of knowledge which any empiricist could hold without being considered a rationalist. Second, I will examine Loeb's reasonings for his view of Locke's project in undertaking the Essay, namely, continuing Descartes' optimistic a priori deductive approach to natural science, and show that Locke's epistemology prevents him from
supporting an a priori deductive science. The passages that Loeb uses to show Locke as an optimistic a priori deductivist are actually passages where Locke is claiming that an a priori demonstrative science, while admittedly the most desirable way of proceeding *if you could do it*, is too much, even in theory, to hope for and so the scientists should proceed differently, i.e., with an empirically based hypothetical-deductive method. Further, Locke was not even all that optimistic about an empirical approach to science. So, far from being optimistic about the theoretical possibility of a rationalistic a priori demonstrative science, Locke was a sceptic even about the success of a experimental science.

Before starting to deal with either of the claims that Loeb makes about Locke, I want to spend some time looking at Loeb's general approach to his overall theory.

Loeb looks at what he calls the standard theory of the division between rationalism and empiricism and identifies three main components of that theory. Briefly, the three components are: 1) that certain historical figures are more important than others in developing the main lines of thought that separate the two major schools, 2) that the two major schools are divided into the rationalist camp and the empiricist camp, with a development of distinctive principles for each school. The philosophers who have the importance mentioned in component 1) are the philosophers who developed these distinctive principles. And, 3) that within each school of thought there is a dialectical development of the distinctive principles.

It is the second component that he draws on in showing the similarities between Descartes and Locke, since the second component sets up the traditionally supposed distinctions between the two schools. Loeb's intention
is to show that the supposed distinction between the prototype rationalist Descartes and the prototype empiricist Locke simply is not as great as expected or as great it would need to be to place these two philosophers into separate epistemological schools of thought. "Distinctions [between the two schools] are primarily epistemological, that they have something to do with competing accounts of the nature of human knowledge, of the standards, sources, structure, and extent of knowledge."6

Loeb begins the section that details the similarities between Descartes' rationalistic epistemology and Locke's with the following claim "I contend that most of Books III and IV of Locke's Essay Concerning Human Understanding constitutes an attempt to contribute to Descartes' epistemological program by establishing the theoretical possibility that both truths of morality and laws of nature can be known in a way which satisfies Descartes' standards for knowledge."7

To begin his study of the similarities between Descartes and Locke Loeb delineates four areas of epistemology that he will look into: the standards of knowledge, the sources of knowledge, the structure of knowledge, and the extent of knowledge.

I have already done the work laying out Locke's views on knowledge, in chapter one so I will not deal with Locke here in much more detail than Loeb himself presents.

At the end of his discussion of the similarities Loeb provides a seven point summary of his findings. Since I want to discuss the seven points of agreement that Loeb find between Descartes and Locke in connection with the evidence Loeb provides, I will list the seven at this time so that they are before the reader. Paraphrasing from page 54, they are:
1) certainty is a condition for knowledge
2) truths known by intuition are perceived all at once, are self-evident, and do not require argument
3) truths known by deduction or demonstration are perceived in a succession or progression, are certain but not self-evident, and are established by arguments consisting of a series of intuitively grasped steps
4) intuition and deduction or demonstration are the sole sources of knowledge, at least with regard to all general truths
5) not only do propositions known by intuition not require argument, they do not admit of argument, and in that sense they function as the foundation of all our knowledge
6) we have intuitive knowledge of propositions about the content of our present sensory states
7) demonstrative knowledge of general or universal truths in principle extends well beyond mathematics, to morality and natural science.

The standards of knowledge for Descartes, "the conditions that true beliefs must satisfy in order to constitute knowledge," are certainty and indubitability. Locke seems to accept en toto Descartes' standards for knowledge, viz., that knowledge must be clear and indubitable, certainly at least for intuition and demonstration.

This is Loeb's support for point 1 above. On this point I agree with Loeb. For both Descartes and Locke the only knowledge that can truly be called knowledge is knowledge which is certain and indubitable.

The awkwardness of that last sentence suggests that some sort of notational device is needed to separate true knowledge from knowledge that is not certain and indubitable. The distinction that immediately suggests itself is one between knowledge and certain knowledge. Accordingly, I will notate knowledge that meets the cartesian standard of certain and indubitable as "knowledge-c" letting the "c" serve a dual purpose of standing for cartesian and certain. Knowledge-c refers to knowledge in a rigid sense. Unless we
"know with certainty" that our beliefs are true we do not have knowledge-c. Knowledge that is not notated will stand for knowledge that is used in a non-specific sense. Knowledge will no attached notation should not be assumed to be mere opinion, but merely knowledge which has not yet been (or may never be) firmly established as certain and indubitable. Also, in discussions where the distinction is not relevant, I will not use the notation but simply refer to 'knowledge' because of the cumbersome aspect of using notations where distinctions are not needed.

The sources of knowledge-c for Descartes, "the faculties employed in gaining knowledge,"9 are intuition and deduction. Intuition, for Descartes, is "an act or operation of the mind in which a proposition is apprehended or perceived 'in its totality at the same time and not successively' and so clearly and distinctly as to be certain or indubitable."10 Also, says Loeb, propositions known by intuition are self-evident. Again, Loeb provides textual support to show that Locke held an almost identical position regarding the way that intuition should be viewed, that truths known by intuition were known immediately, could not be doubted, and were self-evident.11

This is Loeb's support for point 2. As far as Loeb goes, I agree with him, but there is long debate in Lockean study whether Locke agrees that the only sources for knowledge-c are intuition and deduction. After drawing the similarity between Descartes and Locke on their accounts of intuition and demonstration as sources for knowledge-c, Loeb asks whether intuition and demonstration exhaust the sources of knowledge-c. Loeb's account of this issue will be dealt with under point 4.

"It is important to note that for both Descartes and Locke, not all intuitive knowledge is a priori and general."12 The primary evidence for this,
for both philosophers, is knowledge of self-existence. Locke would allow knowledge of self-existence to come from reflection, internal experience. His statements on intuitive knowledge of self-existence are virtually identical to Descartes' cogito argument. "If I doubt all other things, that very doubt makes me perceive my own existence."  

Descartes distinguishes demonstrative knowledge from intuitive knowledge by claiming that the truth of a proposition known demonstratively occurs in a succession or series of intuitions, rather than all at once, as is the case with propositions known through intuition. Also, "truths known by deduction are certain but not self-evident." Once again Locke draws a very similar distinction for he says that with demonstrative knowledge "there must be a progression by steps and degrees" and that intuition is necessary at every step. Finally, Locke claims that knowledge by demonstration is certain, yet not self-evident.  

This is Loeb's support for point 3. Again, I agree with Loeb that this is Locke's position.

On the question of whether or not intuition and demonstration are the sole sources of knowledge (point 4 briefly mentioned above), there finally seems to be some disagreement between the two philosophers. Descartes is emphatic that it is intuition and demonstration alone from which all knowledge comes. Locke says "These two, (viz.) intuition and demonstration, are the degrees of our knowledge; whatever comes short of one of these, with what assurance soever embraced, is but faith, or opinion, but not knowledge, at least in all general truths." Locke agrees then that intuition and demonstration are the sole sources of knowledge for all general
truths, but differs from Descartes in holding the position that intuition and demonstration are the sole source of knowledge-c for all truths.

The reason for the divergence between Descartes and Locke on this point is Locke's account of sensitive knowledge of particulars of the external world. There is a difficulty in assigning a notation to the 'knowledge' of the prior sentence. Locke says that such knowledge is so certain that it may pass under the name of knowledge (knowledge-c) but it is not so certain as knowledge-c from intuition or demonstration.

These two, (viz.) intuition and demonstration, are the degrees of our knowledge; whatever comes short of one of these, with what assurance soever embraced, is but faith, or opinion, but not knowledge, at least in all general truths. There is, indeed, another Perception of the Mind, employ'd about the particular existence of finite Beings without us; which going beyond bare probability, and yet not reaching perfectly to either of the foregoing degrees of certainty, passes under the name Knowledge. There can be nothing more certain, than that the Idea we receive from an external Object is in our Minds; this is intuitive Knowledge. But whether there be any thing more than barely that Idea in our Minds, whether we can thence certainly infer [sic] the existence of any thing without us, which corresponds to that Idea, is that, whereof some Men think there may be a question made, because Men may have such Ideas in their Minds, when no such Things exists, no such Object affects their Senses. But yet here, I think, we are provided with an Evidence, that puts us past doubting: For I ask anyone, Whether he be not invincibly conscious to himself of a different Perception, when he looks on the Sun by day, and thinks on it by night; ... We as plainly find the difference there is between any Idea revived in our Minds by our Senses, as we do between any two distinct Ideas. ... this certainty is as great as our Happiness, or Misery, beyond which, we have no concernment to know, or to be. So that, I think, we may add to the two former sorts of Knowledge, this also, of the existence of particular external Objects, by that perception and Consciousness we have of the actual entrance of Ideas from them, and allow
these three degrees of Knowledge, viz., Intuitive, Demonstrative, and Sensitive: in each of which, there are different degrees and way of Evidence and Certainty. (4.2.14; underlining mine)

The notice we have by our Senses, of the existing of Things without us, though it be not altogether so certain, as our intuitive Knowledge, or the Deductions of our Reason, employ'd about the clear abstract Ideas of our own Minds; yet it is an assurance that deserves the name of Knowledge. If we persuade our selves, that our Faculties act and inform us right, concerning the existence of those Objects that affect them, it cannot pass for an ill-grounded confidence: For I think that no body can, in earnest, be so sceptical, as to be uncertain of the Existence of those Things which he sees and feels. (4.11.3; underlining mine)

And, in footnote summaries of the chapter on "Knowledge of the Existence of other Things," Locke adds, "A condition of certainty as great as our Condition needs." (4.11.8) and "But reaches no farther than actual Sensation." (4.11.9)

I have a number of points to make about Locke's position concerning sensitive knowledge of the existence of external particular objects. The first is that I do think Locke intended for this knowledge to be knowledge-c. It may very well be that he is wrong to say this, but I do think it is the position he held. The textual evidence that it is his position is quite strong and consistent. As my underlining in the above quotations show, Locke held that sensitive knowledge of the existence of external particular objects is "past doubting" (indubitable), "passes under the name Knowledge", "deserves the name Knowledge", "cannot pass for an ill grounded confidence", "A condition of Certainty as great as our Condition needs.", and "no body can, in earnest, be so sceptical, as to be uncertain of the Existence of those Things which he sees and feels." Thus we end up with sensitive knowledge of the existence of external particular objects that is indubitable and certain, making sensitive
knowledge of the existence of external particular objects sensitive knowledge-c. Granted, Locke says sensitive knowledge of the existence of external particular objects is not as certain as knowledge from intuition or demonstration, but he also says that knowledge from demonstration is not as certain as knowledge from intuition. Since it is not a question whether knowledge from demonstration counts as knowledge-c, even though it is of a lesser degree of certainty and obtained differently, sensitive knowledge of the existence of external particular objects should not be ruled out as knowledge-c simply on the basis of being of a lesser degree of certainty and obtained differently from either intuition or demonstration. Locke says that there are three degrees of knowledge, and I strongly feel that he mean three degrees of knowledge-c. When Locke says in, "...these three degrees of Knowledge, viz., Intuitive, Demonstrative, and Sensitive: in each of which, there are different degrees and way of Evidence and Certainty." (4.2.14; underlining mine) I take him to mean exactly what he says.

There is an additional point to make in regard to sensitive knowledge of the existence of external particular objects, namely that the possibility of such knowledge-c is essential for Locke's epistemology at a very basic level. I will discuss this issue in connection with point 5 below, when Loeb discusses the structure of knowledge.

As a summary comment on Loeb's discussion on point 4 (that intuition and deduction or demonstration are the sole sources of knowledge, at least with regard to all general truths), Loeb is correct in terms of what he says precisely, that both Locke and Descartes hold the view that all knowledge-c of general truths are obtained only through intuition and demonstration, but by underplaying Locke's view on sensitive knowledge of the existence of
external particular objects as knowledge-c, Loeb leaves out a crucial
distinction between Locke and Descartes, one that poses a severe stumbling
block for reading Locke as rationalist. As I will discuss more fully at the end
of this discussion on Loeb's work between the similarities between Descartes
and Locke, much of the similarities that Loeb draws between the two are very
general descriptions of knowledge terminology and nowhere near as
significant as the divergences.

Loeb's third area of epistemological agreement between Descartes and
Locke is the structure of knowledge, the interrelationships of beliefs which
constitute knowledge. Accepting for the moment that Locke would agree that
the structure of knowledge is the interrelationships of beliefs, I will go on and
lay out what Loeb draws as similarities between Locke and Descartes.
"Descartes' rules instruct us to proceed by accepting the absolutely simple or
simplest and then progressively more complex propositions (RDM v, vi,
viii)."18 The simplest truths, for Descartes, will be those truths which do not
admit of argument by other truths. Therefore, it is truths by intuition which
are the simples from which all knowledge must be based, making truths by
intuition the foundation of all knowledge.19 Loeb says that Locke held a
similar position, as evidenced by the text "'intuitive knowledge neither
requires, nor admits any proof, one part of it more than another. He that will
suppose it does, takes away the foundations of all knowledge and certainty'
(Essay IV.viii.19)."20

This quote is the only support Loeb offers for Locke's acceptance of
point 5 (not only do propositions known by intuition not require argument,
they do not admit of argument, and in that sense they function as the
foundation of all our knowledge). For Descartes, it seems correct to say that
he grounded all knowledge from truths known by intuition, and in that sense intuition is the foundation of all our knowledge. This also seems to be the correct reading of Locke, at least for knowledge. Where Descartes and Locke seem to differ on the foundational role of intuition is with ideas. Descartes allows ideas to be known by intuition; Locke claims that all ideas come from experience. Granted, some ideas that are known by intuition do come from experience, as evidenced by knowledge of the self, but Descartes dependence on intuition in having knowledge is broader than Locke’s.

The work that is needed to be done in exploring the role of intuition in both Descartes and Locke goes beyond the scope of this dissertation. Loeb has not made it clear that even if there is as close an agreement between the two philosophers as he is arguing for that such agreement would be sufficient to qualify Locke as a rationalist. And even if Locke is a rationalist on this one point, the extent of the differences between Locke and Descartes, as my evaluation of Loeb’s other points show, would seem to qualify calling Locke an empiricist.

The final main area that Loeb looks into is the extent of knowledge, the range of subject matter about which knowledge-c is possible. According to Descartes all knowledge-c must come from intuition and demonstration. Given this, what "sorts of subject matter [for Descartes] contain propositions that can be established on the basis of intuition and demonstration alone?"21 Since I have already shown that Locke did not hold the view that all our knowledge-c comes from intuition and demonstration alone, part of what follows has a 'beside-the-point' flavor. However there remains the critical area of the seeming agreement between Locke and Descartes that all knowledge of general or universal propositions is derivable from intuition and
demonstration alone. So in the section where Loeb looks at the extent of knowledge what he is concerned with is the extent of knowledge derivable from intuition and demonstration alone. Since Loeb's strongest focus in this section concerns natural science, the essential role of sensitive knowledge in providing the foundation of knowledge of corporeal things should be keep firmly in the forefront of the reader's mind.

In discussing the extent of knowledge Loeb looks first at particular propositions and then at general propositions.

One important class of particular propositions for Descartes that is obtained solely from intuition is that of the contents of mental states at the time they obtain.²² Loeb quotes Locke as holding the following similar position "There can be nothing more certain, than that the idea we receive from an external object is in our minds; this is intuitive knowledge (4.2.14)." The above is as much of the quote that Loeb provides, but Locke goes on in that same passage and talks about sensitive knowledge of particulars. Again, this seems to be a case where the similarities between Locke and Descartes that Loeb finds are not as significant as the dissimilarities Loeb does not mention. The quote in its entirety, cited earlier, is used primarily to support the notion of sensitive knowledge-c, something Descartes would not allow since sensitive knowledge-c is knowledge-c that is not from intuition or deduction, at least as Locke sets it up.

For the final comparison Loeb examines similarities between Locke's and Descartes' views on the extent of knowledge concerning general statements. It is based on the work that Loeb does with this final area of comparison that he hopes to have the support for point 7, that Locke's intent in the Essay was much the same as Descartes' in his own work, namely, to
provide for the theoretical possibility of demonstrative knowledge of natural
science. Descartes wanted to be able to have certain knowledge for all areas
of philosophical inquiry, including natural science, and to have that certain
knowledge obtained through the rationalistic means of intuition and
demonstration alone.

For Descartes' views on how to obtain such certain knowledge Loeb
turns to Descartes' discussion on simple and complex natures in the Rules.
Descartes begins with the claim that there are certain simple natures or
essences.23 "Some truths about these simple natures are known by intuition.
In other cases, simple natures are united with each other necessarily, for
example, figure is conjoined with extension. In such cases we can know by
deduction that the necessary union obtains."24

There are several problems with getting Descartes' theory on simple
and complex natures to work, but Loeb claims it is very similar to Locke's
more fully developed account of when demonstrative knowledge is possible.
Loeb says this more developed account occurs with Locke's theory of the
nominal and real essences.25 On page 43, Loeb summarizes Locke's position
on the relationship between demonstrative knowledge and the real essence:

1) all the properties of a kind of thing are deducible from
   statements about the real essence of that kind,
2) the nominal essence and the real essence coincide for all
   modes and relations,
3) mathematical and moral concepts are modes or relations,
4) the nominal essence and the real essence need not coincide and
   we do not (yet) know the real essence of substances.

These four claims suggest Locke allowed for demonstrative knowledge
whenever the real essence was known while admitting that knowledge of the
real essence for substances was not yet known. Loeb, through the use of his
parenthetical 'yet', implies that knowledge of the real essence of substances can be known. Once knowledge of the real essence is known, according to Loeb, we would have scientific knowledge of substances. The rest of this chapter is devoted to showing that the situation for scientific knowledge of substances is much more complicated that Loeb suggests and that, in fact, Locke did not believe that such a deduction was, even in theory, possible for natural kinds.

Loeb provides a full explanation of Locke's account of how demonstrative knowledge would proceed once the real essence were known. Loeb begins his discussion of Locke's theory by briefly defining the nominal and the real essence. "Nominal essences are identified with the abstract ideas for which general terms stand (Essay III.iii.16-17)."26 The real essence is "the very being of any thing, whereby it is, what it is (Essay III.iii.15)," and "that foundation from which all its properties flow (Essay III.iii.18)."27

Loeb provides a quote from 2.31.6 of the Essay to show that the complex ideas of a substance cannot be the real essence or else the properties of that body would depend on the complex idea and be deducible from it, and "their necessary connexion with it be known." That we can deduce all the properties of a thing from its real essence is evidenced by Locke's account of a triangle, "... all properties of a triangle depend on, and as far as they are discoverable, are deducible from the complex idea of three lines, including a space."28 This does not work for substances however, since with substances all we know is the nominal essence, not the real essence.

But it is plain, that in our complex ideas of substances, are not contained such ideas, on which all the other qualities, that are to be found in them, do depend. The common idea men have of iron, is a body of a certain colour, weight, and hardness; and a
property that they look on as belonging to it, is malleableness. But yet this property has no necessary connexion with that complex idea, or any part of it.\textsuperscript{29}

Loeb reads Locke as saying that properties of a natural kind are not deducible from the abstract idea, the nominal essence, but they are from the real essence, since it is from the real essence that all the properties flow; the real essence is the foundation for the properties and because of this, once the real essence is known, the properties may be deduced from it.

Loeb goes on at this point to explain why it is that we have knowledge at present of the real essence of ideas of modes and relations but not of ideas of substances. The reason, he says, is because of Locke's theory of archetypes. I have already presented work on Locke's theory of archetypes in chapter one and what Loeb says about archetypes is not relevant to the issues of his that I wish to discuss in what follows.

Since Loeb started out by showing how Descartes tried to account for all knowledge using just intuition and demonstration, and given that Loeb's professed project in chapter one of his book is to draw forth the similarity of Locke to Descartes, the natural expectation is that Loeb would proceed to show that Locke also held the view that certain knowledge of all general statements, even of natural science, was obtainable through intuition and demonstration alone. What Loeb actually proceeds to show though is that Locke believed that knowledge of general statements of natural science was obtainable by a priori demonstrative means, but only if the necessary precondition of the theoretical possibility of knowledge of the real essence was established.

The requirement of knowledge of the real essence immediately poses a prima facie obstacle for Loeb in drawing a similarity between Descartes and
Locke on the possibility of a natural science obtained through intuition and demonstration alone, since, given Locke's epistemology, he can only have knowledge of the real essence if he relies on sensitive knowledge. Loeb himself admits that knowledge of the real essence requires sensitive knowledge when he stresses that the real essence can be known "in principle, in the sense that it requires more acute senses and/or more powerful microscopes than are available to us."\(^{30}\) This is a straight-forward appeal to knowledge gained through the senses, namely, the sense of sight. So knowledge of the real essence itself, for natural kinds, is obtained through the sense of sight and, as such, is knowledge gained from external experience. Sensitive knowledge of the real essence would be neither intuitive nor a priori.\(^{31}\)

There is the related objection that since Descartes held the view that "the science of metaphysics, natural philosophy, and morals are in principle susceptible to the same degree of certainty as arithmetic and geometry"\(^{32}\) and since sensitive knowledge introduces a lesser degree of certainty, then if sensitive knowledge were used in establishing a demonstrative science of natural philosophy, that science would not be of the same degree of certainty as mathematics and geometry, which rely solely on intuition and demonstration. Locke would not have considered his work as "establishing the theoretical possibility that the laws of nature can be known in a way to satisfy Descartes' standards of knowledge"\(^{33}\) since Descartes' standards of knowledge require a degree of certainty only found with intuition and demonstration.

These objections are too obvious for Loeb to have missed, especially in light of his own admission that sensitive knowledge plays a crucial role in
obtaining knowledge of the real essence. But perhaps Loeb was making a more subtle point, one that would avoid the above criticisms. To see if this is the case a richer understanding of Loeb is required. Accordingly, I want to look more closely at the central issues he discusses in relation to point 7. The issues include the four summary claims mentioned at the beginning of this chapter, the meaning of demonstration, and the function of intuition and the a priori in a demonstration. Once these key concepts are laid out and new interpretations of Loeb are offered I will again evaluate his position to see if it avoids the above criticisms and any relevant new ones.

To begin this richer understanding of Loeb, I refer the reader back to the four claims that Loeb used to summarize Locke's theory of the real essence and demonstrative knowledge. Only claims 1) and 4) are relevant for my discussion.

Claim 1) is that all the properties of a kind of thing are deducible from statements about the real essence of that kind. There are two sub-claims made in claim 1). The first sub-claim is that kinds have a real essence. If a kind does not have a real essence, then there is no reason to look closely at the claim that all the properties of that kind will be deducible from its real essence, since it will not have one from which to do the deducing. The second sub-claim is that if kinds do have a real essence, then all the properties of the kind are deducible from statements about the real essence.

Claim 4), while admitting that the real essences of substances are not known at this time, implies that they can be known, at least in theory.

These two sub-claims and claim 4) are important for Loeb since he wants to explain, for Locke, the conditions under which demonstrative knowledge of general statements is possible, for any subject matter. Loeb is
trying to show that if only the real essence of natural kinds were known, we
could have demonstrative knowledge of natural kinds. Claim 1) above states
that all the properties of a kind of thing are deducible from statements about
the real essence of that kind. Claim 4) states that the real essence of
substances is in principle knowable. Taken together the claims form the
antecedent of Loeb's conditional statement of Locke's position on knowledge
of natural science. If natural kinds have a real essence, and if all the
properties of a natural kind are deducible from statements about the real
essence, and if the real essence of a natural kind can be known, then a
demonstration of the properties can be done. So in order to make the claim
that a demonstration of all the properties of a natural kind can be done, Loeb
must be able to support all three conjuncts of the antecedent. And in order to
maintain the similarity of Locke's views with Descartes', Loeb must also
show that all certain knowledge of general truths is obtainable through
intuition and demonstration alone, which forces Loeb to be able to show that
all three conjuncts are doable using only intuition and demonstration.

Notice that what I have said so far about the requirements facing Loeb
leaves untouched the role of a priori knowledge. As I will show later, the
presence of the a priori in a demonstration for kinds seems to require a
condition in addition to knowledge of the real essence, viz., that knowledge of
the statements about the real essence be a priori as well as intuitive.

Loeb's assessment of Locke's account of demonstration, which I
accept, says that a demonstration occurs with a series of intuitively grasped
steps, even if the link between the starting point and the ending point is not
itself intuitively grasped. For this reason a demonstration, while certain, is
not self-evident, and as such, is distinguished from intuitive knowledge. In a
demonstration, the first premise(s) must be known intuitively, and the link for each step along the way must also be known intuitively.

It is possible, however, for a demonstration, just as a logical structure, not to start with intuitively grasped premises, as evidenced by any of a number of simple hypothetical syllogisms used to teach introductory logic. This point highlights a distinction between the contemporary use of demonstration and what seems to have been Locke's intended use of it. For Locke what was important was the certainty of the conclusion, which could only be guaranteed if the starting premises were guaranteed true. This emphasis on the guaranteed truth of the premises echoes Descartes' claim that the premises of a true deduction must be intuitively known. There is strong textual evidence, as given by Loeb, that Locke also accepted this view.\textsuperscript{34}

There is, however, a problem with this interpretation, given the earlier work that showed that Locke could not have had intuitively pure first principles. Perhaps though when Loeb claims that Locke supported an a priori demonstrative science what Loeb means by "demonstrative" is something more like the present-day understanding of the term, wherein what is important is the logical linking of the premises to each other to force a particular conclusion, leaving the truth status of the premises as a separate concern.\textsuperscript{35}

This alternative reading of a demonstration is highly unlikely though because of the historical background of Loeb's overall project. Loeb makes much of the similarity between Locke and Descartes on their stand on demonstrative knowledge, and it is the intuitively-based-first-premises type of demonstration that Loeb shows to be in common between them. If Loeb did not intend the reader to assume that it was this type of demonstration that Loeb
meant in claiming that Locke supported a demonstrative science then Loeb has been seriously misleading.

Also, Loeb does not just say that Locke held a demonstrative view of science, but an a priori demonstrative view. An a priori deductive science is a science where all the true propositions of that science are deduced from first principles and the first principles are not obtained from experience, and so are a priori. The a priori aspect of the first principles puts the first principles into the realm of necessary truths since all truths known a priori must be necessary truths. A contemporary demonstration does not have this essential link to necessarily true first principles.

Since in any demonstration, modern or contemporary, the connections between the premises to each other and to the conclusion must hold according to the laws of logic, which are themselves a priori, a priori knowledge has an essential role. But I do not think that it was this role for the a priori that Loeb means when he uses the phrase "an a priori demonstrative science" since if it were he would simply be redundant in using the phrase "a priori demonstrative." It is more plausible that what Loeb means by using the term 'a priori' is that the first principles are known to be true without the need for experimentation to prove them true. It is not sufficient for an a priori demonstrative science that the first principles be known to be true intuitively, they must also be known a priori.

Each objection, by itself, will not establish that by a demonstrative science Loeb meant a demonstration in Descartes' and Locke's sense of the word. Even together the two claims do not establish without question that this is what Loeb meant. And, in fact, the question of exactly what Loeb did mean in using the phrase "a priori demonstrative science" will play a prominent role
later in the chapter. But together the two claims do indicate the most consistent natural reading of Loeb.

Given the more consistent natural reading then, what Loeb would be claiming is that Locke held the view that an a priori demonstrative science, understood as having intuitively known first principles which did not have experience as their source, was a theoretical possibility.

At this point there is an overlap of a priori knowledge and intuitive knowledge. The two knowledge terms are not equivalent, and yet they seem to be serving a similar function in the demonstration. In fact, what is going on is that each term is placing its own conditions on the demonstration.

Not all intuitive knowledge is a priori. We have intuitive knowledge of self-existence and yet we must first experience the self to have this knowledge. This situation applies to both Descartes and Locke. Descartes only requires that all knowledge come from intuition and demonstration, he does not require that all knowledge be a priori. There is of course the historical problem with using 'a priori' in talking about either Locke or Descartes, since the term did not come into prominence in its modern sense until Kant, but I think in this case the application is relatively unproblematic. In the cogito Descartes has intuitive knowledge that he exists, but only after he experiences that he is doubting. For Locke, the situation is even clearer. He has knowledge of the self through, in his own terms, internal experience, or reflection. In both cases then there is intuitive knowledge that is not a priori.

Knowledge that is a priori but not intuitive would be the knowledge of a conclusion that was not intuitively known, but gained only after doing a demonstration. This knowledge of the conclusion is not gained through experience and so it counts as a priori knowledge.
Demonstrative knowledge is not self-evident. Intuitive knowledge must be self-evident. Both Locke and Descartes agree on these points. A priori knowledge does not have to be self-evident. Since there is a priori knowledge of demonstrations, and demonstrations are not self-evident, then there is a clear case of a priori knowledge that is not self-evident.

A priori knowledge can only be of necessary truths. Intuitive knowledge does not have this requirement. We have intuitive knowledge of the existence of ourselves and that existence is not a necessary truth. If the first principles are obtained a priori they would have to be necessarily true.

Knowledge gained from intuition is certain simply by the definition of intuitive knowledge.

An a priori demonstrative science of natural kinds then is a science composed of general propositions about external physical substances where the propositions can be determined by an a priori demonstration. Such a demonstration would have intuitively known first principles that were not gained through experience. The first principles would therefore be certain and self-evident (as required by intuition) and necessary (as required by the a priori).

The above description of an a priori demonstrative science is a general one, a simple unpacking of the requirements such a science, typically understood, would have. With this description I conclude my examination of the key concepts Loeb uses in his discussion of point 7.

The question to be asked now is whether it is possible for Locke to have first principles established through intuition and the a priori, i.e., first principles that do not rely on sensitive knowledge. Answering that question depends on what is meant by the first principles. Since first principles serve
as the foundation from which all the other truths are deduced and since Loeb claims that all the properties of a kind of thing are deducible from statements about the real essence of that kind, the statements about the real essence of a kind may be presumed to be the first principles of an a priori deductive science. What is the content of those statements (what knowledge do we have when we know them) and how did we obtain that knowledge of the statements about the real essence?

The most natural assumption is that the knowledge one has from knowing the real essence is the knowledge that serves as the first principles and therefore forms the content of the statements about the real essence of a natural kind. Loeb claims that Locke believed that the real essence was knowable in principle, if only we had more acute senses or more powerful microscopes, so presumably what one would know if one could know the real essence would be knowledge of what the real essence looks like. If this were the case then statements about the real essence would be descriptive statements about the physical structure of the configuration of the primary qualities of the corpuscles. Examples of those types of statements were provided in chapter two where I discussed the red leather wing-backed chair in the chairman's office.

A problem arises though with this explanation. Since the first principles must be intuitive and a priori, it would follow that the descriptive statements about the real essence of natural kinds, if functioning as first principles, would have to be known intuitively and a priori. But the descriptive statements about the physical structure of the real essence are known only if we are able to see the real essence, either through stronger microscopes or more acute senses. Such knowledge is obviously gained through the sense of
sight and as such is sensitive knowledge rather than intuitive knowledge and a posteriori rather than a priori.

The possibility of Locke holding an a priori demonstrative science, as typically understood with intuitively known first principles, where the first principles are the descriptive statements about the real essence is blocked by the crucial role sensitive knowledge plays in Locke's epistemology.

A possible way to remove this difficulty is to see if there can be first principles that not dependent upon sensitive knowledge. First principles that are not dependent on sensitive knowledge might be obtained by having the statements about the real essence from which we deduce all the properties of a kind be something other than the descriptive statements about the physical structure of the real essence, and instead be statements about the connection between the physical structure of the real essence and all the properties that flow from it. It would not just be knowledge of the real essence itself, knowledge of what the real essence looks like, but knowledge of the connection between the real essence and the properties that flow from it which would function as the first principles from which we could deduce all the properties.

This connection might be seen immediately, and, if so, would be intuitive. What then are the statements about the real essence that serve as first principles? In order to be considered as intuitive, the statements about the real essence would have to be statements about the clearly and immediately perceived connection between the complex idea of the real essence and all the ideas of its properties. So it is not knowledge of the real essence itself that would serve as the content of the first principles but knowledge of the connection between the real essence and all its properties.
To know the physical structure of the real essence requires sensitive knowledge; one has to actually see the real essence. But once the real essence is seen, the Loeb interpretation might go on to say, we know intuitively, perceive immediately, the connection between the configuration of the corpuscles (the real essence) and all the properties that flow from it. Having ideas that are obtained from sensation does not preclude intuitive knowledge about the agreement between those ideas. This would mean that what we would know intuitively, perceive immediately, is the agreement between the idea of the configuration of particles of matter and the ideas of the sensations the configuration produces in the mind. The major objection to all this is, of course, the mind-body problem.

What this suggests is that there is no way for the first principles to be intuitively known. If the first principles are taken to be nothing more than descriptive statements about the physical structure of the real essence, then the knowledge of them is sensitive, not intuitive. If the first principles are taken to be the intuitive knowledge claims of the connections between the real essence and the properties that flow from it, then the mind-body problem blocks the possibility of such knowledge.

That the first principles cannot be a priori is established by a line of argument similar to the one showing they could not be intuitive. Again, if the first principles are taken to be descriptive statements about the real essence itself, then knowledge of them is a posteriori, not a priori. The only way to know what the real essence of a natural kind looks like is to visually experience it, to look at it. And if the first principles are taken to be knowledge claims of the connections between the real essence and all the properties that flow from it, then if known a priori, the connections between
the real essence and the properties would have to be known as necessary connections. But as work done by Alexander and myself on the mind-body problem shows, all that one would be able to know is a correlation between a configuration of corpuscles and the idea that results from it. You would never be able to know that the correlation was the result of a necessary connection. Since the mind-body problem prohibits knowledge of the mechanics by which the physical real essence produces the mental ideas of the qualities any claim to knowledge of the connection as a necessary one is denied. And knowledge of a constant correlation would be a posteriori knowledge not a priori knowledge.

Loeb does acknowledge that the mind-body problem prevents a priori knowledge of the connection between the real essence and the secondary qualities that flow from it.

I hasten to add that it is not Locke's position that any law can be known a priori. We cannot even in principle have a priori knowledge of laws which formulate regularities involving secondary qualities. This is because the secondary qualities are nothing but the powers of material substances, by virtue of the primary qualities of their insensible corpuscles, to produce ideas or sensations in persons (Essay II.viii.10, 22-23), and it is inconceivable how corpuscles in motion produce any idea or sensation in particular (Essay IV.iii.6, 13, 28). Laws involving secondary qualities are therefore not grounded in necessary connections, but rather depend upon "the arbitrary determination" of God, and are not susceptible to demonstration.36

His admission about secondary qualities causes Loeb to be inconsistent in part of what he says, although it is a minor inconsistency. In claim 1) Loeb explicitly said "all the properties of a kind of thing are deducible from statements about the real essence of that kind."37 In the above quote Loeb has ruled out the possibility of deducing secondary qualities from knowledge of
statements about the real essence, "secondary qualities . . . are not susceptible to demonstration." At the very least, Loeb needs to qualify claim 1) so that he is not claiming that all properties of a natural kind are deducible from the real essence of that kind.

Loeb assumes that only the secondary qualities are susceptible to the mind-body problem. But work I have done in chapter two suggests that all properties, especially the secondary and tertiary, are susceptible to the mind-body problem. If the first principles are knowledge claims about the connections between the real essence and the properties that flow from it, then knowledge of the first principles is blocked because the mind-body problem prohibits knowledge of the mechanics of how a physical state produces a mental state, and without knowledge of the mechanics we can never know that any connection between a mental state and a physical state is a necessary connection. If my work on this point is correct, properties of secondary and tertiary qualities would not be susceptible to a demonstration, since none the properties have a knowable necessary connection.

Given the problems sensitive knowledge and the mind-body problem pose for Loeb's interpretation he cannot successfully claim that Locke supported an a priori demonstrative science where what is meant by an a priori demonstrative science is a science of natural kinds where the first principles are either intuitive or a priori.

There is still a way to interpret Loeb's claim that Locke believed in the theoretical possibility of an a priori demonstrative science for natural kinds, and this way does not run afoul of first principles because under this second possible interpretation what Loeb means by "a priori demonstrative" is something other than a demonstration where the first principles are a priori. I
have already discussed problems with removing the a priori from the first principles, namely, that Loeb would then be misleading and redundant. However, these objections are not strong enough to rule out the possibility that Loeb does mean for the a priori to function in this different role. If Loeb does not mean for the first principles to be a priori then by "a priori demonstration" Loeb must mean that the connection between the real essence and the properties that flow from it involves a type of necessity that can be known a priori. This knowledge would not function as the first principles which means that Loeb would still have to provide an explanation of what would serve as the first principles in the deduction, but that is a separate issue.

Evidence that Loeb is using 'a priori' to refer to the connection between the real essence and the properties of a species comes from the two types of cases he discusses where, if we knew the real essence, we could derive, a priori, the properties of the species.

There are two sorts of cases. First, if we knew the real essence of gold, we could deduce that gold is malleable. In other words, we could have demonstrative knowledge of "laws of natural kinds," laws of the form: whatever has characteristics c1, . . . , ci at time t also has cj at time t. Locke calls knowledge of such laws knowledge of 'co-existence" (Essay IV.iii.12) and knowledge of "necessary co-existence" (Essay IV.iii.14). Second, if we knew the real essences of two material substances, such as hemlock and human being, we could deduce that hemlock causes persons to die. In other words, we could have demonstrative knowledge of causal laws. . . . Let Ø stand for the complex description of the determinate internal microstructure that hemlock in fact has; and let β stand for the complex description of the determinate internal microstructure that human beings in fact have. In these terms, Locke's claim is that we could know without observation or experimentation that if anything has microstructure Ø, it would cause anything which has microstructure β to die.38
Loeb agrees that requiring the connections to be necessary causes a problem but he limits the difficulty to secondary qualities. If secondary qualities are ruled out then Loeb must be discussing only primary and tertiary qualities in his two cases, and, in fact, the second case clearly seems to be referring to tertiary qualities. Although my work on the mind-body problem will prevent the type of move that Loeb is making here, there is more going on with case 1 and 2 than a simple application of the mind-body problem will resolve. Since case 1 and 2 are exactly the type of cases where I think Locke wants to claim it is not possible to have scientific knowledge of, and because they are what Loeb puts forward as examples where scientific knowledge is possible, I want to look very carefully at the type of necessity involved in the two cases.

To fully understand the necessity involved in the two cases Loeb discusses requires work done in connection with the three conjuncts of the antecedent of Loeb's argument that Locke believed in the theoretical possibility of an a priori demonstrative science. In order to evaluate those conjuncts work needs to be presented on real essences, nominal essences, and kinds. Once these conjuncts are evaluated I can explain that the connections expressed in cases 1 and 2 above involve a different type of necessity for each case and that neither type of necessity is sufficient for an a priori demonstrative science that can meet Locke's requirements for scientific knowledge.

The first step toward evaluating those conjuncts, and hence Loeb's view on the necessity of the connection between the real essence and the properties that flow from it, involves a closer look at Locke's work on the nominal and real essences.
The nominal essence for substances is the abstract idea that stands for a natural kind or species.

That then which general Words signify is a sort of Things; and each of them does that, by being a sign of an abstract Idea in the mind, to which Ideas, as Things existing are found to agree, so they come to be ranked under that name; or, which is all one, be of that sort. Whereby it is evident, that the Essences of the sorts, or (if the Latin word pleases better) Species of Things, are nothing else but these abstract Ideas. For the having the Essence of any Species, being that which makes any thing to be of that Species, and the conformity to the Idea, to which the name is annexed, being that which gives right to that name, the having the Essence, and the having that Conformity, must needs be the same thing: Since to be of any Species, and to have a right to the name of that Species, is all one... it follows, that the abstract Idea, for which the name stands, and the Essence of the Species, is one and the same. From whence it is easy to observe, that the essences of the sorts of things, and consequently the sorting of Things, is the Workmanship of the Understanding, since it is the Understanding that abstracts and makes those general Ideas. (3.3.12; underlining mine)

It is clear that Locke equates abstract ideas, which are nominal essences, with species and that the abstract idea is a construct of the mind.

Locke draws the following distinction between the nominal essence and the real essence,

'Tis true, there is ordinarily supposed a real Constitution of the sort of Things; and 'tis past doubt, there must be some real Constitution, on which any Collection of simple Ideas co-existing, must depend. But it being evident, that Things are ranked under Names into sorts or Species, only as they agree to certain abstract Ideas, to which we have annexed those Names. . . . These two sort of Essences, I suppose, may not unfitly be termed, the one the Real, the other the Nominal Essence. (3.3.15; underlining mine)
A species is determined by the "workmanship of the understanding" meaning that it is the abstract idea or nominal essence which determines the species. There are individual substances which have any number of certain features in common. Depending on what grouping of common traits best serves our needs we distinguish objects as belonging to one sort or another. As needs vary between times and groups so too the traits selected as the basis for the grouping may vary, resulting in certain objects being classified as the same species at one time or for one group, and not being classified as members of the same species at other times or for other groups. While certain objects have enough traits in common to lend themselves to a relatively natural grouping, that we call such a grouping a species is solely an option of the mind.

This then, in short, is the case: Nature makes may particular Things, which do agree one with another, in many sensible Qualities, and probably too, in their internal frame and Constitution; but 'tis not this real Essence that distinguishes them into Species; 'tis Men, who, taking occasion from the Qualities they find united in them, and wherein, they observe often several individuals to agree, range them into Sorts, in order to their naming, for the convenience of comprehensive signs; ... (3.6.36)

I do not deny, but Nature, in the constant production of particular Beings, makes them not always new and various, but very much alike and of kin one to another: But I think it nevertheless true, that the boundaries of the Species, whereby Men sort them, are made by Men; ... (3.6.37)

If it is the nominal essence which determines a species what then does the real essence do? The real essence does not itself determine a species, but is instead only the foundation for the properties that are selected on the basis of their commonality to each other to designate a sort according to the use man
had at the time of the sorting. The nominal essence of a kind, the collection of arbitrarily selected common properties, is dependent upon the real essence as the foundation from which its properties come.

By this real Essence, I mean, that real constitution of any Thing, which is the foundation of all those Properties, that are combined in, and are constantly found to co-exist with the nominal Essence; that particular constitution, which every Thing has within it self, without any relation to any thing without it. But Essence, even in this sense, [the real essence] relates to a Sort, and supposes a Species; For being that real Constitution, on which the Properties depend, it necessarily supposes a sort of Things, Properties belonging only to Species, and not to Individuals; (3.6.6; underlining mine)

There is a connection between the real essence and species in that the real essence presupposes a species since the real essence is the foundation of all the properties and properties exist only in relation to a species.

There are two reasons why the real essence does not determine a species. The first is that we do not know the real essence and yet we do have species. If knowledge of the real essence were required to know how to sort things there would be no sorting of natural kinds.

The second reason is that if individuals were sorted on the basis of their real essences there would not be different properties had by members of a sort.

. . . it is impossible, that two Things, partaking exactly of the same real Essence, should have different Properties, as that two Figures partaking in the same real Essence of a Circle, should have different Properties. (3.3.17)

That we find many of the Individuals that are ranked into one Sort, called by one common Name, and so received as being of one Species, have yet Qualities depending on their real
Constitutions, as far different one from another, as from others, from which they are accounted to differ specifically. 

. . . But if Things were distinguished into Species, according to their real Essences, it would be as impossible to find different Properties in any two individual Substances of the same Species, as it is to find different Properties in two Circles, or two equilateral Triangles. (3.6.8)

In order to make sense of these quotes two areas of distinctions need to be drawn. The first distinction is between properties and non-properties; the second is between a real essence and an inner constitution.

Locke appears to be using the term 'property' in a technical sense. A property is not simply a feature that an individual has, but a feature that an individual has in relation to a species. In the quote from 3.3.17 where Locke talks about the properties that a circle has, he claims that it is impossible for "two figures partaking in the same real Essence of a Circle" to have different properties. Immediately certain counter-examples come to mind illustrating features that two or more circles may have that are truly different for each circle, for example, their size, the radius, circumference, etc., or their locations in space, if they are drawn circles. Based on his words, in both 3.3.17 and in 3.6.6., what Locke must have in mind is that features such as the size of a circle or location are not properties because those features are not part of the nominal essence of the kind, meaning that those features of the object are not used to group it into a species, are not essential to the figure being classified as a circle. That properties, technically, refer only to the features found in the nominal essence, and hence are the features used for sorting, must be what Locke meant in 3.6.6 with the phrase "properties belong only to species and not to individuals."
An object then has both properties and non-properties. The properties are the features in common that are part of the nominal essence, the features by virtue of which the individual is classified as a sort of thing. The non-properties are features which are not part of the nominal essence, not essential to it as a member of a kind, not used for sorting. These non-properties may or may not be in common, since circles may or may not have the same radius, but the non-properties, even if in common, are not the common features that are the basis for the classification. To avoid the oddness of the phrase 'non-property' I will designate the term 'characteristic' to refer to a non-property. An object then has features, some in common, some not, and those features which are in common and are used as the basis of sorting into kinds are the object's properties. All other features, whether common or not, are its characteristics. Characteristics are not essential to the individual being classified as a type of species. At no point in the Essay that I know of does Locke make explicit such a distinction but it is implied when he claims that properties belong only to sorts or species.

Under this distinction, it seems that in the quote from 3.6.8 Locke is drawing a distinction between properties and qualities, where the term 'qualities' denotes the same features as the term 'characteristics' does, but since throughout most of the Essay Locke uses properties and qualities interchangably I want to set up a unique term, such as 'characteristic', to refer to the features of an object that are not in the nominal essence, not essential to the individual being the sort of thing it is classified as.

The second distinction I need to draw is between the real essence and the inner constitution. This distinction is taken from work done by Ruth Mattern. The inner constitution is the entire configuration of the primary
qualities of corpuscles while the real essence is only that aspect of the inner constitution responsible for the properties. Mattern claims that the real essence is not identical with the inner constitution but is only an aspect of it, the aspect of the inner constitution which is responsible for the properties of a natural kind. The inner constitution is the entire physical structure of the object and as such is responsible for all the features of the object. The real essence is that aspect of the entire physical structure, the inner constitution, which is responsible for those features used for sorting into kinds, the features which function as properties.

By this real Essence, I mean, that real constitution of any Thing, which is the foundation of all those Properties, that are combined in, and are constantly found to co-exist with the nominal Essence. (3.6.6)

With the distinctions drawn I can now examine the quote from 3.6.8. Locke claims that members of the same sort can differ from each other as drastically as they differ from members of a different sort, "Individuals ranked into one sort . . . yet have Qualities depending on their real Constitutions, as far different one from another, as from others [of a different species] . . . ". Then Locke goes on to say "But if Things were distinguished into Species, according to their real Essences, it would be as impossible to find different Properties in any two individual Substances of the same Species, as it is to find different Properties in two Circles." Locke is putting this situation forward as a counter-example to show that substances are not distinguished into species according to their real essence, because if they were distinguished by their real essence they would have all the same properties, but since they do in fact have "Qualities depending on their real Constitution, as far different
one from another" substances must not be distinguished into species by their real essence.

The immediate claim to draw from all this is that there is no difference in the properties that come from the same real essence. If things were grouped by their real essence they would be identical, implying that the real essence produces exactly the same properties for every object which has that real essence.

And yet the counter-example will not work as Locke has stated it, given the distinction I have drawn between a property and a characteristic. In my terminology, the underlined phrase in "Qualities depending on their real Constitution, as far different one from another" would be "characteristics depending on their inner constitutions" since I do not want to have a distinction between properties and qualities and since I am taking Locke to mean the same with "real Constitution" as I do with "inner constitution." When Locke goes on to claim that substances are not distinguished into species according to their real essence because otherwise "it would be impossible to find different Properties in any two individual Substances of the same Species" he cannot be meaning 'properties' in the technical meaning I have given it, because in the technical sense 'properties' just are those features, used for sorting, which are common, which are not different. What Locke seems to want to claim with his counter-example is that since the members of a natural kind can have different properties the natural kinds are not distinguished by their real essence. But this is problematic because it seems to imply that individual substances that are members of the same natural kind could have different properties just so long as the individual substances were not classified as being of the same kind on the basis of their real essence.
But my interpretation of 'property' in 3.3.17 had Locke claiming that properties are the features which are common to all members of a kind and are essential to any individual substance being a member of a particular natural kind. The notion of an essence is violated by allowing the possibility that what is essential for membership in the same kind can differ from one individual of the kind to another.

There are two ways to resolve this difficulty. The first is to deny that what is essential for membership in a kind must be the same for all members of the kind. The second way is just to say that Locke was imprecise in his usage of 'property' in 3.6.8. and that where he used 'properties' the first time in the passage "But if Things were distinguished into Species, according to their real Essences, it would be as impossible to find different Properties in any two individual Substances of the same Species, as it is to find different Properties in two Circles" what he meant was 'characteristics' in my usage, because of course we do find different characteristics in any two substances of the same species and what he meant by 'properties' the second time, in connection with the circles, he meant in the technical sense, so as to conform to what he said about circles in 3.3.17. Given that Locke is often imprecise and that the first way of resolving the problem entails denying what we mean by an essence, the second way seems clearly the solution to accept.

Reconstructing the quote then what Locke appears to be wanting is the following: That we find many of the individuals that are ranked into one sort, called by one common name, and so received as being of one species, have yet characteristics depending on their inner constitution, as far different one from another, as from other, from which they are accounted to differ specifically. . . . But if things were distinguished into species, according to
their real essences, it would be as impossible to find different characteristics in any two individual substances of the same species, as it is to find different properties in two circles or two equilateral triangles.

This interpretation only works if one accepts the idea that all the features that come from the real essence will be identical and that the identical features which come from the real essence are the properties which serve as the distinguishing marks of a species.

The term 'property' then applies only to those features which are in common, are the basis for classification into a kind, and are the result of the real essence. The real essence would not be the cause of every feature that an individual member of a species has but only the cause of all its properties and all those properties would be in common. Those features which come from the real essence, the properties, will be the same for all members of a kind. Having a real essence as the foundation of all the properties the members of a kind have does not exclude the possibility of the different members of the kind having certain other dissimilar features, its characteristics, because those characteristics would be determined by the inner constitution, not the real essence. The real essence is that which is responsible for the properties in common used for sorting and yet the members of a species must have features which are not in common, its characteristics, because otherwise the members would be wholly identical and indistinguishable, which is not the case for members of natural kinds, as pointed out in 3.6.8. So the real essence is not the cause of the characteristics. If the real essence is reserved as the source of all the properties in the nominal essence then there must be something other than the real essence which is responsible for all the dissimilar characteristics an object has. Let that which is the source of the characteristics be called the
inner constitution. Technically, the inner constitution is responsible for all the features an object has, but just as part of those features are called properties, part of the inner constitution is called the real essence. It may be that a third term is needed in connection with the inner constitution and the real essence. Just as features were divided into properties and characteristics, perhaps there needs to be a unique term to refer to that part of the inner constitution responsible for the characteristics, the part of the inner constitution left over once the real essence has been set apart. Let the inner constitution be responsible for all the features, both properties and characteristics. The real essence is responsible for the properties, and the "leftover" constitution is responsible for the characteristics. As should be obvious I do not have an appropriate term for that part of the inner constitution which is not the real essence but I do not think that it matters much. The distinction I want between the inner constitution and the real essence and between properties and characteristics should be sufficiently clear without a unique term for that part of the inner constitution which is not the real essence.

This separation of a source for all properties and a source for all characteristics is necessary in order to account for the differences between members of a kind who are similar enough to be grouped together.

Implied in this interpretation is the idea that every single feature that a body has must have a physical explanation. Under the corpuscluarian hypothesis every feature of a body is physically determined by the number, motion, and arrangement et al. of its corpuscles, i.e., its inner constitution. The primary qualities of a substance, its size and shape for example, are the result of the corpuscles being a specific amount in number forming a specific sized and shaped configuration. The secondary qualities of a substance, its
smell, color, and taste, for example, are the result of specific primary qualities of the corpuscles creating a specific configuration which is capable of interacting with the mind in some inexplicable fashion to cause in us the ideas of those specific sensations. The tertiary qualities of a substance, its solubility in certain other substances or is its power to be melted in fire, for example, are the result of specific primary qualities of the corpuscles creating a specific configuration which is capable of interacting in a specific way with the the specific configuration of the primary qualities of corpuscles of another substance.

Occasionally the different inner constitutions of the individual objects have in common aspects of their overall configurations which result in the production of similar features. Since specific aspects of the overall arrangement of corpuscles can be in common even though the different inner constitutions are unique, that aspect of the inner constitution which produces the idea of, for example, yellow can be shared commonly with several different inner constitutions of individuals. The yellow objects would still maintain differences from each other based on the aspects of their different inner constitutions that are not in common.

When this overlap of aspects of the different inner constitutions occurs we perceive similar features in different objects, such as the yellowness of an egg yolk, a canary, a rain slicker, and the ubiquitous gold. We can recognize the similarities between these objects while easily acknowledging the dissimilarities. The same thing can occur with members of the same species, as happens with a pile of gold nuggets. What the pieces have in common is, among other things, the quality of yellowness. But there are still differences between any two nuggets of gold. And these differences can only be
explained, for Locke, in terms of their inner constitution. Each object in the
world which has any quality difference from another object must have its own
unique inner constitution as a physical explanation for the features it has.\textsuperscript{40}

We rely on the overlaps to group the different objects into species or
natural kinds.

I would not here be thought to forget, much less to deny, that
Nature in the Production of Things, makes several of them alike; there is nothing more obvious, especially in the Races of
Animals, and all Things propagated by Seed. But yet, I think,
we may say, the sorting of them under Names, is the
Workmanship of the Understanding, taking occasion from the
similitude it observes amongst them, to make abstract general
Ideas. . . (3.3.13; underlining mine)

Things are naturally similar, but in any number of different ways, so
that which similarities are used to determine a sort is arbitrary and is
determined by the need, convenience, and convention of man. Once we
determine which similarities we wish to select for the determination of a sort
(a natural kind) we then have a species where before none existed naturally.

The real essence is that aspect of the inner constitution responsible for
the overlap. There are of course numerous overlaps, all of which are the
result of the inner constitutions of each object. The real essence is correctly
referred to only as that aspect of the inner constitution which is responsible for
the features which overlap and are used for sorting. There may be overlaps
where there are not species based on that overlap and for those overlaps the
real essence is not the aspect of the inner constitution responsible, as
evidenced by 3.6.6. What this implies is that there is no real essence unless
there is a species and since properties belong only to species, it also means
that a real essence is the foundation of the properties, and not of the
characteristics. The real essence is of course still a physical reality, a true part of the inner constitution, but what part of the inner constitution we call the real essence can change as we change our determinations of species. When the nominal essence changes, as it will in accordance to the use man has of any grouping, which part of the inner constitution referred to as the real essence will also change. There is no physical difference when this change occurs, either in the inner constitutions of the individuals or in the relationship between an aspect of the inner constitution and the features for which it is the foundation. The same inner constitution is producing the same features, and that aspect of the inner constitution, which once was called the real essence, is still responsible for the production of the same characteristics that were once called properties, but if new characteristics are being grouped then those characteristics are the new properties, and whichever aspect of the inner constitution is responsible for those new properties becomes the new real essence. The change is only a reflection of what is being referred to and the name attached to what is referred.

The real essence of the individual members and the species itself expands and decreases as the list of properties in the nominal essence are added or subtracted. The real essence of a species is no more or less determined than the nominal essence of a species is determined. And nominal essences can change. Since the real essence is responsible for producing the ideas found in the nominal essence, and the nominal essence changes, the real essence must also change. What does not change is the link between the real essence and that which it produces. The feature which is produced may change from being a characteristic to being a property, or change in the other direction, from a property to a characteristic, or may even change back and
forth any number of times, but the link between the physical structure and the
feature produced by that structure remains unchanged by any change in the
reference of the real essence.

The real essence, in addition to being responsible for the properties in
the nominal essence, might also be responsible for the characteristics that any
member of a kind, having the specific properties contained in the nominal
essence, would also have to have. The idea would be that the real essence, as
a particular aspect of the inner constitution, is responsible for a determined
group of common features, only some of which are used for sorting. If we
knew the real essence, we would know what characteristics, not functioning
as properties contained in the nominal essence, would necessarily be found in
a piece of substance that was known to have all the properties in the nominal
essence of a certain natural kind. Any member of a natural kind which has a
specified set of properties, would also, necessarily, have a specific set of
characteristics. It would not be possible for an object to have a specific set of
properties without also having a certain set of characteristics. And we would
be able to know what those specified characteristics were just from knowing
the real essence, because it would be from the real essence that those
properties flowed, and because that very same real essence would necessarily
produce additional characteristics any time it produced a certain set of
properties. A real essence might not be capable of producing properties W, X
and Y without also producing feature Z, which, if not included in the nominal
essence along with W, X and Y, would be a characteristic. We would know
that when we had a nominal essence containing only properties W, X, Y we
would also necessarily have characteristic Z, since the real essence which is
responsible for producing W, X, Y is also responsible for producing Z.
There would not be a case where a piece of substance existed and had properties W, X, Y and did not also have Z.

The implication is that there is some sort of lateral necessary connection, a necessary connection between the features, in that the presence of certain properties necessarily requires the presence of certain characteristics. This is the type of necessity Loeb refers to in case 1.

A lateral necessity implies that the existence of certain features requires, makes necessary, the existence of other features, either as properties, if included in the nominal essence, or as characteristics, if not included.

It is usually assumed that if the real essence were known then all the properties of a type of thing could be deduced and what is usually meant by this is not simply the deduction of the features that are in the nominal essence (the properties) and so are already known but a deduction of the features that should be properties, should be included in the class of features which are essential to an object being a member of a particular species.

Locke claims that when we inquire into substances what we want is knowledge about which "qualities or powers" a substance will have whenever it has other qualities or powers that we already know about. (4.3.9) The reason that this knowledge is what we want in regard to substances is because what we need is to be able to make the correct grouping of things and to have those things always behave in a certain way as set out by the type of thing it is. As long as we have to depend on mere observation of sensible qualities and correlations there is always the possibility that our grouping is imprecise or incomplete to the extent that we allow into the species certain objects that have all the properties that we use to mark off that species and yet will behave in a way that no other member of the species will behave, causing the
reliability of any particular member of the species to be questionable, since there would be no way to tell in advance which piece of substance in the species would differ at the crucial moment. It could well be the case that there is a substance out in the world which has all the properties of the seventeenth-century nominal essence of gold but differs from any other piece of substance called gold in some area for which a test has not yet been discovered and that that one area where it differs turns out to be a crucial area where we want anything which is called gold to be able to do. Should this happen we would feel that we should have placed the ability to do this thing in the nominal essence of gold; it should have been a property of gold. Because our nominal essence was incomplete a substance which was not what we would want to call gold was called gold.

The notion of the real essence is suppose to prevent this from happening because the real essence is thought to be the essence of what the thing is in some strong sense of essentiality, in that if we knew the real essence we could know, without trial and error, what objects truly are a member of the species gold. But there can be a real essence in this strong sense only if there truly is such a thing as the species gold out in the world. And Locke denies that there are species independent of the mind; he denies that species actually exist in the world. The notion of a feature that should be included in a nominal essence but is not goes well beyond any claims that Locke about the role of either the nominal essence or the real essence.

The question at stake here is whether there is lateral necessity. Without lateral necessity it is not possible to deduce which feature(s) will be found whenever certain other features (properties) are always found together. Locke never addresses this issue in any direct way. He does say that if we could
know the real essence we could deduce the properties a thing has, but as I have shown, this claim could be interpreted as meaning a purely trifling deduction. Locke also says that it is not possible to know the real essence. Since knowledge of the real essence, in particular, knowledge of how the real essence functions, is not possible, we could not know if there is such a thing as lateral necessity, since in order to know if there are necessary connections between the qualities themselves we would have to know how the configuration of the corpuscles works on a deep level.

Textual support that Locke was not very optimistic about the existence of lateral necessity comes from 3.6.8.

That we find many of the Individuals that are ranked into one Sort, have yet Qualities depending on their real Constitutions, as far different one from another, as from others, from which they are accounted to differ specifically. This, as it is easy to be observed by all, who have to do with natural Bodies; so Chymists especially are often, by sad Experience, convinced of it, when they sometimes in vain, seek for the same Qualities in one parcel of Sulphur, Antimony, or Vitriol, which they have found in others. For though they are Bodies of the same Species, having the same nominal Essence, under the same Name; yet do they often, upon severe ways of examination, betray Qualities so different one from another, as to frustrate the Expectation and Labour of very wary Chymists.

Further support for the view that Locke did not have any strong role in mind for essences of either type comes from Margaret Atherton in her article "The Inessentiality of Locke's Essences."^41 Atherton's main point is that, Locke is not, in fact, in his discussion of essences, intending to tell us how the extension of a term is to be determined. He is not endorsing an essentialism of any kind, either with respect to the meanings as derived from nominal essences, or of hidden structures of natural kinds, associable with real essences. Instead, I think Locke introduced the distinction to downplay the
notion of an essence and to show how little mileage could be gained from its use. 42

Atherton claims that a nominal essence cannot be referring to any single essence existing out in the world since the nominal essence can vary from person to person and even change for the same person. "His point is not that the different ideas people . . . have ought to be regarded as different approximations of a single essence that everyone's ideas should be trying to capture." 43 That the nominal essence is not trying to mark out absolute essences is clear "for Locke says that each person's set of ideas is as entitled to be called essences of gold as any other." 44 Since the nominal essence, which is composed of properties, class-defining terms, is not to be understood as trying to capture a single essence, its properties cannot be taken to mark out a distinction between essential properties and accidental properties. "Any property has an equal right to be included in an abstract idea as any other and so there can be no real distinction between essential and accidental properties and no sense in which one abstract idea rather than another is the 'right' one." 45 Certainly once a feature becomes a property then it is essential that a piece of substance have that property for it to be classified as gold, but it is not essential that part of the definition of gold contain that feature or any other feature as a property.

Questioning Locke's commitment to lateral necessity between features should not be taken to imply a questioning of what might be called vertical necessity. This vertical necessity is the physical necessity between the inner constitution and all the features that flow from it. Given a certain inner constitution an individual piece of substance must have certain features. That Locke believed in this physical necessity has already been discussed. But to require the presence of certain characteristics on the basis of the presence of
certain properties (lateral necessity) would require that a piece of substance with an inner constitution which produced certain characteristics that became properties would have that part of its inner constitution which is its real essence necessarily producing certain other characteristics because that part of the inner constitution produces certain properties.

There is a way to get what we actually do want in regard to substances but it is not possible to get this from the real essence, if one maintains the distinction between the real essence and the inner constitution. The way to get this is to accept the idea that every unique object in the external world has a unique inner constitution and to accept the notion that if we could see the inner constitution and if we could know from seeing the inner constitution what all of its features would be, we would then know, for any piece of substance, how it would react in any situation. We could then correctly group objects in terms of what we wanted in regards to them and would have the knowledge that would enable us to exclude from our grouping any object which would not act in a certain way and would be assured that any piece of substance included in the grouping would act in the way expected of it because we would have a reliable explanation for why any object had all the features it had. Again we would rely on the overlap between the objects to group them but such a correct overlap would be possible only from knowledge of the inner constitution since it is the inner constitution, the corpuscularian structure of the individual object as a whole, that will tell us how any one individual will react at any time. We could still allow that the overlap is the real essence and once we take into account all that is required for knowledge of the real essence could go on to make the claim that knowledge of the real essence, the full, complete, and adequate real essence, would allow us to deduce all the
features that should be properties, so that we would have things grouped only as we wanted them and would make no errors in what we grouped together. We could then rely on any individual, classified as gold, to act only as all other pieces classified as gold would act and to know that this would be the case so long as each piece of substance classified as gold maintained the relevant part of its inner constitution responsible for producing those features selected as the basis for the classification.

But of course the ability to do the groupings correctly depends on knowledge of the mechanics by which a physical state, a particular aspect of an inner constitution, produces an idea in our minds. And there is no reason to think that just by looking at the corpuscularian configuration we could know, and know a priori at that, that the configuration predisposes the substance to react a certain way with another object with a particular configuration or that the configuration will produce a certain idea in the mind. The most we could hope for, even with knowledge of the inner constitution, knowledge of the configuration of the corpuscles, is an a posteriori knowledge of correlations which are only probable but never certain.

From the preceeding work I have the following pieces of information: a distinction between the inner constitution and the real essence, a distinction of features into the categories of properties and characteristics, the claim that the mental determination of the nominal essence in turn establishes what the real essence will be, the claim that knowledge of the nominal essence necessarily precedes knowledge of the real essence, and the claim that a
deduction of features which should be properties is possible only if there is lateral necessity between the features.

The first conjunct of Loeb's antecedent is that natural kinds have a real essence. This conjunct is true because a natural kind does have a real essence in that there is an overlap of the inner constitution of each member of the kind which produces the characteristics that are in common and are used as the basis for sorting. These characteristics, once established as part of the nominal essence, are called properties. And the abstract common overlap of the inner constitutions of each member of the kind is the real essence of the kind. It is important to remember that a natural kind species, while having a real essence, is not determined by that real essence in the way that species ideas of modes and relations are. With substances it is the nominal essence which actually determines what the real essence will be. So natural kind species do have real essences but their real essences do not function in the same way that the real essences of ideas of modes and relations do.

While there is a reading under which natural kinds do have real essences it cannot be claimed that natural kinds have inner constitutions. There are no natural kinds in the world; they exist solely as abstract ideas in the mind, although they are applied to actual entities in the world. The real essence of a natural kind is also an abstract idea as it is the term used to refer to the common aspects of all the inner constitutions of all the members which are grouped together. But inner constitutions refer only to the actual physical structure of each individual. To apply the term 'inner constitution' to a natural kind would imply a commonality of inner constitutions beyond the commonality covered by the term 'real essence'.

The second conjunct is that all the properties of a natural kind are deducible from statements about the real essence of the natural kind. Given work done it can now be seen that this conjunct can be true but only if a fairly elaborate explanation of the real essence is understood. The inner constitution of each object physically determines all the features of that object. There are overlaps of the inner constitutions so that objects with unique inner constitutions have common features. We select among the common features those features we wish to use to mark off a species. Once a feature is determined to be a class-defining feature is it called a property and the aspect of the inner constitutions responsible for the properties is called the real essence. Since what is the real essence results from what is the nominal essence, the collection of class-defining features, the nominal essence must be known before the real essence can be determined. Since we must know all the properties before we can determine the real essence then it is easily done to deduce the properties from the real essence, in fact, it is trivial. To deduce the features which are not properties, but which we would wish to include in our nominal essence, requires all of the above, (in order to know the real essence) and requires the actuality of lateral necessity. Since Locke did not believe it was possible to know the real essence in the strong reading I have given it, and since it is not at all certain that he believed in lateral necessity, the claim that Locke believed in the theoretical possibility of a deductive science is not a plausible claim.

As long as Loeb intended the phrase "all the properties of a natural kind are deducible from statements about the real essence of that kind" to mean 'properties' and 'real essence' in the technical sense that I have given, then the conjunct is true, but only in a trifling way since knowledge of the real essence
requires prior knowledge of the nominal essence which means that all the properties are already known. This problem will be illustrated below when I discuss Loeb's case 1.

The third conjunct claims that the real essence is, in principle, knowable. When Loeb talks about the theoretical possibility of knowledge of the real essence either through more acute senses or more powerful microscopes, he must actually be referring to the inner constitution, the corpuscularian make-up of the object since it is the inner constitution one would actually see just from looking at the micro-level of a piece of substance. So it is true that knowledge of the inner constitution is, in principle, knowable through more acute senses or stronger microscopes. But this knowledge of the inner constitution, while necessary, is not sufficient for knowledge of the real essence. To see the real essence, as the real essence, and not just as a mere aspect of the inner constitution, would require knowledge of which aspect was responsible for the properties in the nominal essence. Knowledge of the real essence requires knowledge of which aspect of the inner constitution it is that is responsible for producing the properties in the nominal essence. This means that we must have not only knowledge of the properties which are in the nominal essence but must also be able to correlate those properties to their respective aspect of the inner constitution responsible for producing them.46

Because of this extra condition placed on knowing the real essence Loeb must, at least implicitly, agree that knowledge of the real essence in regard to secondary qualities is not, even in principle, knowable, since Loeb admits that the connections for secondary qualities are arbitrary.47 In order for the real essence of primary qualities and tertiary qualities to be known we
must be able to establish a necessary correlation between the inner constitution and the features that flow from it that become the primary or tertiary qualities. Once again the mind-body problem prevents knowledge of the necessary connection between the corpuscularian structure and the ideas it produces. The application of the mind-body problem to the area that Loeb thinks a priori demonstrative knowledge is possible will be illustrated in my discussion of case 2 in what follows.

Loeb instantiates his argument for the possibility of an a priori demonstrative science first as case 1:

If we knew the real essence of gold, we could deduce that gold is malleable. In other words, we could have demonstrative knowledge of "laws of natural kinds," laws of the form: whatever has characteristics c1, ..., ci at time t also has cj at time t. Locke calls knowledge of such laws knowledge of 'co-existence' (Essay IV.iii.12) and knowledge of "necessary co-existence" (Essay IV.iii.14).48

A major problem in interpreting Loeb's claims at this point is the determination of his usage of real essence and characteristics. I think it is clear that in case 1 Loeb is using 'real essence' in the same technical use that would distinguish it from the entire inner constitution. His use of 'characteristics' seems to function the same as features since he is not drawing a distinction between the features in the nominal essence (c1,...,ci) and the feature outside the nominal essence (cj, which presumably is intended to be a feature not included in the nominal essence, making it a characteristic in my terminology). So what Loeb is saying with case 1 is that if the real essence of a species were known we would know that the nominal essence of that species consisted of certain properties (c1, ..., ci) and we would be able to
deduce the existence of characteristic cj because cj would have a necessary connection to properties c1, . . . , ci. So if what Loeb meant by cj was that cj was a characteristic then, unless there is lateral necessity, cj does not have a necessary connection to the properties c1, . . . , ci, and if there is no necessary connection between the properties and the characteristic, the characteristic could not be deduced.

One way that what Loeb says about case 1 could be correct is if cj was understood to be a property of gold. To have knowledge of the real essence of a natural kind necessarily requires prior knowledge of all the properties of that kind. Taken precisely, all Loeb says is "If we knew the real essence of gold, we could deduce that gold is malleable." He does not say "only if." This leaves open the possibility that we could deduce that gold is malleable from something other than knowledge of the real essence. And since we must know all the properties in the nominal essence before we can know the real essence, we would already know, from the nominal essence alone, that gold was malleable, if malleable was a property of gold. The only work that our knowledge of the real essence is actually doing is providing a safety check that we do in fact have knowledge of all the properties, for without that knowledge we would not be able to determine precisely which aspect of the inner constitution is designated as the real essence, and so we would fall short of knowing the complete real essence.

The only type of necessity viable for the necessity discussed in case 1 is a definitional type of necessity, and one which, as it turns out, does not depend on knowledge of the real essence but actually depends on knowledge of the nominal essence. Further, we only have this definitional type of necessity when 1) the "whatever" of Loeb's statement "whatever has
characteristics $c_1, \ldots, c_i$, at time $t$ also has $c_j$ at time $t''$ is already known to be a member of a determined kind, which implies that we already know all the properties of the "whatever" and 2) $c_j$ is also a property. We could deduce that gold is malleable only if malleable were already included in the nominal essence of gold, only if part of what we mean by gold is that it is malleable. We could deduce it only if we already knew it. Such knowledge, for Locke, would be merely trifling.

All to the good Loeb might say, since it is definitional or analytic necessity we want with a priori knowledge. But this is not what Locke meant by either necessary connection or scientific knowledge. As earlier work in chapter two showed, definitional connections cannot be what Locke meant by the term necessary connection since he claims that we have only "scarce any at all" instances of knowledge of the necessary connections of substances whereas the instances of definitional necessary connections of substances are likely to be infinite. Also, knowledge of this type of necessary connection is not scientific knowledge since it is not instructive knowledge, as was shown in chapter one. Knowledge of these type of connections is not scientific knowledge because it does not tell us how any actually existing particular will behave in the future. All it tells us is that if a particular member of a kind fails to act in such a way, or fails to continue to have all its properties, that it will no longer be a member of that kind, that we would no longer be correct in calling it gold or iron, depending on what our nominal essence was. Such knowledge is not knowledge about the world, but knowledge about the meaning of the words. Science does more than simply assign names.

The necessity discussed in case 2 is the vertical physical necessity discussed earlier.
Second, if we knew the real essences of two material substances, such as hemlock and human being, we could deduce that hemlock causes person to die. In other words, we could have demonstrative knowledge of causal laws. . . . Let Ø stand for the complex description of the determinate internal microstructure that hemlock in fact has; and let B stand for the complex description of the determinate internal microstructure that human beings in fact have. In these terms, Locke's claim is that we could know without observation or experimentation that if anything has microstructure Ø, it would cause anything which has microstructure B to die.49

When Loeb refers to "the determinate internal microstructure" of hemlock and human being he is referring to inner constitutions rather than real essences. Nothing in his description of the interaction between hemlock and persons requires membership in a kind, since he is actually basing the description of the interaction on the way that one inner constitution will react with another inner constitution and not on membership in a natural kind. The way that one inner constitution will react with another inner constitution is not the "product of the understanding" but a product of physical laws, what Loeb refers to as causal laws. Certainly we may choose to group individuals on the basis of that interaction, but the interaction would occur regardless of how things were grouped.

Loeb's claim in case 2 is that we are able to know a priori the necessary interaction between one inner constitution and another inner constitution. Loeb claims that Locke believed that "...we could have demonstrative knowledge of causal laws...we could know without observation or experimentation that if anything has microstructure Ø, it would cause anything which has microstructure B to die."
Loeb is correct that Locke held the view that if it were possible to know the real essence then it would be possible to know the causal laws. But this is true simply because in order to know the real essence one must first know the inner constitution (see the corpuscularian configuration, what Loeb refers to as the determinate internal microstructure), know the nominal essence (so that one will know which properties one needs to look for the grounding of in the inner constitution) and know which aspect of the inner constitution is responsible for just those properties. Knowing the inner constitution is at least in theory possible and knowing the nominal essence is an easily done thing, but knowing the correlations between the any particular aspect of the inner constitution and any features which happen to end up in the nominal essence is an impossibility because of the mind-body problem. But if we could know the correlations, then we could know the real essence, and once we knew the real essence we would have knowledge of causal laws since knowledge of the causal laws is nothing more than knowledge of the necessary correlations.

I think that Locke did indeed hold the position that if we could know the necessary correlations between inner constitutions and features (which would automatically include the possibility of knowledge of the correlations between the real essence and properties), then we could have an a priori demonstrative science just as Loeb has described in case 2. But Locke did not believe that such knowledge of the correlations was possible even in theory because of the mind-body problem and certainly did not believe that it could be achieved a priori, because knowledge of the inner constitution is achievable only through more acute senses or more powerful microscopes, making it a posteriori.
It has been suggested to me by Mark Kulstad that one way in which the type of a priori knowledge Loeb wanted with case 2 is in fact achievable is if all possible combinations of inner constitutions and effects were considered. Only if this list were truly exhaustive could we be certain that included in the vast amount of conditional claims would be those which actually reflected the way the world is. In this way we would have a priori knowledge that "if anything has microstructure Ø, it would cause anything which has microstructure β to die."

My objection to this possible approach is that if the list were to be exhaustive we would also have the proposition that "if anything has microstructure Ø, it would cause anything which has microstructure β to live long and prosper." In other words, the exhaustive list would necessarily contain contradictions. Certain a priori knowledge of both claims involved in a contradiction is not possible since at least one of the claims must be false. In order to actually know which claim was true we would have to return to observation and trial in the real world. Loeb would be prohibited from having a priori certain knowledge of causal laws because he could not know for certain which hypothesis was true.

The objection that Mattern raised against an early claim in this chapter, namely my view that sensitive knowledge is a requirement for knowledge of the real essence, can now be addressed. In correspondence, Mattern says, "I'm not convinced that the theoretical knowledge of the real essence is limited by Locke in principle to sensitive knowledge. Some passages make it sound like something in theory (though not in practice) is achievable without sensory knowledge (e.g., 4.6.11, where Locke says that if we had ideas of real
constitutions it would not be necessary that gold would exist or that we would 'make experiments' upon it).²⁵⁰ The relevant part of 4.6.11 is,

Had we such Ideas of Substances, as to know what real Constitutions produce those sensible Qualities we find in them, and how those Qualities flowed from thence, we could, by the specifick Ideas of their real Essences in our own Minds, more certainly find out their Properties, and discover what Qualities they had, or had not, than we can now by our Senses: and to know the Properties of Gold, it would be no more necessary, that Gold should exist, and that we should make Experiments upon it, than it is necessary for the knowing the Properties of a Triangle, that a Triangle should exist in any Matter, the Idea in our Minds would serve for the one, as well as the other.

What I am reading Locke as saying in this passage is that if we had knowledge of the inner constitution to the extent that we could know "what real Constitutions produce those sensible Qualities we find in them, and how those Qualities flowed from thence" we could then determine what the properties of a natural kind would be without the need for experimentation, and that if experimentation were not needed there would be no need for gold to exist to experiment upon. The correlation itself between an inner constitution and the qualities it produces, if necessary, would hold eternally even if no such inner constitution existed in the external world. What would be the case is that if that inner constitution did not exist, that quality would not exist either, but that if that inner constitution were to exist then the quality would also exist. But all of this is contingent upon knowledge of the necessary correlation. Since the necessary correlation cannot be known, knowledge of the properties of gold is not possible whether gold exists or not.

... It is not to be wondered that 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. (4.6.12)

Loeb’s modus ponens argument that Locke believed in the theoretical possibility of an a priori demonstrative science fails because Loeb is not able to support the third conjunct of his antecedent. It is true that natural kind species have real essences, and it is true that if the real essence were known and if there is lateral necessity, then one could deduce a priori all the properties of the natural kind. Locke does believe that from the nominal essence of a natural kind one can deduce all the properties of the natural kind, but that knowledge would not count as scientific knowledge because the nominal essence is merely the listing of all the mentally determined properties that will make up the boundaries of the species. Deducing properties from the nominal essence is trivial because it is an identity statement of the kind "if p & q & r, then p." Such knowledge is trifling and thus fails to meet the requirement that scientific knowledge be instructive in addition to being certain and universal. But it is not true that Locke held onto an even theoretical possibility of knowledge of the real essence.

Perhaps where Loeb went astray was in reading too much into those sections where Locke claimed that a priori demonstrative knowledge is the only way to have scientific knowledge about the external world. Locke did
hold this position but he concluded from it that scientific knowledge about the external world was not possible rather than that a priori demonstrative knowledge about substances was possible. The type of rationalist that Locke was might be called an "ideal" rationalist in that Locke accepted that the ideal way to do science of natural bodies is the rationalistic approach. The only way to have scientific knowledge of corporeal bodies, knowledge that is certain, universal, and instructive, would be through an a priori deduction, but an a priori deduction is not possible, therefore scientific knowledge of corporeal bodies is not possible. Locke was presenting an explanation of how an a priori deductive science would proceed and Loeb is correct in his interpretation of Locke on that point. Where Loeb errs however is in interpreting Locke as putting forth a modus ponens argument when what Locke was actually doing was a modus tollens argument to show why a priori deductive science was not possible and in order to do that he had to lay out the requirements for an a priori demonstrative science.

Loeb reads Locke as saying that if natural kinds had a real essence, and if all the properties of a natural kind could be deduced from statements about the real essence and if the real essence could be known, then an a priori demonstrative science would be possible. For the second premise Loeb claims that all three of the conjuncts are, in theory, possible, giving him his conclusion that an a priori demonstrative science was in theory possible. What Locke was actually doing was claiming that if an a priori demonstrative science of natural kinds were possible then natural kinds would have to have real essences, all the properties of that natural kind would have to be deducible from statements about the real essence of the kind and that the real essence of the kind was at least in principle knowable. Since Locke did not hold that the
real essence of natural kinds was even in principle knowable, he could not have held that an a priori demonstrative science of natural kinds was possible, not even in theory.

As pointed out throughout this chapter there are problems at other areas in Loeb's interpretation of Locke, for example, the claim that all the properties are deducible given that the secondary qualities are acknowledged by Loeb not to be deducible, the claim that Locke held scientific knowledge of natural science to be certain to the same degree as Descartes did although Locke included sensitive knowledge while Descartes did not and sensitive knowledge is not certain to the same degree as knowledge obtained solely through intuition and demonstration, and the fact that Descartes had first principles that were a priori and intuitive and Locke could not, but it is on the issue of the possibility of knowledge of the real essence, even in theory, that Loeb commits his most damaging error for his overall theory that Locke is best thought of as a rationalist, since without knowledge of the real essence an a priori demonstrative science of the external world cannot be done.

As I will discuss in chapter four, the intent of Locke's Essay was to show that such a science was not even theoretically possible, and to go on and explain what science should set as its standards and goals in light of this limitation.
CHAPTER FOUR
Scepticism and the Improvement of Knowledge

Locke made two claims about scientific knowledge of corporeal bodies. The first claim, as discussed in chapter one, is that without knowledge of the real essence our knowledge of corporeal bodies can never count as scientific knowledge and, further, that humans cannot have knowledge of the real essence of substances. As laid out in chapters two and three, the mind-body problem lies at the root of Locke's explanation for why humans cannot have knowledge of the real essence of substances. But Locke also made a second claim about our knowledge of the external world, that although what we know of the world will never reach the level of scientific knowledge, it can be continually improved in a way that is useful to human life. Support for this second claim, and a fleshing out of how Locke thought knowledge of the external world could be improved, will be provided in what follows, as will the evaluation of the mind-body problem's ability to accommodate this claim.

It is important in dealing with Locke's views on natural science that one does not apply what he says to areas with which he was not concerned. Locke was dealing with a very specific issue, viz., the necessary connection of qualities in natural bodies and it is to this specific issue that he addresses his comments. Locke felt that scientific knowledge of corporeal bodies, qualified to apply only to questions concerning the co-existence of qualities, was impossible. The main reason Locke says scientific knowledge of the corporeal bodies is impossible is because we can never know their real essences. Since the real essence is the foundation of all the properties a substance has, knowledge of it is required to do a deduction of the properties. One could still observe and test a substance to determine what properties it
would have but the knowledge obtained in that way 1) would never be a complete listing of the properties and 2) could not be known to apply to any other piece of substance nor be known to hold true of the tested substance in the future.

Objects of the world are divided into species based on the use humans have for the observable properties. But because the species are based on observable properties that cannot be known to be stable, the grouping of properties that determine the species cannot be known to be stable. We cannot know with certainty that any piece of substance that has all the properties we use to set out the species of gold will also have any other properties that other pieces of gold will have. It is exactly this knowledge of what properties, other than the ones listed in the nominal essence, the species gold will have, that concerns Locke.

To know the properties of a natural kind it would be necessary to know the real essence of the natural kind. As explained, knowing the real essence of a natural kind is an involved process that requires knowing the nominal essence of the kind, knowing the inner constitution of each member of the kind, knowing which aspect of the inner constitution of each member correlates to the overlap of properties used to mark off the species, and finally, knowing how that aspect, which is the real essence, produces the properties it does. To know the real essence as the real essence requires knowing which aspect of the inner constitution is responsible for certain properties and knowing this in a manner that would allow us to deduce, without trial or observation, all the properties that would flow from it. This last step in the process would require knowledge of the mechanics of how the specific aspect of the configuration of the corpuscles that produces the ideas
that make up the nominal essence produces those ideas. Without knowledge of the mechanics we cannot know for certain that what we see as a connection between a specific configuration and an idea is a necessary connection that can be relied on or a mere correlation that may have no causal connection and hence could change at any time. Knowledge of the appearance of the corpuscularian arrangement alone cannot provide for the extra step required for certainty about the co-existence of qualities in substances. And finally, there would need to be some type of lateral necessity in order for there to be features which are deduced once the real essence is known.

If all that Locke had meant by knowledge of the real essence was knowledge of the corpuscularian arrangement, there would be no reason for him to declare that scientific knowledge is an impossibility. But because Locke held that knowledge of the real essence included all the steps summarized above, and because Locke accepted the mind-body problem as insoluble, and because it is the mind-body problem that prevents our having knowledge of the mechanics, Locke's claim that scientific knowledge of the external world is impossible, is justified.

That scepticism about the corpuscles themselves cannot be Locke's main concern has apparently not been realized by at least two recent commentators on Locke.

Garber claims that Locke was more concerned with corpuscular scepticism than with the more standard veil of perception explanation for his scepticism. While not denying that the veil of perception problem was problematic for Locke, Garber argues that Locke's worries about ever discovering the minute insensible corpuscles is more significant than has
typically been realized, specifically in relation to Berkeley's refutation of Locke.

Unlike the sceptical problems that figure most prominently in the Berkeley commentaries, Locke's own worries do not derive in any direct way from problems connected with the representative theory of perception and the veil of perception difficulties it raises for establishing the existence or real nature of external objects. Locke himself is not particularly worried about how we can know what things are like on the other side of our ideas, as the veil-of-perception sceptic is (though perhaps he should be). What concerns Locke is something quite different. If the gross bodies of our everyday experience are really made up of parts too small for us to sense, as the corpuscularians tell us, Locke asks, then how could we ever discover the hidden nature and real constitution of things?!

At this point in the thesis I do not intend to take up the task of working with Berkeley's theory. However, some of what Garber says can be applied to Locke without the necessity of going into Garber's views on Berkeley's theory.

I think that Garber is correct to draw the distinction he does between Locke's concerns about veil of perception scepticism and corpuscularian scepticism, and, more importantly, to characterize corpuscularian scepticism as the more relevant for Locke's concerns about science. However, I think that Garber has himself conflated two very distinct types of scepticism that can be found in Locke, viz., level-1 and level-2 scepticism. Level-1 scepticism concerns the ignorance resulting from our inability to perceive the minute corpuscles. This type of ignorance is in theory curable if only we had "more acute senses or more powerful microscopes." As should be obvious, level-1 scepticism and Garber's corpuscular scepticism are the same concern. Alexander, Loeb, and Garber all agree that Locke felt that such scepticism was
able to be overcome, at least in theory. The corpuscles are unobserved, but not unobservable.

But this level-1 corpuscular scepticism cannot be equated with level-2 scepticism, the ignorance resulting from our inability to perceive how a physical entity, such as the corpuscularian composed microstructure, the inner constitution of a body, could produce a purely mental effect, such as an idea. This ignorance is of course simply the result of the mind-body problem.

That Garber does not draw a distinction between his corpuscular scepticism and the scepticism of the mind-body problem, and that he needs to draw such a distinction, is evident from the following passages:

Had we sufficiently powerful microscopes or the microscopical eyes that God could have given us and might have given angels (Essay, 2, 23, 11-22), then we would be able to actually see the real essence of bodies, the corpuscular substructure that is responsible for the properties that we observe in bodies. But, of course, we don't have such acute senses, or even microscopes powerful enough to penetrate to the level of the supposed corpuscles and discover the real properties that bodies have. Consequently, we have no knowledge of the "internal Constitution and true Nature of things, being destitute of the Faculties to attain it" (Essay, 2, 23, 32; see 3, 6, 9.).

This pessimism with regard to our ability to know the real properties that bodies have, their true natures, can be thought of as a kind of scepticism, and is what I earlier characterized as corpuscular scepticism.7 . . . If we had more acute senses or powerful enough microscopes, the restrictions would be lifted, and the corpuscular sceptic would be a sceptic no more.3

If all that Garber means by seeing the real essence of bodies is knowing what the corpuscles look like, and that the appearance of the corpuscles is all that the corpuscularian sceptic is curious about, then Garber is correct to claim
that with more powerful microscopes or microscopical eyes, "the
corpuscularian sceptic would be a sceptic no more." But it seems clear that
Garber wants to know more with his microscopical eyes than just what the
corpuscles look like because of his use of the terms "real essence," "real
properties," and "true natures." Garber implies that if we could see the
corpuscles we would understand the true nature of bodies, know why the
bodies have the properties they do. But, of course, all we would know with
microscopical eyes is that a body with the ability to produce idea X had the
corpuscular arrangement of Y; we would not know why Y resulted in X. To
know why Y resulted in X would require knowledge of the mechanics behind
the physical cause of a mental effect which is prevented by level-2 scepticism,
the mind-body problem.

In the footnote cited above, Garber does acknowledge the possibility of
level-2 scepticism.

What I have called the corpuscular scepticism is only one of the
limits that Locke places on our knowledge of body. For a
complete understanding of body, Locke sometimes argues that
we need to know more than just the corpuscular substructure,
though knowledge of that is certainly necessary. For a complete
understanding of body, Locke sometimes thinks that we would
need to know how it is that the corpuscles cohere (Essay, 2, 23,
23-28) and that we would need an a priori knowledge of the
connections between any given configuration of corpuscles and
the ideas that it causes in us (Essay, 4, 3, 12-14; 4, 6, 14). It is
the lack of all of this that seems to make a science of body
impossible (Essay, 4, 12, 9-10). . .

That Garber refers to level-2 scepticism, the mind-body problem, repeatedly
as a "sometimes" concern of Locke's, and the Garber places the only
reference to level-2 scepticism in a footnote, indicates a failure to give adequate weight to a major aspect of Locke's scepticism.

Since Garber admits that his corpuscular scepticism is in theory possible to cure, it must not be corpuscular scepticism that makes a science of body impossible. The impossibility Garber mentions must be grounded in a type of scepticism that is absolute, which seems to imply either veil of perception scepticism or level-2, the mind-body problem scepticism. If Garber is trying to explain why Locke felt that a true science of bodies was impossible, he has focused on the wrong type of scepticism. A theory of a curable type of ignorance cannot explain Locke's absolute scepticism about scientific knowledge. Granted, Garber does say that all the types of scepticism go together to make scientific knowledge an impossibility, but his focus is off.

Garber uses the majority of his article to explain how Berkeley could solve corpuscular scepticism while remaining an immaterialist. Such an explanation is in all probability the reason he wrote the article, so I do not mean to criticize him for not doing something that he never intended to do by claiming that Garber did not focus on the truly important aspect of Locke's scepticism. However, since he is commenting on the confusion that results when commentators miss the important distinction between veil of perception scepticism and corpuscularian scepticism in the debate between Locke and Berkeley, for Garber himself to miss the importance of the distinction between corpuscular scepticism and mind-body problem scepticism is a misstep. It is quite possible that Berkeley's theory of idealism was intended to solve Locke's insistence on the mind-body problem as a stumbling block for knowledge of the world. The solution that Berkeley had recourse to that
Locke did not of course to deny the existence of the body as a physical entity. If the world is purely mental, the mind-body problem is no longer a problem.

Garber was not trying to lay out a complete theory on Locke's scepticism. He was only trying to point out that there are areas of Berkeley where what Berkeley was addressing was the aspect of Locke's scepticism concerning our inability to see the corpuscles. Garber's point is that these comments of Berkeley have been incorrectly assimilated by commentators under Berkeley's comments on the veil of perception difficulties. My point is that under Garber's reading of Locke's scepticism, comments by Berkeley that actually apply to the mind-body problem in Locke may be incorrectly assimilated as comments applying to level-1 scepticism.

I do not wish to criticize Garber directly for failing to recognize the significance of the distinction between corpuscular scepticism and mind-body problem scepticism, but I do think that his failure on this matter signifies a festering problem in Lockean study, namely that not enough emphasis has been placed on the impact of the mind-body problem on Locke's views on scientific knowledge.

Another commentator who seems to have missed the true reason for Locke's scepticism is Atherton.

It is, however, quite puzzling that Locke should have so unequivocally rejected the use of real essences to determine the reference of terms. His rejection depends upon a conviction that the inner constitutions of things as described by real essences remain beyond our grasp. Such an attitude is odd, for it seems to require considerable pessimism about the success of any scientific inquiry into inner constitutions. . . . So it is hard to see why Locke thinks that real essences should be so completely ignored, since he does not seem to think that the claims of
contemporary science ought to be regarded as groundless. Surely, it would have been reasonable for Locke to recommend that we understand the reference of our terms to be determined by whatever the real essences of substance-terms turn out to be, and simultaneously recommend that people buckle down and discover what the real essences or hidden structures might be, using, if possible, the insights of corpuscularianism.\footnote{5}

Once Locke's scepticism is understood as rooted in the mind-body problem rather than in any variation of Garber's corpuscularian scepticism Atherton's puzzlement about the absoluteness of Locke's scepticism disappears.

And yet, in spite of the absolute insolubility of the mind-body problem, Locke felt that our knowledge of the world could be improved in a way that was useful to human life. This is the second claim Locke made about natural science.

I would not therefore be thought to dis-esteem, or dissuade the Study of Nature. \ldots He that first invented Printing; discovered the Use of the Compass; or made publick the Virtue and right use of Kin Kina, did more for the propagation of Knowledge; for the supplying and increase of useful commodities; and saved more from the Grave \ldots \footnote{4.12.12}

Locke felt that the way to improve our knowledge of the physical world was through the use of experimentation and observation as suggested by the hypothetical-deductive method.

\ldots Locke's conclusion is not that we must despair with respect to scientific knowledge, but that where there is no certainty or true knowledge, we must make do with probability. In natural science this means that we must make do with experiment, and whatever can be inferred from experiment by a basically hypothetico-deductive reasoning.\footnote{6}

Locke's acceptance of any hypothesis, even the corpuscularian one, was guarded. Hypotheses could be used to increase knowledge of the world,
to "guess righter at . . . yet unknown Properties," (4.12.10) and "to direct us to new discoveries." (4.12.13) Since hypotheses were of value in improving knowledge they should be used, but scientists needed to be very careful not to accept any hypothesis too quickly nor assume them to qualify as scientific knowledge. Hypotheses need to have their usefulness as an explanation tested through a variety of experiments.

Not that we may not, to explain any Phenomena of Nature, make use of any probable Hypothesis whatsoever: Hypotheses, if they are well made, are at least great helps to the Memory, and often direct us to new discoveries. But my Meaning is, that we should not take up any one too hastily, till we have well examined Particulars, and made several Experiments, in that thing which we would explain by our Hypothesis, and see whether it will agree to them all; whether our Principles will carry us quite through, and not be as inconsistent with one Phenomenon of Nature, as they seem to accommodate, and explain another. (4.12.13)

Locke did not end his directives to the scientists with the simple instruction to use the hypothetical-deductive method but continued on to give fairly explicit directions on exactly how to use the hypothetical-deductive method to improve our knowledge of the external world. According to Locke, the way to improve our knowledge is to settle in the mind as clear and complete an idea as possible of the qualities that determine a species. Since the complex idea of the species cannot be determined by the real essence, knowledge about the qualities which make up the species must come from the experience of the qualities themselves as they do in fact co-exist in nature.

. . . [the way to improve our knowledge of substances is] to get and settle in our Minds determined Ideas of those Things, whereof we have general or specific Names; at least of so many of them as we would consider and improve our Knowledge in, . . . And if they be specific Ideas of Substances, we should
endeavour also to make them as complete as we can, whereby I mean, that we should always put together as many simple Ideas, as being constantly observed to co-exist, may perfectly determine the Species: And each of those simple Ideas, which are the ingredients of our Complex one, should be clear and distinct in our Minds. (4.12.14; underlining mine)

The scientists were to use the hypothetical-deductive method to continually refine the nominal essences of natural kinds. Locke believed that the best way to "endeavour also to make them (the nominal essences) as complete as we can" was by testing the observed connection of qualities by empirical means, i.e., observation and trial and error. Since nothing about the qualities themselves can indicate what, if any, connection there is between one quality and any other, the only way to learn which qualities are more likely to be found together is to simply go out and experience which qualities are in fact more often found together. Our judgment about what qualities will continue to be found together would be based on the ever greater weight of evidence caused by the observance of the continued co-existence of those qualities in ever greater test samples. Similarly, a quality would be ruled out of the nominal essence by the evidence provided from an instance where the quality failed to co-exist with others in the nominal essence. The more we work with substances and devise tests of their qualities, the more likely we are to experience an instance of the failure of a quality to co-exist. In this manner, our groupings of qualities into species will be continually refined.

The information gained from the testing would provide indications for more stable groupings of the particulars into species on the basis of the particulars' shared qualities. While such indications would be "judgment and opinion" and so would not count as scientific knowledge, the knowledge
gained would be useful to humans; they could "guess lighter" about the qualities of a species.

I deny not, but a Man accustomed to rational and regular Experiments shall be able to see farther into the Nature of Bodies, and guess lighter at their yet unknown Properties, than one, that is a Stranger to them: But yet, as I have said, this is but Judgment and Opinion, not Knowledge and Certainty. . . . Experiments and Historical Observations we may have, from which we may draw Advantages of Ease and Health, and thereby increase our stock of Conveniences for this Life: (4.12.10)

The hypothesis that Locke used in explaining the connections between qualities was corpuscularianism. His account of the inner constitution of bodies as composed of insensible particles, which have the primary qualities of shape, size, and motion status, and are capable of combining to produce the primary, secondary, and tertiary qualities of macro bodies is clearly corpuscularian, as the following quotation illustrates.

For supposing the Sensation or Idea we name Whiteness, be produced in us by a certain number of Globules, which have a verticity about their own Centres, strike upon the Retina of the Eye, with a certain degree of Rotation, as well as progressive Swiftness; it will hence easily follow, that the more the superficial parts of any Body are so ordered, as to reflect the greater number of Globules of light, and to give them that proper Rotation, which is fit to produce this Sensation of White in us, the more White will that Body appear that, from an equal space sends to the Retina the greater number of such Corpuscles, with that peculiar sort of Motion. I do not say, that the nature of Light consists in very small round Globules, nor of Whiteness, in such a texture of parts as gives a certain Rotation to these Globules, when it reflects them; for I am not now treating physically of Light, or Colours: But this, I think, I may say, that I cannot . . . conceive how Bodies without us, can any ways affect our Senses, but by the immediate contact of the sensible Bodies themselves, as in Tasting and Feeling, or the impulse of some insensible Particles coming from them, as in Seeing, Hearing,
and Smelling, by the different impulse of which Parts, caused by their different Size, Figure, and Motion, the variety of Sensations is produced in us. (4.2.11; underlining mine)

His reliance on corpuscularianism, as evidenced by the above quotation, is intended to be tentative. He is not claiming that color is the result of the rotation of very small round globules, but that if color is the result of such bodies, then "it will hence easily follow, that the more the superficial parts of any Body are so ordered, as to reflect the greater number of Globules of light, and to give them that proper Rotation, which is fit to produce this Sensation of White in us, the more White will that Body appear."

Locke accepts corpuscularianism, to the extent that he does, because it can provide a model with significant explanatory power for how a body has the properties it does. The supposition of corpuscles having primary qualities, even though we cannot sense them, is an easily understood concept.

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. (2.8.9)

That the corpuscles can arrange themselves to produce in us the ideas of primary qualities is also easily understood by analogy, as when we see a brick fence consisting of twenty rows of bricks and forty columns of bricks, and have the idea of a rectangle of a certain length and width. The explanation of the production of secondary and tertiary qualities from the corpuscles is less direct, but still captures a crucial belief we have about the world, viz., "I cannot ... conceive how Bodies without us, can any ways affect our Senses, but by the immediate contact of the sensible Bodies themselves." (4.2.11)
The corpuscularian hypothesis has value because,

We must resort to analogies and models in conceiving the nature of microscopic events because, since our conjectures about them cannot be directly verified, the only reason we have for believing them to be even probable is that "they more or less agree to truths that are established in our minds" and because such conjectures are at least compatible with "other parts of our knowledge and observation." 7

If the qualities of the macro body are not the result of the primary qualities of corpuscles, then they must be the result of "something yet more remote from our Comprehension." (4.3.11)

I have here instanced in the corpuscularian Hypothesis, as that which is thought to go farthest in an intelligible Explication of the Qualities of Bodies; and I fear the Weakness of humane Understanding is scarce able to substitute another, which will afford us a fuller and clearer discovery of the necessary Connexion, and Co-existence, of the Powers, which are to be observed united in the several sorts of them. (4.3.16)

Locke had absolutely no way of knowing that there were necessary connections in nature because the mind-body problem prevented him from having a means of determing the correlations as necessary connections. However, since he had the belief that there were necessary connections in nature and since corpuscularian, as part of its theory, can explain why the connections are necessary, Locke had an additional reason to accept corpuscularianism. By assuming that the qualities of a body were the result of the body's corpuscularian configuration and that there were necessary connections in nature, scientists can make progress in better determining species in a way beneficial to humans, even if, in reality, the determinations are ungrounded by the factual situation of the world.
Locke sees in the metaphysical account that it justifies a limited faith in the power of observation and induction; if there are necessary connections in nature then it is sensible to look for regularities which, even if we cannot establish their necessity, depend upon and reflect those connections.8

Assuming that there are necessary connections in nature, then "it is sensible to look for regularities," and, since we cannot determine by the qualities themselves which qualities will always, or even, more likely, be found together, the best way to determine whether one grouping of qualities will have greater regularity than some other possible grouping of qualities is to posit the different possible groupings of qualities and to test the groupings in terms of their stability. Since, presumably, a factor in the selection of which qualities to include in any group will be the general usefulness of that grouping for human life, the knowledge of which grouping will actually occur with the most regularity will advance the cause of the grouping in the first place.

How well can the mind-body problem interpretation of Locke's scepticism accommodate the optimism of the second claim, given that the mind-body problem is insoluble and that it prevents knowledge of the necessary connections of qualities in bodies? Can Locke be a mind-body problem sceptic and still be optimistic about obtaining enough knowledge about the connection of qualities in substances so as to "draw Advantages of Ease and Health, and thereby increase our stock of Conveniences for this Life?" (4.12.10) There seems to be a tension in balancing the two claims, one negative, one positive, about the exact same area of knowledge, the connections of the qualities.

The tension is short-lived however once it is realized that the extent of the ignorance caused by the mind-body problem extends only to knowledge_of
the necessity of the connections of the qualities and not to the knowledge of the connections of the qualities themselves. Some knowledge of the connections is obtainable through observation, as Locke recognized by urging the scientists to perform experiments testing the connections. The mind-body problem, while denying that humans can ever know how the physical causes a change in the mental, does not deny that there is interaction between the physical and the mental nor claim that humans are unaware of the results of the interaction.

In fact, far from causing a tension in Locke's two claims of natural science, the mind-body problem interpretation of his scepticism seems to be perfectly suited to account for both the claims. The second claim does not simply say that knowledge of the connections of qualities can be improved but says the knowledge of the connections can be improved but not to the point of qualifying as scientific knowledge. Whatever theory of scepticism of natural science is attributed to Locke needs to be able to handle the qualification Locke places on the second claim. The mind-body problem, being able to explain why scientific knowledge of the connections of the qualities in bodies is not possible, while at the same time having no application to the probability knowledge of the connections between the qualities obtained through observation, can explain why knowledge of the connections can be continually improved but never reach the level of certainty.

Although I do think a significant motivation of Locke's in writing the Essay was his interest in the corpuscularian hypothesis, I do not see the Essay
as an *ex post facto* justification for corpuscularianism. Rather, I see Locke as interested in the corpuscularian hypothesis and that he developed the themes in the *Essay* as a means of first, providing a framework from which to evaluate the corpuscularian hypothesis, i.e., to see if it was more feasible than the method employed by the alchemists, and then, given that he found it to be so, to endorse it by showing its value in providing useful information of a world where certainty was simply not epistemologically possible. To see if the corpuscularian method was a feasible method for obtaining useful knowledge of the world, Locke had to determine how knowledge of the world was obtained, which necessitated an in-depth study into the epistemological questions that shape the *Essay*. From this, Locke realized that scientific knowledge was an impossibility and yet our knowledge of the world could still be improved. Given Locke's epistemology, a corpuscularian hypothesis had much to recommend it. Accordingly, I am making the assumption that Locke developed his views on natural science as a result of his epistemology rather than constructed an epistemology to justify the limits of the hypothetical method of corpuscularianism.

About the directives Locke gave to the scientists on what expectations to have from their work and the best way to proceed to increase the store of scientific knowledge, I have had little original to say. Locke's views on science are well-documented and there is remarkable agreement between the commentators I have read on the subject. What I do have that contributes to Lockean scholarship is a stronger explanation as to why Locke was as sceptical as he was and why he instructed the scientists to proceed in the way he did. My work is beneficial in that it allows for a focus on a particular type
of scepticism as the most relevant in Locke's overall project and allows for a better explanation of why he made some of the claims he did.
Chapter One

1The term "scientific knowledge" may seem redundant but it is needed since not all knowledge meets the triadic requirement of scientific knowledge. The phrase "certain knowledge" is, technically, redundant, but qualifying "knowledge" in this way is useful for drawing distinctions. Similarly, talk of scientific knowledge of corporeal bodies may again seem redundant but is actually a reflection of Locke's use of the phrase "scientific knowledge" to apply to mathematical and moral concepts as well as to ideas of corporeal bodies. The phrase "scientific knowledge of corporeal bodies" is merely a precise setting out of a specific area of interest.


3Ibid., 2.1.3-4.

4Ibid.; Locke's own footnote to 2.2.2-3.

5Roger S. Woolhouse discusses problems with ideas of relations in Locke (Minneapolis: University of Minnesota Press, 1983), 91-5.

6Woolhouse discusses the possibility that modes are Aristotelian accidents, i.e., properties of substances, but ultimately rejects the notion, in part by dismissing the importance of making such a distinction. Locke (96-8).

7For a discussion of problems with simple modes, see Woolhouse, Locke (119).

8Ibid., 119.

9Ibid.

10Ibid., 120.

11Ibid.
12Ruth M. Mattern, "Locke on Natural Kinds as the 'Workmanship of the Understanding'," Locke Newsletter 17 (1986): 66; underlining mine.

13About archetypes of substances, Mattern claims that it is mind-dependent aspects of objects that function as the archetypes. What counts as the archetype depends on the use the mind has for its idea.

14The claim that all the simple ideas will be real only applies to component simple ideas that are true simples, and not to complex ideas of powers which Locke calls simple only for ease of discussion. See 2.23.7 and my earlier discussion of this point on page 6.

15Mattern, 80.


19Loeb, 57.

20Although I am still not sure I agree with all he says, and less sure that whether he would agree with what I have said here, numerous conversations with Richard Reilly over the last couple of years about this very issue have been extremely helpful. See his article "An Interpretation of John Locke's Classification of Truth," Auslegung 15 (Winter 1989): 37-55.

21Loeb, 44.
There are exceptions to this dichotomy but they are very few and
not of the type of knowledge Locke wanted with natural science. These
"scarce any at all" instances will be discussed in the next chapter.

Chapter Two

1Daniel Garber, "Locke, Berkeley, and Corpuscularian Scepticism," in Berkeley: Critical and Interpretive Essays, ed. Colin M. Turbayne
(Minneapolis: University of Minnesota Press, 1982), 174-5.

2Ibid., 177-8.

3Peter Alexander, Ideas, Qualities, and Corpuscles: Locke and Boyle
on the External World (Cambridge: Cambridge University Press, 1985),
281.

4Ibid., 292.

5Garber, 192; Garber's footnote #7.

6Peter Alexander, "Boyle and Locke on Primary and Secondary
Qualities," in Locke on Human Understanding, ed. I.C. Tipton (Oxford:

7Ibid.

8Alexander, Ideas, Qualities, and Corpuscles, 292.

9Alexander, Primary and Secondary Qualities, 65.

10Alexander, Ideas, Qualities, and Corpuscles, 292-3.

11Ibid.; underlining mine.

12Loeb, 48; Alexander, Ideas, Qualities, and Corpuscles, chapter 14.
particularly 289-98.

13Though quite different in example, this passage is similar in spirit
to what Locke says about globules producing the color of white in 4.2.9-
13.
14 Alexander, *Primary and Secondary Qualities*, 68.

15 Ibid., 68-9.


17 Through the years I have heard Dick Grandy talk on the issue of color and the primary/secondary distinction. To what extent his views have influenced my work I not know, but certainly I have benefitted from the exposure. Two works of his which had direct impact are "History of the Unreality of Colors, 1987" TM6S [photocopy], Rice University, Houston and "A Modern Inquiry into the Physical Reality of Colors," in *Mind, Value, and Culture: Essays in Honor of E.M. Adams*, ed. David Weissbord (Itascadero, California: Ridgeview Publishing Co., 1989), 229-45.

18 Support for the notion that both secondary and tertiary qualities reduce back into simple primary qualities (the configuration of the corpuscles as a whole rather than features of the configuration) can be found in 2.8.17 and 2.8.18.

19 This example was provided by Richard Reilly while discussing whether tertiary qualities produce ideas.


21 See 4.3.11 and Alexander, *Ideas, Qualities and Corpuscles*, 290.

22 This point comes from conversations with Mark Kulstad.

**Chapter Three**

1 Loeb, *Descartes to Hume*.

2 Ibid., 36.
3Ibid.
4Ibid., 53.
5Ibid., 49.
6Ibid., 25.
7Ibid., 36.
8Ibid., 37.
9Ibid.
10Ibid.
11Ibid., 37-8.
12Ibid., 38.
134.9.3, as quoted in Loeb, 38.
14Ibid.
154.2.4, as quoted in Loeb, 39.
16Ibid.
174.2.14, as quoted in Loeb, 40; underlining mine.
18Ibid.
19Ibid.
20Ibid.
21Ibid., 40-1.
22Ibid., 41.
23Loeb refers the reader to Descartes' Rules, VI, VIII, XII.
24Loeb, 43.

25Loeb refers the reader to 2.30 and Books 3 and 4 in the Essay.

26Loeb, 43.

27Ibid., 44.

28Ibid.

292.31.6, as quoted in Loeb, 44.

30Ibid., 50; also see the similar point on page 53 of Loeb.

31Ruth Mattern raises the point that there may be some way in which knowledge of the real essence is not dependent upon sensitive knowledge. I believe I can answer this objection but will need work which is done later in this chapter to explain why it is not so.

32Loeb, 42.

33Ibid., 36.

34Ibid., 39.

35The possibility that Loeb might have a contemporary meaning of demonstration in mind was suggested to me by Mark Kulstad.

364.3.28, as quoted in Loeb, 48; underlining mine.

37Ibid., 43; underlining mine.

38Ibid., 48; underlining mine.

39I first heard this view when Mattern discussed it during a visit with the Locke Reading Group, Rice University, May 21, 1988. Further development occurred from conversation with Mark Kulstad and correspondence and conversation with Mattern.

40Locke discusses artificial kinds in 3.6.40-41. I do not intend to deal with man-made artifacts of exact replication, but one possible way out of the difficulties such objects pose would be to rely on the difference of
the identity of the corpuscles themselves, their spatial-temporal identity if nothing else. Mass produced bullion is a case where there is, theoretically at least, the possibility that there are two gold bullions with absolutely no perceivable differences between them except their location. They would still, however, be made up of different corpuscles.


42 Ibid., 278.

43 Ibid., 279.

44 Ibid., 280.

45 Ibid.

46 I refer the reader to the passage from Alexander, Ideas, Qualities and Corpuscles, 292-93.

47 Loeb, 48.

48 Ibid.

49 Ibid.

50 Correspondence with Mattern, December 25, 1989.

Chapter Four


2 Ibid., 177

3 Ibid., 177-8; the footnote is Garber's.

4 Ibid., 192, footnote #7.

5 Atherton, "The Inessentiaity of Lockean Essences," 283.


8Alexander, Ideas, Qualities and Corpuscles, 305; underlining mine.
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