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ATOMS AND MONADS: AN INQUIRY INTO THE IDEA OF NATURE IN
LOCKE'S "ESSAY" AND LEIBNIZ'S "NEW ESSAYS"

City University of New York

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ATOMS AND MONADS

An Inquiry into the Idea of Nature
in Locke's Essay and Leibniz's New Essays.

by

Sue M. Weinberg

A dissertation submitted to the Graduate Faculty
in Philosophy in partial fulfillment of the
requirements for the degree of Doctor of
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1985

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This manuscript has been read and accepted for the Graduate Faculty in Philosophy in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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Abstract

ATOMS AND MONADS
An Inquiry Into the Idea of Nature
in Locke's Essay and Leibniz's New Essays

by Sue M. Weinberg

Advisor: Professor Charles Landesman

A matter of significance for the history of philosophy is the question of what are the issues that underlie Leibniz's response to Locke's Essay Concerning Human Understanding, in his own New Essays on Human Understanding. Exploration of that question can contribute to interpretations of both Locke and Leibniz. Equally important, it can provide insight into problems of philosophy that have their genesis in the seventeenth century.

The dissertation uses the Essay and the New Essays to explore what it regards as the central conflict between Locke and Leibniz: the conflict about the primacy of metaphysics. It takes for its focus their differing positions on atomism, contrasting the particle theory of matter that it finds central to the Essay with Leibniz's metaphysical unit, the monad. It develops the implications of those differing positions for an idea of nature specifically--nature here conceived as the arena in which science and metaphysics meet.

The thesis of the dissertation is that the positions of Locke and Leibniz on atomism express opposing responses of philosophy to science; and, further, that this opposition had profound significance for the subsequent direction of philos-

ophy. The first element in the thesis is the specific concern of the dissertation. Its second element, which suggests an approach to the history of philosophy since the seventeenth century, is an issue for further exploration.

Locke's Essay is shown as a deliberate construction of an epistemology grounded in the new science, combining that purpose with an explicit rejection of the value of metaphysical speculation as the basis for knowledge. Locke's scientific background and orientation determine his analysis of ideas, of the powers and qualities of matter, and of real essences and material substances.

In contrast, the New Essays is seen as asserting the primacy of metaphysics for the solution of epistemological and scientific questions. Leibniz's arguments against atomism are examined, to show why the basic reason for his rejection of all particle theories of matter is their violation of specific metaphysical principles. His positive position is presented in a discussion of the monad, emphasizing its characteristics in the realm of nature.

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A Note on Editions, Translations, Abbreviations

The following editions and translations will be referred to most frequently. They will be identified by abbreviation both in the text immediately following quotation or reference to a passage, and in the notes. (Quotations from Locke's Essay are given without modernizing spelling, capitalization, and punctuation--exactly as they appear in the Nidditch edition.)

- E: John Locke, An Essay Concerning Human Understanding. Edited by P.H. Nidditch. Oxford: The Clarendon Press, 1975.
- NE: G.W. Leibniz, New Essays on Human Understanding. Translated and edited by Peter Remnant and Jonathan Bennett. Cambridge: Cambridge University Press, 1981
- LNE: G.W. Leibniz, New Essays Concerning Human Understanding (together with some of his shorter pieces). Translated and edited, with an appendix, by Alfred Gideon Langley. LaSalle, Illinois: The Open Court Publishing Company. Third edition, 1949.
- GPS: G.W. Leibniz, Die philosophischen Schriften. 7 volumes. Edited by C.F. Gerhardt. Hildesheim, Germany: Georg Olms Verlagsbuchhandlung, 1965. (Reprint of original 1882 edition)
- PPL: G.W. Leibniz, Philosophical Papers and Letters. Translated and edited, with an introduction by Leroy E. Loemker. Dordrecht, Holland: D. Reidel Publishing Company. 1969.

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General Introduction

At the beginning of the last decade of the seventeenth century, John Locke's An Essay Concerning Human Understanding finally made its appearance. Some twenty years in the writing, awaited with curiosity and impatience in the commonwealth of learning, it was a work whose significance was immediately realized. For, in intent and accomplishment, the Essay presented an epistemology grounded in the new science, and would be recognized as that by its author's contemporaries.

Within five years of the Essay's publication, Gottfried Wilhelm Leibniz attempted to engage Locke in a correspondence whose purpose would be the exploration of issues and positions contained in and implied by the Essay. Locke rejected Leibniz's attempts at dialogue, but in vain. By the time Locke died in 1704, Leibniz was at work on a full examination of the Essay, his own New Essays on Human Understanding. Leibniz's response to Locke would not be published until 1765, in time to influence Immanuel Kant who was soon to be "interrupted [from his] dogmatic slumber" by David Hume.¹

These two seminal philosophical works of the period now known as the scientific revolution² are the textual core of the dissertation. There are many issues that might be singled

out to explore the differences that separate Locke and Leibniz --and the similarities that draw them together. The one chosen is atomism. For, atomism is the issue through which a central conflict between the two philosophers can be seen most clearly. That conflict provides the basic motive underlying the dissertation.

The thesis of the dissertation is that the positions of Locke and Leibniz on atomism express opposing responses of philosophy to science, and that this opposition had profound significance for the subsequent direction of philosophy.

There is no claim made for either position as the true or correct one, nor for the greater fruitfulness of one position or the other. The purpose, rather, is to suggest a perspective on the history of philosophy since the seventeenth century, a way of approaching the genesis of contemporary issues and positions. The scope of that purpose demands the narrowing of focus to a specific issue through which the opposing positions can be explored, their implications developed. The specific issue is the contrast between the material unit of Locke and the metaphysical unit of Leibniz--between atom and monad; the implications are developed for an idea of nature--nature conceived as the arena in which science and metaphysics meet.³

Atom and monad and the idea of nature are, then, the focal points for the exploration of the conflict which is the dissertation's underlying concern: the opposing responses of philosophy--in relation to epistemological and metaphysical

problems, especially--to the new science.⁴

In placing the focus on atomism and in using the Essay and the New Essays as the basic texts for the examination of the contrasting positions it must not be assumed that atomism is offered here as the issue that impelled Leibniz to seek written dialogue with Locke. Any such implication must be immediately corrected. The thesis does not in any way propose atomism for this distinction. Nor is it suggested that Leibniz's major arguments against atomism are given in the New Essays. Leibniz's criticisms in that work are fundamentally the same as those that appear in others of his writings, and frequently at greater length and in greater detail.⁵

Nonetheless, the thesis asserts that the disagreement about atomism can be regarded as an expression of opposing positions on the relationship between science and philosophy --between natural philosophy and metaphysics, to be consonant with the terminology of the time. The thesis is demonstrated by showing, first, how atomism as a scientific theory is the basis on which Locke works out the philosophical purpose of the Essay; and then how Leibniz's reasons for rejecting atomism are, fundamentally, metaphysical and how his own positive position--the concept of the monad--is grounded in metaphysics. To support this, the study shows, first, the way in which Locke's background and orientation in natural philosophy determined the direction he took to achieve the Essay's stated purpose, "the Original, Extent, and Certainty of humane Knowledge," and, in particular, how those scien-

tific commitments determined his analysis of aspects of the physical world. It then shows that, although mathematics and dynamics enter into Leibniz's arguments, his fundamental reasons for rejecting all particle theories of matter are metaphysical; and, further, that even those mathematical and physical theories are grounded in metaphysical principles.

The ideas of nature that follow from the differing positions on the primacy of metaphysics have certain similarities; the differences are profound. This is an issue to set aside until the context and background of the issues which are the study's concern have been established.

The dissertation's thesis has its basis in the extraordinary intellectual changes that characterized the seventeenth century--not the least of which changes involved the separation of science from philosophy. The seventeenth century was a turning point in the history of the Western philosophical tradition, second in significance only to that period during which philosophy arose in the ancient Greek world. From its beginning, philosophy was intellectual home to speculation about nature. Natural philosophy and metaphysics were aspects of that quest for knowledge which was --and continues to be--philosophy. However, the discoveries that were to culminate in the scientific revolution led to changes of purpose and method that resulted in the emergence of natural philosophy into science, and thus the separation of science from philosophy. Locke in the Essay and Leibniz in the New Essays would regard themselves and each other as

being concerned with issues that were completely philosophical. We know, in retrospect, that the separation had already taken place.

The separation of science from philosophy resulted not only in the development of different disciplines, but also in problems involved in working out the connections between the disciplines. The burden of those problems was, inevitably, borne by philosophy; the independent scientific offspring, proliferating as decades and then centuries passed, had a clearer mission in pursuing an understanding and knowledge of the natural world, and in developing methods by which such understanding and knowledge could be achieved. The achievements of the sciences were fruitful for philosophy in that philosophy was freed to explore those achievements and their implications in a way that scientists working within specific disciplines could never do. The philosopher could pursue the broader perspective essential for exploring the implications of scientific discovery.

There were other aspects of the separation that raised significant issues for the future of philosophy. Could philosophy aspire to the condition of the sciences through the adoption of those methods that were productive of scientific discovery? Should philosophy have such aspirations? Would this require the relinquishing of those methods of speculation that had characterized so much of the philosophical tradition through the centuries? A major question--the question that is central to the present thesis--was to define

the task of philosophy in light of the developing sciences and in relation to scientific discoveries. The question is not one that would have been explored deliberately or explicitly in the time that Locke and Leibniz thought and wrote. Yet, Locke's purpose in the Essay and Leibniz's response to Locke can be regarded as beginning responses that that central question--as early attempts to face it and to deal with it.

There is nothing unusual about one philosopher choosing to make extensive comments on the work of another; in a sense, all philosophers do precisely that--implicitly, if not in so explicit and extended a way as was Leibniz's commentary on Locke's Essay. Yet, there is something idiosyncratic about the New Essays, idiosyncratic because it is a substitute for a direct exchange with Locke. What could have been a two-sided spontaneous exchange in correspondence became a contrived and one-sided response to Locke's published work, using that work as a point of departure for the expression of Leibniz's own ideas; selecting those of Locke's ideas that were especially important for Leibniz's own thinking, for criticism or as points of departure for the development of his own positions; changing Locke's ideas, even distorting Locke's positions to make them conform to what he wished to comment on.

Why Locke rebuffed Leibniz's repeated attempts to open correspondence could have been a matter of personality (Locke's), as much as a matter of intellectual commitment or of a reluctance to open correspondence with Leibniz specif-

ically.⁶ There is also the question of Locke's friendship with Newton as a possible reason for his reluctance to have a cordial exchange--perhaps any exchange--with Leibniz. Yet, when Leibniz first attempted to engage Locke in correspondence, in 1695, the conflict about the discovery of the calculus had not erupted into the anger and nastiness of 1700 and after. Nor, in his correspondence with William Molyneux specifically (with whom he had discussed Leibniz), does Locke refer to this as the reason for his unwillingness to respond to Leibniz.⁷

There are two aspects to the background of the New Essays: one somewhat trivial (why Locke would not reply to Leibniz); the other, of significance (what was the real motive, and therefore the real issue, that led Leibniz to pursue correspondence as persistently as he did).

It has already been pointed out that atomism is not put forth here as the issue which prompted Leibniz to engage Locke in correspondence initially, and as the motive behind the writing of the New Essays; and that, further, the New Essays does not contain Leibniz's major analysis of and arguments against atomism. Whatever may have been Leibniz's motives for writing the New Essays, it is clear that atomism was never regarded as the fundamental issue. Just as the Essay is not a study of the corpuscular philosophy, so the New Essays is not an examination and rebuttal of corpuscularianism--of any particle theory of matter.

What, then, is the issue that led Leibniz to undertake

his detailed commentary on the Essay? The answer is a matter of some significance because of what it reveals about the thinking both of Leibniz and of Locke: the latter through his clear refusal to agree to an exchange of ideas; the former for what it expresses about what he saw as important to the Essay and about his agreements and disagreements with Locke's ideas. More than one candidate for the "real issue" has been suggested. The epistemological issue is certainly important. Leibniz is explicit in his disagreement with Locke's denial of innate ideas--of an inner source of all thought; as he is critical of Locke's position that all ideas have their origin in experience, from what is "without" the mind. It is important also to keep in mind that Leibniz presents for the first time in the New Essays his own conception of apperception--s'apercevoir. (NE, 2.9.4;134)

A position offered and supported recently by Nicholas Jolley⁸ is that the heart of the dispute centers on metaphysical and theological issues; specifically on what Leibniz interprets as the materialist implications of Locke's thinking in the Essay. The material basis of mind which Leibniz saw implied by Locke's thinking is an inherent threat to the immortality of the soul. Further, again according to Jolley, this led Leibniz to associate Locke with the Socinians, a radical sect that denied the natural immortality of the soul, a position that could be connected with the material basis of mind.⁹

Now, what is interesting and significant within the present context is the connection of both possibilities--the

epistemological and the theological--with the thesis here proposed. Both, clearly, are bound up with the corpuscular basis--and thus the scientific grounds--of Locke's explanation of how ideas originate and, with that basis, how he explains the origins of thought. If the thesis is valid, then the roots of both the epistemological and the theological differences as central to Leibniz's response to Locke are to be found in a conflict between whether science or metaphysics is to be primary in the resolution of epistemological and theological issues. The real issue is over the primacy of metaphysics.

The position offered and supported here is precisely this. Leibniz's motivation in seeking to engage Locke in correspondence--in that exchange of ideas which he sought so persistently--is his sharp realization that Locke was grounding epistemology and metaphysics in the new science. Leibniz was supremely sensitive to the dangers of this position, the theological dangers in particular; and thus it became imperative to comment on Locke's work, even though Locke's death stopped Leibniz from making his written dialogue public and even though so many of Leibniz's arguments in the New Essays are repetitions of arguments offered in others of his works.

To pursue this point with evidence from the New Essays: In both the Preface and the Introduction to that work, Leibniz identifies Locke with those philosophers (natural and metaphysical, past and contemporary) who accept and support and use in their thinking atomism in one or another of its

interpretations.¹⁰ What is revealing about these connections which Leibniz makes is not that he regards atomism as the reason why he pursues the exchange with Locke, but rather that he recognizes the central significance of atomism in Locke's thinking. This, in spite of the fact that Locke more than once in the Essay denounces that atomism which is associated with Democritus and Epicurus, and in spite of Leibniz's explicit admiration for the ideas of Robert Boyle, who is acknowledged as the major thinker in the formulation of that corpuscular philosophy which Locke does accept.

Before leaving this brief introductory discussion of the Essay and the New Essays (and there will be further consideration of the issues in the introductions to Parts One and Two), it is useful to be reminded again of the point that was mentioned previously and that is related to the fact that atomism is not the central issue of contention in the New Essays. Just as Leibniz did not write the New Essays as a major statement against atomism, so the work is not Leibniz's major analysis of the inadequacies of particle theories of matter. His criticisms, the problems he identifies, the reasons why he rejects atomism--all are to be found in other works, in articles and correspondence both. And, there are criticisms found in other works that are not discussed in the New Essays. On these grounds, too, one would not want to assert that the New Essays is concerned primarily with atomism.

However, and for the reasons that have been considered thus far, one could not dismiss atomism as only incidental to

Leibniz's concerns in the New Essays. As, one must keep in mind, it is central to the Essay itself.

Locke and Leibniz have been singled out from among the great thinkers in a century rich in great thinkers--philosophers and scientists, poets and statesmen--to illustrate a thesis about an intellectual conflict that was generated during that time. They have not been singled out solely because one wrote a lengthy and detailed commentary on a major work of the other. But, although that connection is necessary to illustrate the thesis, it is not sufficient. Their thinking must reveal the kinds of distinctions that the thesis asserts and that the study strives to support. It is the task of the study itself, and the conclusions it will draw for the idea of nature in particular, to point out similarities and distinctions that are specific to atomism and to a conception of nature. The present introductory purpose is to look at some fundamental and overall similarities and differences in the thinking of Locke and Leibniz without specific reference to atomism and the conception of nature.

Consider the similarities. Each is a nominalist, insofar as nominalism is that position which affirms that the individual only exists. Each recognizes that motion is the instrument of change in nature. Each undertakes the kind of analysis of substance that would lead to a new conception of that traditional category (although Locke was never explicit in developing the implications of his own analysis, an anal-

ysis in which he is on the edge of a conception of substance as activity). There are explanations for the similarities, as there are grounds for the differences. Both, after all, are influenced by that rush of possibilities for understanding and interpreting nature that would, eventually, be seen as a revolution--albeit a scientific revolution. They are united by their times, in that they share in--and contribute to--the intellectual ferment that demanded a reexamination of established ways of thinking about knowledge and about the physical world. They are not completely freed from the established ways in their attempts to find ways of shoring up the foundations as they demolish the structure built on those foundations.

And, they are divided: divided by temperament, by attitudes towards the significance of scholarship in their views on the value of the ideas of other thinkers of other times, divided by the ways in which they would attempt to find value in the past and thus preserve it, or to totally reject that intellectual past.

What divides them, and the ways in which they differ, are in this context the greater interest. The contention is not that all differences have their basis in the conflict about the primacy of metaphysics, but that many of the differences can be traced to that conflict, and follow from it. There are, for example, the restraints on speculation that Locke places on himself throughout the Essay, and that he frequently mentions. There are the differences in method sug-

gested by each approach, influenced by differing intellectual backgrounds and orientations: consider the connection between Locke's background in medicine and biology and his grounding of knowledge in observation--his empiricism, in other words; and between Leibniz's orientation to mathematics and dynamics --his rationalism.¹¹

This raises yet another issue, as interesting as it is complex and provocative: the empiricist and rationalist distinction that, in modern times, is given its roots in the thinking of Locke and of Descartes; each the source of a different approach. The Lockean tradition is exemplified by Berkeley, Hume, Bentham and the Mills, on into the present Anglo-American tradition; that which is exemplified by Leibniz is represented also by Spinoza, German idealism of the nineteenth century, and on into the contemporary "Continental" tradition. With these categories, Locke and Leibniz each is representative of an approach that is the basis for interpreting the history of modern philosophy. The problem, of course, is whether the tradition of so dividing the philosophical world by the English Channel is supported by evidence that is stronger than tradition. This is not the place to enter into the current re-evaluation of that tradition of interpretation, and the fruitfulness of the categories as approaches to an understanding of the course of philosophy's history (and thus of how people think about matters philosophical in the broadest sense). The problem, in this context, is that the categories indeed fail to recognize so-called

rationalist elements in Locke's thinking, although Leibniz does seem to fit into the traditional requirements for a rationalist.¹²

However, if one is to say that the distinction rests on where a philosopher places the source of all "ideas"-- of where and how thought originates--then Locke's position that the source is in experience, and his explanation of how and why that takes place, and Leibniz's position that the source is, ultimately, within, are indeed positions that would reaffirm the distinction.

No matter what the categories may be, and no matter how appropriate or inappropriate they may be, it is clear that Locke and Leibniz speak different philosophical languages. Their presuppositions differ profoundly; and their intellectual attitudes and temperaments express those differences. Consider, for one revealing example, their attitudes towards themselves--Locke in the Essay, Leibniz in the New Essays.

Locke refers to himself, in his famous term, as an "under-labourer," in comparison to the "master-builders" in the commonwealth of learning. His mission as an under-laborer is "in clearing Ground a little, and removing some of the Rubbish, that lies in the way to Knowledge;" (E, Epistle.10)¹³ Locke never referred to himself as a scientist, or a natural philosopher; nor did he regard himself as one who was making a major contribution to knowledge of the physical world. But, he uses the results of the labors of the master-builders to clear the ground; he uses what they had

done to show how ungrounded speculation and the misuse and misunderstanding of terms deflect us in our struggles for knowledge. He is to show in the Essay the significance of those discoveries by developing their full implications for knowledge.¹⁴

Locke, in the Essay, turns to the new science for his beginning, his foundation. He turns to that science not as discoverer, but as one who will utilize the ideas of others to pursue the Essay's purpose. Given that science, what are the implications for knowledge of what exists, be it in nature, as mind, God; knowledge of morality; knowledge of those signs that are words. (E, 4.21)

Leibniz expresses a completely different attitude towards his contributions to knowledge. In the New Essays (and in others of his works and in his diplomatic activities), he regards himself as the great reconciler of opposing positions. Thus, in his own introductory comments--comparable to Locke's introductory first chapter--he outlines his position, in contrast to Locke's, through Theophilus, his voice in the New Essays. Referring to his "new system,"¹⁵ he writes, "This system appears to unite Plato with Democritus, Aristotle with Descartes, the Scholastics with the moderns, theology and morality with reason." (NE, 1.1;71)¹⁶ Leibniz as reconciler puts into perspective his accomplishments as scholar. He is a seventeenth-century Aristotle, searching the ideas of predecessors and contemporaries for positions on important issues, evaluating those positions, using what he finds "true" or insightful

before proceeding to formulate his own position.¹⁷ His relentless pursuit of exchanges of ideas with his contemporaries--including Locke--can be regarded as part of his method of developing his own ideas. The ideas of others have a significance for Leibniz in the working out of his own ideas that is totally different from the way Locke developed his ideas.

But Leibniz is more than the reconciler and the scholar. He is also one of the master-builders, although Locke would never see him in this light. His contributions to mathematics and to dynamics were substantial. Some five years after the genesis of Locke's 20-year project that became the Essay, Leibniz had begun to work out his differential calculus (in 1675); nine years later (in 1684), he published the basic outline of that calculus. (And that after a late start in his mathematical studies!) His correction of Descartes' conservation of motion to the conservation of force was a major contribution to dynamics.

Thus, the contrast between Locke and Leibniz, in light of how each regarded his own work, his own contributions: Locke, the under-laborer, working out the implications of the ideas of the master-builders, clearing away the debris resulting from the sweep of new ideas; Leibniz, the reconciler, scholar, formulator of new ideas that would resolve old disputes and old problems.

There remain two additional issues to touch upon in these introductory remarks. It is essential, first, to mention the many important questions that cannot be developed or

pursued in the way that their significance demands, even though they must be introduced here. Consider the question of substance which deserves (even demands) separate and independent treatment, and which will be discussed both in the Locke and the Leibniz sections. Substance is central, especially because Locke and Leibniz both are at the edge of working out radical redefinitions of a concept that goes back to Greek times, and in the context of discoveries that clearly made obsolete the traditional approaches. Locke's notion of real essences--those of substances particularly--has its own mysteries and problems. The issue of principle in Leibniz, and especially the specific principles that will be considered in the discussion of the grounds Leibniz has for the inadequacy of atomism--these are intriguing issues that will not be pursued beyond the demands of the study. Always, the specific focus of the thesis itself must be the guide.

The second, and not unrelated, issue involves the way in which the thesis will be supported; to express the point in more immediate terms, how the study is organized. The dissertation's thesis has suggested a two-part organization. Part One will explore how Locke's scientific convictions--his medical background as well as his acceptance of the corpuscular philosophy--determine his epistemology and his attitude towards those issues that are, ultimately, metaphysical; in particular, his renouncing of metaphysical speculation. It will show how the corpuscular philosophy determines positions which are crucial to Locke's conception of nature: qualities

and powers, material substances and their real essences. The study will turn, in Part Two, to Leibniz, to show that the basic grounds for his rejection of atomism are metaphysical; and then to examine the monad--the "true atom of nature" which is his metaphysical unit and which underlies his solution to problems that are at once metaphysical and scientific.

In this way, the primacy of natural philosophy--of science--for Locke is contrasted with the primacy of metaphysics for Leibniz.

Evidence to support the position taken here on Locke comes almost completely from the Essay. The case is not the same for Leibniz who, it will be recalled, does not use the New Essays to work out his major statements on atomism's inadequacies. Others of Leibniz's works will be referred to. The guide has been what Leibniz had already written by the time he was at work on the New Essays. Thus, there will be almost no reference to works--including correspondence--that appeared after 1705. The few exceptions from the post-1705 years were used because they presented a position made earlier in Leibniz's writings or because they express Leibniz's thinking and support for that thinking so clearly and in a way that is particularly pertinent to the present inquiry.

Each of the two parts begins with its own introductory comments and its own background discussion, to provide the basis of central issues that are taken up subsequently, and its own conclusions. There will be times when both introductory comments and some of the background discussion will

repeat points made in this introduction. It is trusted that the significance of the point, and the proximity to the actual discussion, will be reason enough to justify such repetitions.

Notes

1. The word usually cited to describe Kant's state of mind is "awakened." Kant's word in the Prolegomena to Any Future Metaphysics (260) from which the quoted phrase is taken, is unterbrach, "interrupted"; it is so rendered in the Carus translation (Indianapolis: Hackett Publishing Co., 1977, p.5) and the Beck translation (Indianapolis: Library of Liberal Arts, Bobbs-Merrill Co., 1950, p.8).

2. I.B. Cohen has discussed the origins of the designation of the period as the scientific revolution in The Newtonian Revolution (Cambridge: Cambridge University Press, 1980), in particular considering how "revolution" came to describe scientific progress. He traces the designation to the work especially of eighteenth-century French writers: Fontenelle, D'Alembert, LaLand, Bailly, in particular. The question of the precise dating of the scientific revolution is left open by these writers. There is no agreement about whether it is to be associated with Newton specifically, or with the entire seventeenth century, or was ushered in by Copernicus, or might have been begun even earlier. (chaps. 1 and 2, especially pp. 39-49)

3. "Nature" here, and throughout the study, refers to the physical world specifically. Human nature is excluded, even though there is an interesting and important issue about the continuity of physical and human nature in Locke's analysis of sensation (and in the thinking others in the seventeenth century, including Descartes and Hobbes).

4. Nicholas Jolley, in Locke and Leibniz: A Study of the New Essays on Human Understanding (Oxford: Clarendon Press, 1984), discusses a similar opposition in his introduction to that new and important work. (pp. 1-8 especially) Jolley's position on the real issue behind the New Essays will be discussed shortly, when that question is considered in some further detail. Many issues--background issues and those of more central important--raised in this study appear also in Jolley's newly published work. Needless to say, the ideas that are expressed here were conceived of and written without knowledge of Jolley's book.

Even before the publication of Jolley's book, R. E. Butts, in "Leibniz's Monads: A Heritage of Gnosticism and a Source of Rational Science" (Canadian Jrl. of Philosophy, X (March 1980): 47-62), discusses his thesis that Leibniz's metaphysics is the central concern.

5. Both these points--the question of what is the real issue behind the writing of the New Essays and the sources for Leibniz's arguments against atomism--will be considered later in this Introduction, as well as in appropriate places in the text.

6. Locke's responses to Leibniz's attempts at correspondence are recorded in the former's correspondence with William Molyneux in particular; these will be referred to below.

7. The conflict between Newton and Leibniz about who was the discoverer of the calculus has been discussed in many books and articles. A. R. Hall's recent Philosophers at War (Cambridge: Cambridge University Press, 1980) is devoted entirely to the conflict and some of the underlying issues.

8. In Locke and Leibniz.

9. Ibid., pp. 7 and 13-14. There are several sources in the Essay for this interpretation: Locke's speculations on whether God might have imbued matter with the capacity for thought (E,4.3.6; 4.10.10-13); and also--perhaps of greater significance--his explanation of the origins of ideas which, as we shall see, is dependent upon the corpuscular philosophy. (See below, chap. 2) Locke's discussion of whether matter can think met with considerable contemporary criticisms; witness especially the extended correspondence with Stillingfleet. The question of thinking matter, with Locke as the major source of the position, is now being given considerable attention. John W. Yolton's recent and important book, Thinking Matter (Minneapolis: University of Minnesota Press, 1983) explores the controversy beginning with Locke and in Locke's time, and its development during the eighteenth century.

The Socinians, who accepted a bare minimum of dogma, with that minimum excluding the Trinity (a position that might with fairness be attributed also to Locke), are not to be associated with the religious enthusiasts subjected to Locke's stern criticism and rejection in the Essay (4.19).

10. NE, Preface, 59; 1.1,70-72.

11. It should be noted that these connections have been made before. Further, they can be seen already in the thinking of Plato, for whom mathematics was so important, and Aristotle, whose biological orientation is so significant.

12. Louis E. Loeb, in From Descartes to Hume (Ithaca: Cornell University Press, 1981), opens to critical scrutiny the convention of categorizing seventeenth and eighteenth century philosophers in particular as Continental Rationalists and British Empiricists, the former exemplified by Descartes, Spinoza, and Leibniz, the latter by Locke, Berkeley, and Hume. He finds that "the distinction is fatally flawed." (p. 70) Without consid-

ering Loeb's arguments for that fatal flaw, and the grounds for a different approach and realignment, what is significant is the opening of that convention to different perspectives that might offer a sounder grasp of the issues to which philosophers were then responding--and what fed into their responses. The present study suggests that the primacy of natural philosophy--of science--as opposed to the primacy of metaphysics is another such perspective.

13. The passage continues at some length, and includes many ideas that are significant for understanding how Locke regards his "mission" in the Essay, and what he identifies as the problems the Essay was conceived to solve.

14. The passage in the Epistle, just referred to, helps put into focus the final chapter of the Essay (4.21), in which Locke writes of the "compass of Humane Understanding." The entire Essay is that rubbish-clearing enterprise whose goal is to show what we can know. It pursues this purpose by showing first how ideas--as the materials of knowledge--originate. It then tackles the issue of language, before dealing with the subject of knowledge itself, concluding with Locke's brief statement of the division of knowledge and the extent of knowledge.

15. Leibniz tells us that he has read about that "new system" in the "learned journals . . . and in M. Bayle's marvellous Dictionary, in the article entitled 'Rorarius' . . ." (NE, 1;71) The reference, of course, is to that New System of the Nature and Communication of Substances which is the pre-established harmony. (PPL, pp. 452-460; also, pp. 492-497 and 574-585)

16. Leibniz continues, with his usual lack of modesty: ". . . it takes the best from all systems and then advances further than anyone has yet done." (NE, 1.1;71) Even though he is the great reconciler, he also associates Locke with the tradition of Aristotle, himself with that of Plato. (NE, Preface; 47)

17. Aristotle, of course, was not bent on reconciling differing positions, but, rather, on finding what was significant or fruitful or "true" in the ideas of others.

Part One

The Idea of Nature in Locke's 'Essay'

Introduction

Locke begins An Essay Concerning Human Understanding with a lengthy introduction in which he discusses his purposes in writing the work, what he hopes to achieve, and the method he will use to pursue his purposes and hopes. The grand purpose of the work is "to enquire into the Original, Certainty, and Extent of humane Knowledge; together with the Grounds and Degrees of Belief, Opinion, and Assent; . . ." (E,1.1.2) Some 69 chapters--and, in the Nidditch edition, 700 pages--later, he concludes with a brief statement of the threefold division of the sciences, of "All that can fall within the compass of Humane Understanding . . ." (E,4.21.1): natural philosophy (physike), "The knowledge of things, as they are in their own proper Beings, their Constitutions, Properties, and Operations . . ." those "things" to include spirit and mind as well as matter and body; ethics (praktike); and the "Doctrine of Signs," or logic (symeiotike, logike). (Ibid., 2-4)

The subject of the present study in this, its first part, falls into Locke's first category, natural philosophy--though it does not exhaust that category. For, its concern is with that aspect of natural philosophy which deals with matter and

body, "as they are in their own proper Beings." Its concern is nature, the idea of nature specifically, as it emerges from and is suggested by the Essay.

In identifying those elements which enter into Locke's idea of nature, it is important to keep in mind two points: first, how Locke defines natural philosophy; and, second, that he finds a knowledge of natural philosophy possible. Natural philosophy is included within those purposes Locke outlines at the Essay's beginning. It is one of the "Objects of the Understanding"; it is part of Locke's purpose to explore the extent to which it may be known, and what are the grounds and degrees of our belief, opinion and assent in relation to natural philosophy.

But, there is an additional issue to be raised before we get on with the proper business of this introduction to the consideration of Locke's idea of nature. And that issue takes us back to the Essay's Introduction; there, Locke is explicit in his reluctance to become engaged in certain of those concerns of natural philosophy. He tells us:

I shall not at present meddle with the Physical Consideration of the Mind; or trouble my self to examine, wherein its Essence consists, or by what Motions of our Spirits, or Alteration of our Bodies, we come to have any Sensations by our Organs, or any Ideas in our Understandings; and whether those Ideas do in their Formation, any, or all of them, depend on Matter, or no. These are Speculations, which, however curious and entertaining, I shall decline, as lying out of my Way, in the Design I am now upon.

(E,1.1.2)

His purpose, rather, is to "consider the discerning Faculties of a Man, as they are employ'd about the Objects, which they

have to do with:" (E,1.1.2) His stated concern is not with the objects of knowledge, with what it is we seek knowledge of, but with the mind as that which has the capacity to know, or to have beliefs and opinions, and to give assent. He denies a concern with the physical and physiological exploration of the process of cognition and with the "essence of the mind," both relegated to "speculation." Such speculation, further, lies outside his "way"--the historical, plain method of the Essay; and his "design"--expressed in his opening statement of purpose. Locke begins at what he would call the beginning of that process through which the mind comes to know, by addressing himself to the sources of our ideas.¹

Thus, Locke's purpose in writing the Essay is explicitly epistemological. He is neither scientist nor metaphysician in the Essay; he does not set out to write about nature, nor does he in fact end up writing about nature. Nonetheless, the natural world--and thus both science and metaphysics--is central to the Essay. For, there is an idea of nature embedded in the Essay, and it is the purpose here to ferret out those elements which go into that conception. The fundamental elements are to be sought in what Locke brings to the Essay--in his scientific background and orientation, including methodological convictions. Others are developed within the Essay itself--in spite of Locke's initial statement disavowing such "speculations."

We will begin with Locke's scientific background, including those influences that prevailed throughout the 20

years of the Essay's writing, and the 14 additional years that saw four revisions of the original edition of the work. Discussion of where Locke stands in relation to the science of his day is central to an understanding of the Essay. It would be impossible to delineate his idea of nature without prior consideration of his scientific background and experience, without examining those influences which molded his thinking on those aspects of natural philosophy which might properly be termed scientific.

With this in mind, let us begin by looking at Locke's scientific background and orientation as a way of identifying the ideas and convictions that govern his approach to nature.

Notes

1. In the order of Locke's discussion, this "beginning" follows Locke's arguments against innate knowledge--the burden of Book I.

Chapter I

Locke's Scientific Background and Orientation

John Locke, born in 1632, came of age in the midst of the intellectual, political and religious ferment of seventeenth-century England. For his entire adult life, until his death in 1704, he lived at the center of that ferment, influenced by it and, it is fair to say, exerting a reciprocal influence upon events, people, ideas.

The central concern here is with that aspect of the intellectual upheaval that eventually came to be known as the scientific revolution, specifically with how its uniquely British form fed into Locke's way of thinking, with how it provided the scientific context in which his ideas took shape and developed.¹

An Essay Concerning Human Understanding began its 20-year development in 1670, according to comments of those involved in its inception, out of a discussion which took place at a regular gathering of some half-dozen friends--"citizens" of the "commonwealth of learning."² Speculation about the subject that would ultimately grow into the monster Essay always places the issue of knowledge as central; the usual assumption is that a question of moral knowledge was involved.³ Whatever the actual subject, Locke volunteered to write "a few pages" for

the next meeting, proceeded to do so, and found that a brief discussion of the issue was hardly adequate to the subject. For, the door that had been opened was one that required consideration of knowledge, without regard to what it was knowledge of.

In the course of those 20 years from inception to publication, Locke wrote drafts of the work, discussed the issues with fellow "virtuosi,"⁴ commented in his journals and in correspondence on the questions that kept emerging as the work developed. All this while pursuing his varied interests and commitments, especially those related to his personal, medical, and, eventually, political association with Anthony Ashley Cooper--later Chancellor of the Exchequer, Lord Chancellor, first Earl of Shaftesbury. For, when Locke was invited to join the Ashley household in 1666, the major function he was to fulfill was a medical one: he would be the household physician.⁵

The connection between Locke's medical training and skills, and the questions about knowledge which provided the impetus for the writing of the Essay lies behind this consideration of Locke's scientific orientation. We are accustomed to link the ideas in the Essay with others of Locke's activities and commitments, including the political. However, we tend to forget--or ignore--that Locke was a practising physician for much of his life, constantly in touch with fellow practitioners, always advising friends and acquaintances on matters medical.⁶ A concern with Locke's idea of

nature requires that this connection with the sciences of his time be explored to ascertain the influence that that science had on the Essay.

The evidence we have from Locke's journals and correspondence, as well as from his published works, reveals how deeply Locke was involved in issues and activities political, philosophical, scientific, theological; a part of the intellectual movement that rejected the influence of methods and ideas grounded in that authority which had tradition as its basic justification.⁷ That rejection brought with it a heightened emphasis on observation, on experiment, on experience. It is an intellectual commitment that not only permeates the Essay; it is the approach which provides the foundation of Locke's purpose and his ideas.

The point is that Locke came to the Essay not himself tabula rasa, but with an intellectual orientation that began to be formulated in the early 1650s when he entered Oxford's Christ Church College as an undergraduate. In the almost 20 years that passed between 1652 and the inception of the Essay, Locke was exposed to, and then became part of, an intellectual movement that had a scientific movement as its foundation. He arrived at Oxford, University and town, at the same time as did a group of leaders in the developing scientific movement in England. They were men who had already come together to discuss ideas in astronomy, physics, medicine, chemistry, meeting at Gresham College (or in nearby taverns) in London. There were others influenced by the social and educational

ideas of Comenius and Samuel Hartlib--those whom Robert Boyle would refer to as the "Invisible College." Some were involved in both groups. Eventually they would come together to form the Royal Society.⁸

Locke entered a university in which the influences of the traditional and the revolutionary both were present. On the one side, the curriculum (and its accompanying teaching methods) continued the Scholastic tradition with its disputatious wrangling, its logic, rhetoric, and Latin. On the other side was the new science, with its emphasis on observation and experiment, methods that were polar opposite to those that prevailed in what many regarded as the moribund Scholastic tradition. Locke was exposed to both ways; the records of his life at Oxford reveal the extent to which he came to reject the traditional and embrace the new.⁹

The Essay's true genesis, then, can be traced back further than that 1670 discussion in London. It can be traced back to Locke's formative years at Oxford.

This discussion of Locke's scientific background will consider four categories of influence: first, his scientific interests and activities, centered on medicine and chemistry (in the infancy of the latter); second, his convictions about the methods for obtaining knowledge; third, the corpuscular philosophy; and, finally, his membership in that intellectual community referred to as the commonwealth of learning.

1.1: Locke's Scientific Interests and Activities

It has been noted that for much of his adult life, Locke practised medicine. He chose medicine as his profession after he received his Oxford baccalaureate, rejecting the ministry and the law (the latter his father's profession); choosing medicine as the remaining possibility that would allow him to remain at the University without taking orders.¹⁰ Even though he was not granted the degree of Bachelor of Medicine until February 1675, he diagnosed illnesses and prescribed treatment before then.¹¹

The medical thread runs through Locke's journals and especially through his correspondence. The former records, in detail, the treatment Locke gave many of his patients, including descriptions of the course of their illnesses and of the ways other physicians treated various ailments.¹² The correspondence is filled with exchanges with friends, relatives, patients, about medical and even psychological problems; the letters usually sought Locke's advice for treatment.¹³ There are exchanges with fellow physicians, some of whom were close friends, others known only through reputation (theirs or Locke's) and correspondence, about the treatment of specific diseases and of a variety of medical and psychological problems.

In addition, the written records reveal how much of Locke's attention during his travels on the Continent reflect this medical orientation. The places he visited, the people he sought out and met, were frequently (not always, of course)

determined by a medical connection or a medical reason.¹⁴

Two points, at least, are significant in this consideration of those aspects of Locke's background that reveal his approach to science: first, the detailed descriptions of the course of a disease; and second, the prescriptions used by Locke or recommended by other physicians--those "receipts" or "recipes" discussed in the correspondence and described in the journals. The first is more closely related to the issue of method; for, the descriptions are histories. Each description is an example of the "historical, plain method" of the Essay in action in a practical context, and in this way clarifies the meaning and procedures involved in that method.

(E, 1.1.2).¹⁵ The second concerns medical chemistry--iatrochemistry, the chemical treatment of disease. Thus, if we consider Locke's medical interests only, we find guides to his approach to the Essay. These guides are found in the method for study and investigation, and in the significance of chemistry in Locke's scientific pursuits. The former will be considered in the next section, in the discussion of method; the latter will now concern us.

Locke's interest in matters scientific was apparent early in his Oxford years, certainly by the mid-1650s. What seemed to interest him most even then had some relation to medicine, or would eventually be seen in that relation; in addition to medicine itself, chemistry, botany, biology, even geology and minerology as they were related to the sources of the ingredients of medicinals. In pursuing these interests,

Locke turned away from the traditional approach of the traditional curriculum, and towards those at Oxford--again, town and University--who were involved in studying and exploring these sciences with new methods and new ideas. Those methods and ideas were new in the sense that they were associated with the rejection of the methods and ideas of Aristotelian and medieval science, and of the tradition of Galen in medicine.¹⁶

It is impossible to know whether it was Locke's proximity to practitioners of the new science that was the initial stimulus, or whether his temperament and intellect made him question the traditional curriculum and then turn elsewhere. It doesn't really matter which came first. What does matter is that among fellow students, university faculty, and people living in the town of Oxford, Locke met and came under the influence of those who shared with him an approach to the sciences that expressed a rejection of the old and a pursuit of new approaches to subject-matter and method.¹⁷

One of the central interests was chemistry; not chemistry as we know it today, but that discipline in the early stages of its emergence from alchemy.¹⁸ It was central because it was a link that connected the different scientific pursuits of Locke and the Oxford circle of which he became a part. These were early years in the development of chemistry as a modern science; what would eventually emerge as that science in the next century had roots in alchemy and iatrochemistry.¹⁹

Iatrochemistry was a mainstay in the treatment of illnesses, at least among those who no longer had their heads in Galen's treatises.²⁰ Knowledge and skill were central in finding and combining the possible elements (not, of course, chemical elements in the modern sense) to effect cures and to alleviate symptoms. The ingredients came from nature--from fauna, flora, minerals. This made vital a knowledge of botany, zoology, mineralogy and so on, as sources of medicinals. Also, there would have to be knowledge of what, how much, and how to combine the ingredients; most of the techniques of combination required the use of heat. There was, therefore, a concern with method, at every step--with observation, with experiment.

Locke was drawn to those activities relating to the treatment of disease, and to the ultimate nature of matter. His concern, at least during his Oxford years, was with those sciences that would be related to medicine, rather than with physics, astronomy, mathematics.²¹ Further, there is evidence that in the Oxford years preceding his association with Lord Ashley (before 1666, that is), Locke was--to use a later designation--a pharmacist, spending time preparing medicinals for the use of physicians and for those for whom he prescribed directly.²²

Locke's interest in alchemy would have had a similar impetus. He, along with Boyle and other major and minor natural philosophers (including Newton some years later), was interested in and at times even practised alchemy. It could

be a respectable pursuit, without the connotations of magic that today we tend to associate with it. There were aspects of a concern with alchemy that were closely related to explorations into the nature of matter, specifically to the particle theory of matter. For, if mass matter is made up of qualitatively undifferentiated particles (even if, in some theories, there might be three or four basic or ultimate elements), then perhaps recombinations of particles under certain conditions would produce mass matter with changed and desired characteristics; a potion to cure the gout, for example; or Boyle's "red earth" transmuted into gold.²³ Within the context of medicine, alchemy would involve and lead to the experimentation with different natural elements--excluding herbs, and focusing on certain metals especially--to discover how they might be combined and modified for the treatment of diseases. The alchemists, too, had their medical theories, including theories of how diseases were to be treated and why they were to be so treated.

This brief summary of Locke's scientific background, beginning with his early years at Oxford and developing into his profession as a physician, suggests the influence of medicine and chemistry on his thinking--an influence that would have been significant at the time the Essay was begun in 1670. His approach to the working out of the problems which the Essay addressed would have to be affected by that background, by his experience as a physician, by the methods he was familiar with in the treatment of illnesses.

We turn next to the issue of method--an issue closely related to Locke's medical background, but one demanding separate discussion--to consider its influence on the method of the Essay, and of the acquisition of knowledge in general.

1.2: Methods of Attaining Knowledge

At the Essay's beginning Locke tells the reader that the method he will use in his inquiry into the "Original, Certainty, and Extent of humane Knowledge" is to be the "Historical, plain Method." (E, 1.1.2) What is that method? What is its source? What are its implications? What is Locke's own experience with it--outside the Essay and its writing?

In the position for which Francis Bacon is the initial major spokesman in seventeenth-century England, the method of attaining knowledge has its basis in experience--in the careful, detailed, and accurately ordered and recorded observations of the subject or phenomenon under consideration. An individual--any individual--trained to make and record those observations can contribute more to the "advancement of learning" than could one steeped in knowledge of the writings of others.²⁴ No extraordinary requirements are necessary; just the capacity to observe carefully, and then to record those observations with precision.²⁵

Observation as the basis for building knowledge of nature suggests, at the least, two kinds of procedures, or, possibly, ways of regarding a single basic method: one is

experiment, with the results carefully and precisely recorded; the other, the historical, plain method.²⁶ Locke, in the Essay, does not offer any experiments to support the development of his position. His use of the word "experiment" almost always means "experience."²⁷ But, whether there are two methods or a single method--whether that historical, plain method is identical to the careful recording of experiences--there was always a rejection of the use of hypothesis as the starting point.²⁸

A pertinent illustration of the contrast between the historical, plain method--with its emphasis on observation--and an adherence to traditional authority is to be found in the contrast between the practice of medicine by a Galenist and that of Thomas Sydenham.²⁹ The former would refer to the works of Galen to determine what to expect; where the findings disagreed with what Galen described, there was something amiss with patient or disease, or, perhaps, observer. The disease had to fit the text; the text determined the interpretation of the observation.

Sydenham's method--and it was a method that Locke took up in his own medical activities--was to approach each case as unique and individual. He would seek the course--the history--of that particular illness in that particular person. Although the treatment would have to be based upon the physician's accumulated experience with the treatment of similar symptoms in similar circumstances, the approach and diagnosis would not be predetermined.

This is the method that permeates the Essay. It underlies the criticisms of hypothesis that Locke makes in the Essay.³⁰ For, the historical method is opposite to the method of hypothesis, and especially to any hypothesis which appeals for support through the authority of its source. The historical method is a method of precise description of what is observed or what is experienced. Locke's aim in the Essay is to provide a history of that process by which the human mind, the human understanding as capacity--beginning with birth--gradually comes to have ideas and, ultimately, knowledge.³¹ His rejection of innateness in any form, other than as capacity, is to be associated with the rejection of traditional authority and with his acceptance of a contemporary Baconian method grounded in the careful record of the course of phenomena made by those trained to carefully observe and then record that course.

The second of the methods (or another aspect of the same method) is that of experiment. Again, the experiment is to be free of any preconceived hypothesis; any hypothesis involved must have its basis in many experiments, and must be open to future modification and verification. This--the conducting of experiments--was a primary activity of those groups which eventually came together to form the Royal Society. Locke became involved with the group at Oxford, initially as a student observer, eventually as a participant in the laboratory established by and operated under the direction of Robert Boyle. The Oxford meetings were held in Boyle's laboratory.

Those attending would gather to observe experiments performed by Boyle and--more likely--his assistants. This, in fact, was to be a major purpose of the Royal Society: its members met to observe and to discuss experiments devised by its members, or by non-members invited for that purpose, or, most usually, by its own official curator of experiments employed for that specific purpose.³² Non-member notables (including the Society's patron, Charles II), and visiting scientific dignitaries (including Huygens and Leibniz) would be invited to attend meetings and witness experiments.

Although Locke certainly witnessed experiments and may even have been involved in them--especially at Oxford--and was eventually a member of the Royal Society³³--he seems to have left this aspect of the accumulation of knowledge to others of his contemporaries, including those "master builders"--Newton and Boyle, Huygens and Sydenham.³⁴

Thus, Locke brings his convictions about method, developed in his own practice of medicine and in his participation in the activities of scientific groups, to the writing of the Essay. It is the method of the Essay; it is the method which forms the basis for our knowledge of nature. Experiment, careful observation, the keeping of records of those experiments and observations to serve as the formation of histories of natural phenomena: these are the bases of any theory of nature and the means for knowing nature. The method of discovery and of the acquisition of knowledge must reveal something essential about that which is discovered, about what we seek to know.

1.3: The Corpuscular Philosophy

A third influence on Locke's scientific orientation is the one referred to in Locke's time as the corpuscular philosophy. It was a theory about the nature of matter that had its roots in Democritean and Epicurean atomism, but it was identical with neither.³⁵ We will consider Locke's corpuscularianism in detail in Chapter II. The issue here is the nature and status of particle theories of matter in the seventeenth century--with specific reference to the theory that had the most profound influence on Locke's thinking: the corpuscular philosophy of Robert Boyle.³⁶

The particle theory of matter--atomism--that originated in fifth-century Greece and had its most influential expression in the form associated with Epicurus, had suffered a centuries-long eclipse.³⁷ It was revived by the late sixteenth century, and by the seventeenth century the foundations were laid for the scientific development of a particle theory of matter. This renewed particle theory took two basic forms: that of Descartes, and that of Gassendi. It was the latter theory that took root in England, transplanted and reinterpreted primarily through Walter Charleton's Physiologia Epicuro-Gassendo-Charltoniana of 1654. The intellectual soil had already been prepared by the ideas of Bruno (who had been in England in the 1580s), of Thomas Hariot and his "circle." and then of Hobbes and those who were with him in France during the 1640s--refugees from the Revolution. Charleton (later the physician to Charles II), was one of that last

group, and it was at this time that the writings of Gassendi found in him their instrument of translation, and of transmission to England.³⁸

There was nothing accidental about the revival of atomism in the seventeenth century. It went hand-in-glove with the development of the mechanical philosophy--that interpretation and conception of the natural world which explained all phenomena in nature as, ultimately, the result of matter in motion. The mechanical philosophy required a particle theory of matter, and the seventeenth century obliged with the two theories of Descartes and Gassendi. In the theory of Descartes, there were three sizes of particles, infinitely divisible, moving in a vortex, and with all motion through direct contact.³⁹ In Gassendi's atomism, the ultimate particles were not differentiated by size, were finitely divisible, and moved in the void.⁴⁰

One of the serious issues involved in the seventeenth century's acceptance of atomism was its source in ancient, pagan Greece: its association with "godless Epicureanism." Gassendi's re-interpretation was a significant beginning of the rehabilitation of atomism; he was, after all, a priest. But, the major expression and influence in England was Charleton's work. Not only was the Deity not excluded by a relentless mechanism, but it could be shown that atomism could conform to the demands of English Protestant Christianity.⁴¹

In addition to the needs of natural philosophy for a particle theory of matter (as well as the need for the re-

moval of theological opposition to atomism), there was also growing evidence for it. That evidence came from two sources, both of major significance for grasping the science of the Essay. There was, first, the evidence supplied by the microscope. What was observed through the microscope provided support for the theory that all matter was made up of units not accessible to the unaided eye; and that many of the qualities of phenomena could be explained by the properties of those units.⁴²

A second support for a particle theory of matter is found in the chemical and physical-chemical theories and experiments of such scientists as Robert Boyle. Boyle was, in fact, a major influence on the development of Locke's own position on the nature of matter, for several reasons: Boyle's position of leadership among the proponents and practitioners of the new science; his own experiments and those conducted under his direction; the number and nature of his publications, including the experimental evidence for his corpuscularianism which many of those publications presented; and, perhaps most important, the fact that Locke became acquainted with Boyle at a crucial time in his (Locke's) intellectual development. It has been pointed out that Locke knew Boyle by 1660--the date of their first correspondence.⁴³ Locke witnessed experiments in Boyle's Oxford laboratory, took part in those experiments and in the other activities of the laboratory, and by 1663 was a part of the chemical study group that met in Boyle's Oxford quarters. Locke's friendship with Boyle

continued until the latter's death; he was preparing a work of Boyle's for publication at the time. Locke read--or, at least, possessed--all of Boyle's published work.⁴⁴

In considering Boyle's corpuscular philosophy, we will single out those ideas that are central to it and that also are clearly significant in Locke's Essay in the sense that they are among its scientific underpinnings. Whether those ideas may be attributed to Boyle exclusively, whether Locke may actually have contributed to them--these are questions that will not be considered here; the Essay is evidence that Locke clearly absorbed those ideas. The purpose here is not to explore Boyle's overall influence on and contributions to Locke's thinking; nor is it to present an exhaustive summary of Boyle's ideas, even those related to corpuscularianism. For this reason, comments about Boyle will be limited to his major statement, The Origin of Forms and Qualities, first published, in 1666.

Boyle's purpose in Origin is to present a position on the sources and causes of the properties of natural phenomena, in opposition to the doctrine of substantial forms. The problem is to account for the nature of objects by explaining what it is that determines what anything is and why it has its specific properties. Boyle seeks to discredit the doctrine of substantial forms as a tenable explanation by showing that--and how--the properties of each thing are the result of its specific component particles, with the experimental evidence to support his position.⁴⁵ Boyle divided the work into two

parts, one theoretical, the other "historical"--the latter consisting of a series of experiments to support the corpuscular theory and out of which the specifics of that theory emerged for Boyle.⁴⁶ The qualities found in natural phenomena are not determined by the substantial forms of the schoolmen, but, rather, have their source in the nature of matter. Boyle's basic unit of matter is the particle. The particle is, in his words:

. . . too small to be, whilst single, sensible; and being intire or undivided, must needs both have its determinate shape, and be very solid. Insomuch, that though it be mentally, and by divine Omnipotence, divisible, yet by reason of its smallness and solidity nature doth scarce ever actually divide it; and these may in this sense be called minima or prima naturalia. 47

These particles in turn make up the corpuscles, "little primitive concretions or clusters of particles." (BOF, p. 30)

These clusters are divisible into their component particles, but because they adhere so closely and strictly, this rarely happens. Rather, ". . . they remain intire in great variety of sensible bodies, and under various forms or disguises."

(Ibid.)⁴⁸ Thus, it is the particle that is the basic unit of matter, identified by those properties that are shared by all matter: ". . . there is one catholick or universal matter common to all bodies, by which I mean a substance extended, divisible, and impenetrable." (Ibid., p. 15) These are the properties of all matter, from the minima to the largest of masses.⁴⁹

The question is: given "universal matter," what differentiates it? What causes changes in the properties of matter,

including its generation and corruption? Boyle's answer is motion: ". . . local motion seems to be indeed the principal amongst second causes, and the grand agent of all that happens in nature." (Ibid., p. 15) The first cause is God, the "wise author of things" who "established the laws of motion among bodies," and "by guiding the first motions of the small parts of matter, ∫d̄id∫ bring them to convene after the manner requisite to compose the world . . ." (Ibid.) Motion, therefore, is not inherent in matter; it must have its ultimate source in what is not matter: ". . . local motion, or an endeavour at it, is not included in the nature of matter."

(Ibid.)⁵⁰ The two points combined--that motion is the immediate cause of all natural phenomena, and that motion is not inherent in matter--are central to Boyle's mechanical philosophy: all properties exhibited by bodies, all changes that take place in nature are the result of motion and, thus, are mechanical. The machine is the model: ". . . the motion, size, figure, and contrivance of the parts of corporeal agents are the mechanical affections of matter, so called because to them men willingly refer the various operations of mechanical engines." (Ibid., p. 13)⁵¹

The third element in Boyle's corpuscularianism, also basic to his mechanical philosophy, is that each part of matter--from the "minutest" or "primitive fragment" to the "biggest masses of universal matter" must have its own "magnitude ∫or size or bulk∫ and its own figure or shape." (Ibid., p. 16) These are the "inseparable accidents of each distinct part of

matter." They are "absolute" accidents "since a body would have it were there no other in the world." (Ibid., p. 22) Boyle refers to the possibility of calling these "inseparable accidents" the "moods or primary affections of bodies . . ." (Ibid., p. 16) There are, in addition, "relative" accidents: posture and order. These two refer to the corpuscle's position relative to other corpuscles or corpuscle clusters: posture, to the individual corpuscle as erect, inclined, horizontal; order, to individual and cluster as beside or behind other individual corpuscles or clusters. Both are reducible to situation. And, finally, there is texture: "the disposition or contrivance of parts in the whole." (Ibid., p. 22)⁵²

The list of qualities now consists of bulk (size, magnitude), figure (shape), situation, and texture; the first two the absolute, the second two the relative accidents of matter. These, in addition to impenetrability, or solidity, and extension, and--with some qualification--divisibility, are the properties of universal matter. These are the simple and "primitive affections" of matter. (Ibid., p. 23)⁵³

These Boyle now distinguishes "from the less simple qualities (as colours, tastes, and odours) that belong to bodies upon their account . . ." Ibid., p. 16); the "sensible qualities" which we attribute to bodies, though

there is in the body . . . nothing of real and physical but the size, shape, and motion or rest, of its component particles, together with that texture of the whole . . . (Ibid., p. 23)

The secondary qualities (of Locke) have now been distinguished

from the simple and primitive affections. (Ibid., pp. 23-24)

Thus, Boyle designates the sensible qualities; his "primitive affections" are the primary qualities of the Essay.⁵⁴ He describes the process by which the organs of sense,

. . . each of distinct and peculiar texture, whereby it is capable to receive impressions from the bodies about it, are affected by the figure, shape, motion and texture of bodies being fitted to affect the eye, others the ear, others the nostrils, etc. And to these operations of the objects on the sensories, the mind of man, upon the account of its union with the body, perceives them givith distinct names . . . (Ibid., p. 23)

Boyle has, in this way, identified two types of qualities, or "affections," of matter: the first, intrinsic to matter; the second, the result of the effects of the first on human sense organs.⁵⁵ (Motion and rest are, technically, not affections of matter because they are not intrinsic to matter.)

But now, in addition, matter has effects on matter independent of human senses:

And as it is by their qualities that bodies not immediately upon our senses, so it is by virtue of those attributes likewise that they act upon other bodies, and by that action produce in them, and oftentimes in themselves, those changes that sometimes we call alterations and sometimes generation or corruption. (Ibid., p. 11)

Further:

. . . we must consider each body, not barely, as it is in itself, an intire and distinct portion of matter, but as it is a part of the universe, and consequently placed among a great number and variety of other bodies, upon which it may act, and by which it may be acted on in many ways . . . (Ibid., p. 20)

Boyle's corpuscularianism, then, includes tertiary qualities, those "barely powers" of the Essay (2.8.10 and 24); and, it contains the heart of the remarkable passage in 4.6.11, in

which Locke speculates that events (motions) at the farthest reaches of the universe may affect the behavior of matter that comes within the scope of human experience.⁵⁶

Thus, by 1666, Boyle had formulated a corpuscularian philosophy that would show the uselessness of substantial forms as a means of explaining the qualities of bodies, and therefore of natural phenomena; that offered a theory of the nature of matter and its actions, supported by observation and experiment (the burden of the historical part of Origin) to account for those qualities by mechanical means--by motion acting upon corpuscles and their component particles--to effect changes in size, shape, situation, and texture of mass matter; that distinguished three kinds of qualities (Locke's primary, secondary, and tertiary qualities); that extended the mechanical interactions of matter from sources beyond the immediate human environment; and, finally, through the position that motion is not inherent in matter, pointed the direction for Locke's distinction between active and passive powers.

Throughout his discussion of qualities, Boyle never refers to our ideas of qualities; his concern always is to explain that process that accounts for the qualities of bodies, and the changes of those qualities, based upon the minima, or prima, naturalia, and supported by painstakingly described experiments--all to show the inadequacies of substantial forms to account for the properties of natural phenomena.

None of this is intended to demonstrate that Locke's position on qualities is a mere repetition or copy of Boyle's

position. Locke's concern always is with ideas; Boyle's, with the properties of matter qua matter and their sources. However, Locke did bring to the problems of the Essay a position on the nature of matter and the process of change in nature. That position has its source in the corpuscular philosophy--the mechanical philosophy worked out by Boyle and based upon experiment and observation. Locke's adoption of corpuscularianism expressed a conviction about nature, and the nature of matter. It was a conviction that determined the direction which the Essay would take in working out the questions which are its basis.

1:4: The Virtuoso in the Commonwealth of Learning

There is one final point to raise in this brief examination of Locke's scientific orientation: his view of himself as a "virtuoso" in the "commonwealth of learning."⁵⁷

In the Essay itself, there are but two references to the commonwealth of learning: in the "Epistle to the Reader" and at the beginning of the chapter, "Of Enthusiasm" (4.19). There is no reference at all to the virtuoso. Nonetheless, Locke's correspondence is filled with references to the commonwealth of learning--to actual meeting but more important to the idea of community which the commonwealth expresses. And, the correspondence remarks constantly about friends, associates, and Locke himself as virtuosi. Locke brings to the writing of the Essay an attitude towards himself, his work, his interests, his involvement in an endeavor shared

with many of his contemporaries, a position about the attainment of knowledge and those engaged in its pursuit.

There will be no attempt here to trace the sources of the terminology and the ideas involved. It is possible, however, to clarify the meanings of the terms and their significance, and through this to clarify Locke's attitudes towards his own contributions to knowledge. We have already discussed the central influence of Francis Bacon, with his assertion that trained and careful observers, systematically recording their observations of natural phenomena and sharing those observations with others, will ultimately build up that knowledge which will reveal nature's secrets.⁵⁸ There are two key ideas here: First, the observer need not be a professional, in the sense of being trained or schooled in any special way. Second, the work is not for one person alone; the pursuit of knowledge through observation and experience is a shared activity. The Royal Society epitomizes the Baconian ideal; it is Salomon's House brought to fruition. Most of its members regarded themselves as virtuosi, joined together to share observations and experiments in a formally organized and officially recognized commonwealth of learning, working for the advancement of learning.⁵⁹

But, one need not be a member of the Royal Society, or of any formal group, to contribute to that advancement. For, the commonwealth of learning referred not to a formally organized group, but to the totality of individuals joined in spirit and interest to pursue all aspects of knowledge: scientific

(in the broad sense that all of the natural world was a major concern), moral, theological, political, philosophical--the nature of knowledge itself, as the Essay bears witness. The pursuit of knowledge could be undertaken in many ways: in regular meetings of a few people, come together for discussion of common interests; in correspondence; in laboratories, such as the ones equipped by Boyle in Oxford by the early 1650s and by the 1670s in London when Boyle took up permanent residence there; it could be in groups formally organized for such endeavors. In regarding themselves as virtuosi, those meeting together expressed the breadth of their interests and acknowledged that a reliance on individual intelligence and effort were crucial to all intellectual achievement.

Further, during travels or other extended periods away from home city and circle, fellow virtuosi in the commonwealth of learning would be sought out, with introductions arranged through mutual friends and associates. It was a ready-made community to join during a prolonged absence from home. Locke --at home in England, traveling in France in the 1670s, living in the political safety of Holland in the 1680s--sought out and became part of an intellectual community of fellow amateurs in pursuit of learning: physicians, theologians, businessmen and merchants, government officials--friends who would continue to share ideas even when they were no longer able to meet and talk. Their extensive and continuing correspondence is testimony to the strength of the commonwealth, and to the attitude of its citizens towards themselves and

each other as contributors to the growth of knowledge.

This characterizes Locke's attitude towards himself: not a "master-builder," such as Newton or Boyle, or Huygens or Sydenham. but an "under-labourer," an amateur who could add to the store of knowledge through his own intellectual efforts (grounded in experience and observation), and through sharing and exchanging experiences, observations, ideas, with fellow amateurs.

And so the Essay: a celebration of the amateur as scholar.

Summary

Four factors central to Locke's scientific background and development have been considered:

. Scientific activities, including training and long years of experience as a medical doctor. Locke was both theorist and practitioner in his approach to the diagnosis and treatment of illnesses. The latter is significant especially for its relationship to the study of natural materials and their properties in combination as major elements in treatment: chemistry and pharmacology in embryo.

. Methods of attaining knowledge, exemplified by the practice of medicine and the study of chemistry's precursors. These emphasized careful observation; the treatment of each situation as unique, even though experience with similar cases would always be a point of reference; the experimental combination of different material elements for use as medi-

cinals.

. The profound influence of the particle theory of matter, specifically the corpuscular philosophy as it was formulated by Robert Boyle.

. The attitude that learning and knowledge would result from the contributions of amateur scholars--virtuosi--joined in an intellectual commonwealth for the advancement of learning.

These four categories of influence certainly do not exhaust the possibilities; the influence of Descartes, for one, has central significance. However, because the present focus is on Locke's atomism, the emphasis here is on the scientific orientation he brings to the working through of the Essay's stated purpose: the "Original, Certainty, and Extent of humane Knowledge; together with the Grounds and Degrees of Beliefe, Opinion, and Assent."

Notes

1. Whether there is a uniquely British expression of a spirit of scientific change and of scientific method, going back through Francis Bacon to Robert Grosseteste and to William of Ockham, and that might underlie change and method is an issue that is not developed here, though the issue of method will be considered in relation to Locke's background, in 1.2. Certainly, the influence of Francis Bacon, with his emphasis on observation and experience, is central--both in spirit and in method.

2. See 1.4 for discussion of the commonwealth of learning.

3. Locke mentions the Essay's genesis in his "Epistle to the Reader" as arising among ". . . five or six Friends . . . discoursing on a Subject very remote from this . . ." (E, Epistle, p. 7) Alexander Campbell Fraser writes in the introduction to his edition of the Essay that James Tyrrell--a friend of Locke from the Oxford days and one of those friends "discoursing" who is cited by Locke--identified the subject as the "principles of morality and religion." (John Locke, An Essay Concerning Human Understanding, Alexander Campbell Fraser, ed., 2 vols. New York: Dover Publications, 1959. I, xvii)

Kenneth Dewhurst, in John Locke: Physician and Philosopher (London: Wellcome Historical Medical Library, 1963), suggests the possibility that the issue might have involved medical knowledge, because several of those present were involved in matters medical. (p. 44) However, considering Tyrrell's comment, this would seem unlikely--even if, as Dewhurst suggests, such medical notables as the doctors Sydenham and Mapletoft were present.

4. Richard S. Westfall discusses the possible meanings of "virtuoso" in Science and Religion in Seventeenth-Century England (Ann Arbor: University of Michigan Press, 1973. Reprint of Yale University Press edition, 1958). Westfall refers in his discussion to the literature of the 17th century as well as to modern commentaries. Possibilities Westfall mentions range from a dilettante (the interpretation of W.E. Houghton, Jr., in "The English Virtuoso in the Seventeenth Century," Jrl. Hist. Ideas, 3 (1942) to Westfall's own position on the meaning: "one who has a general interest in arts and sciences, or who pursues special investigations in one or more of these . . ." (pp. 13-14)

Locke's own use, in references to "virtuosi" throughout his correspondence, would indicate the person who has a serious interest in all aspects of natural philosophy, expressed in discussions, reports of his own observations at meetings formal (e.g. the Royal Society) and informal. Some virtuosi were "professional" in the sense that most of their efforts involved

activities we would now call scientific (e.g. Newton and Boyle); some, amateurs (e.g. Samuel Pepys, who also was a member of the Royal Society). Locke seems to fall somewhere in the middle; his medical practice would include him among the professions, yet the active practice of medicine did not extend throughout his life, as other responsibilities superseded medicine. But, Locke's interest in natural philosophy was always serious, always more than that of a dilettante.

5. The circumstances that brought Locke and Lord Ashley together have been described many times: in the early biography by Peter King (The Life of John Locke, 2 vols. London: Colburn & Bentley, 1825, 1st ed.); in Maurice Cranston's biography (John Locke: A Biography, New York: Macmillan Co., 1957); in Dewhurst's book on Locke--these among others. Locke was asked to procure special waters for Lord Ashley during a visit to Oxford, when the physician with that responsibility could not do so. Apparently, the two got along very well, with the connection strengthened when Locke proposed the surgical treatment of a persisting ailment suffered by Lord Ashley--and the treatment was a success. Locke's duties in the Ashley household were more than medical; he seemed almost to be a personal trouble-shooter, even secretary, attending to complex matters at first personal and later political as Ashley's political influence and position grew.

6. The persistence of Locke's interest is made dramatically clear by references to medical matters in the correspondence, continuing almost to the end of his life. The exchanges are with fellow-physicians and with friends and acquaintances seeking advice on medical problems.

7. Neither authority nor tradition was sufficient to establish any position--although, clearly, there might be an authority or a tradition that could be respected; the authority that was Boyle, for example. But, the point is that the acceptance of any position could not be through appeal to its standing as authority or tradition. This would be as true for Descartes as it was for Locke--to cite the usual contrasts of rationalist and empiricist; this is one of the many issues on which they are united. (Emile Brehier, in his paper, "The Formation of our History of Philosophy," points out that tradition is "in part at least, the object of the methodical doubt of Descartes . . ." /in Philosophy and History: Essays Presented to Ernst Cassirer, Raymond Klibansky and H.J. Paton, eds., New York: Harper Torchbooks, 1963, p.160. Reprint of Clarendon Press edition, 1936./)

8. It had been assumed until fairly recently that the Gresham College group and the "invisible college" constituted a single and continuing group, composed of the same men meeting regularly and informally to discuss matters of philosophy, theology and, primarily, scientific concern; that they met at first

mainly at Gresham College in London, with which many were associated, with several members moving to Oxford in the early 1650s, and some of these returning to London with the Restoration. However, it has been shown, by Marie Boas Hall and by J.R. Jacob--to cite two important sources--that there were two separate groups; that the invisible college was concerned especially with social issues, with the new science regarded as a major instrument of educational and social reform. Samuel Hartlib was associated with the invisible college, and the reigning spirit was that of the Czech philosopher, A.J. Comenius. The groups converged when Boyle and leading lights of the Gresham College group settled in Oxford --with Boyle as the pivotal figure who brought both groups together.

What was significant for the future was that those in Oxford and those who remained in London provided the core of what would become the Royal Society, chartered by Charles II in 1662. (J.R. Jacob, Robert Boyle and the English Revolution, New York: Burt Franklin & Co., especially chaps. 1 and 4; and M.B. Hall, Robert Boyle and Seventeenth-Century Chemistry, Cambridge: Cambridge University Press, 1958, reprinted New York: Kraus Reprint Co., 1968, pp. 5-7 and 31.)

9. There are two issues suggested by this point: first, the question of the curriculum in the various Oxford colleges; second, the specific curriculum to which Locke was subjected and his subsequent comments on his response to it. W.N. Hargreaves-Mawdsley, in Oxford in the Age of John Locke (Norman: University of Oklahoma Press, 1973), is concerned more about the first than the second point. But, it uses Locke's time at Oxford as the focus for discussion of what town and university were like in the middle of the 17th century. Oxford colleges had their individual characters and curricula; some were strongholds of the past; others were leaders of the intellectual avant-garde. Christ Church, Locke's college, was a stronghold of the past, of the traditional curriculum. (That curriculum--in Hargreaves-Mawdsley's description, based on Anthony a Wood's Fasti Oxonienses--was centered on rhetoric, grammar, logic, Greek, Latin, Hebrew, moral philosophy, and eventually practise in arguing in public on specific subjects.) Other colleges--Wadham, headed by John Wilkins is an important example--were leaders in the acceptance of important new thinkers, with Descartes as a major representative of the break with the past. Eventually, Locke made contact with those who were to become major contributors to mathematics and the new sciences (John Wallis, Seth Ward, John Wilkins, Christopher Wren, and others).

Locke's comments about the "schoolmen" that are sprinkled throughout the Essay--especially those about "disputatious wrangling" (e.g. E, 4.7.8-12)--express and reflect his own experience at Oxford. (Peter King, in his Life, comments also on Locke's criticisms of his Oxford education; I, 5-9.)

10. An Oxford graduate could not continue to live and work at the university indefinitely without a commitment that would justify residence. Most fellowships were for those taking orders; there were a few available in law and medicine.

11. It seems that Locke had not taken the complete course of study for the medical degree and, apparently, the university officials were reluctant to grant it to him. Locke's first meeting with Shaftesbury--Lord Ashley--in 1666 involving medical matters took place before Locke had a degree in medicine! The date usually cited for the degree is February 1675. (Dewhurst, John Locke, p.45 and n. 5, and p. 49 and n. 5.)

12. All medical and medically related entries in the journals are included in Dewhurst, John Locke.

13. Locke's advice was sought on all manner of problems. The extensive correspondence with his friends, Edward and Mary Clarke, on the raising of their children (and including matters of health, nutrition, behavior, and education) led to the publication of Some Thoughts Concerning Education, in 1693.

14. For instance, in his prolonged travels in France, from November 1675 to early in 1679, Locke spent considerable time in Montpellier--the site of one of the oldest and most important of Europe's medical schools, dating back to the 12th century. During his second prolonged stay, this time in Holland exclusively, from November 1683 to February 1689, his closest associates included physicians. It was during this period that he also met Leeuwenhoek, in Delft in 1686. (Dewhurst, John Locke, p. 229, citing an entry in Locke's Journal.)

15. The historical, plain method is discussed in 1.2.

16. Several commentators on Locke have pointed to these interests and influences, among them Cranston, Dewhurst, and Hargreaves-Mawdsley in the works cited above.

17. Robert Boyle was a central influence, both personally and as a scientific hub for those drawn to the new science in Oxford town and university. (This is considered in some detail here, in 1.3.)

18. In that early state, the extent of its emergence from alchemy might be pondered; witness the "red earth" episode (n.23, below).

19. Iatrochemistry is medical chemistry--the chemical treatment of diseases. A.C. Crombie writes of the influence of Paracelsus on chemistry, and especially on the preparation and purification of drugs: "After him, chemistry became an essential part of medical training, and for nearly a century /i.e., into the 17th century/ doctors were divided into

paracelsists (or 'spagyrist') and herbalists, who kept to the old herbal drubs." (Augustine to Galileo, 2 vols., Cambridge: Harvard University Press, 2nd rev. ed., 1961. II, 259-260.)

Alchemy and iatrochemistry are interrelated, with the latter a development out of alchemy. Alchemy, which had a long tradition going back through Arabian science possibly into the Greek world, is the primary as well as the prior study, in the sense that iatrochemistry was an outgrowth of it. (Crombie, *ibid.*, I, 67-68)

20. If the physician's observations differed from Galen's text, the text won out.

21. Yet, soon after the publication of Newton's Principia Mathematica in 1687. and while he was living in Holland, Locke tackled that work, without the requisite mathematical background and training. He appealed to Christian Huygens to confirm the validity of the mathematics and was, appropriately, reassured. It is now thought that the review of the Principia that appeared in the Bibliothèque Universelle in March 1688--one of the first reviews--was written by Locke. (I.B. Cohen, Introduction to Newton's 'Principia', Cambridge: Harvard University Press, 1971, pp. 145-148. Prof. Cohen does not exactly praise the review that appeared; one gathers that it did not approach the mathematical sophistication necessary for an appropriate commentary. James L. Axtell has also commented on Locke's reading of the Principia in "Locke, Newton and the Two Cultures," in John Locke: Problems and Perspectives, J.W. Yolton, ed., Cambridge: Cambridge University Press, 1969.)

22. Dewhurst considers this possibility, even though he questions how major an activity it was for Locke. (John Locke, p. 23 and note.)

23. The "red earth" episode is documented in Newton's correspondence with Locke. Boyle claimed to have transmuted mercury into gold, an event that had to be kept secret for England's economic stability. Locke, on Boyle's death in 1691, had access to the red earth that figured in the transmutation, and Newton appealed to him for some of what was considered to be priceless matter. (Locke would have known Newton for less than two years at the time.) (The Correspondence of John Locke, E.S. de Beer, ed., 8 vols., Oxford: Clarendon Press, 1976-. Vol. IV: #1457, 26 Jan. 1692; #1465, 16 Feb. 1692; #1513, 7 July 1692; #1519, 2 Aug. 1692.)

24. This spirit is expressed in several of Bacon's works, including Novum Organon and The New Atlantis.

25. In the Essay (2.23.3), Locke comments on the respective contributions to knowledge of, specifically, "a smith or jeweler" and a philosopher with all his talk of substantial forms. As with iron and diamonds, so with all our knowledge of nature.

Though Locke's specific subject is complex ideas of substances, the point remains: what we can know about iron and diamonds will come from the kind of experience with iron and diamonds that only a person working closely with them will have, and not from speculation.

26. Although experiments and histories do seem to require somewhat different processes, both might be, in fact were, thought of as histories. Boyle, for example, divides The Origin of Forms and Qualities into two sections: theoretical and historical. The latter section is composed of a series of observations, followed by descriptions of several experiments. Those observations and experiments, following the theoretical part within the work itself, provide the evidence for the theory.

27. Nidditch, in the Glossary to the Essay, and with the OED as his source, cites the meaning of "experiment (as a verb) as "to have experience of, experience." "Experimental" is "empirical . . . insisting on experiment as the necessary foundation and test of all reasoned conclusions." (p. 837b)

The OED entry on "experiment" as a verb indicates that in the 17th century that word had meanings of "experience" today, and "experiment" as trial or test. (OED, III, 431)

28. "Hypothesis" here means any theory which would explain a category of events or phenomena, but would (necessarily) be grounded in observation. When Locke refers to the "corpuscular hypothesis" in the Essay (e.g. 4.3.16), it is with what he regards as empirical justification.

29. Thomas Sydenham (1624-1689) was one of Locke's "master-builders," and the central figure in British medicine. He emphasized diagnosis grounded in observation of symptoms, and with this, descriptions of different diseases compiled from those observations. It is not clear just when Locke would have met Sydenham. Dewhurst believes they did not meet until 1667, when Locke was living in London at least half the time and still maintaining residence at his Oxford college. (John Locke, p. 28) However, Sydenham was at Oxford when Locke entered Christ Church in 1652, and the two might have met during the 1650s. (Hargreaves-Mawdsley, Oxford, p. 20)

30. Consider, for example: ". . . we should not take up any /hypothesis/ too hastily . . . till we have very 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 . . ." (E, 4.12.13. Note also 2.1.10) The issue is not hypotheses themselves, but how we arrive at them. (One is reminded also of Francis Bacon's discussions of axioms, general and intermediate, and their relation to sense experience in the Novum Organon, Preface and Book I, Aphorisms LXIX and LXX.)

31. See, for example, E, 1.1.21 and 22. One of Locke's arguments against innateness--a thread running through Book I --is that we have been created with those faculties or capacities sufficient to arrive at ideas and, ultimately, truth; and thus there would be no reason for the Deity to have created humankind with innate ideas or knowledge of such principles that can be arrived at through the use of those faculties or capacities.

32. Robert Hooke (1635-1703), one of Boyle's assistants in the Oxford laboratory, was curator of experiments for the Royal Society from 1662 until his death.

33. Locke became a member of the Royal Society in 1668.

34. All four exerted significant influences on Locke, coming into his life at different stages. Boyle was first, sometime around 1660; as has been noted above, he met Sydenham by 1667, possibly earlier; Newton he first met at the end of 1689 or early in 1690; and Huygens during that five-year stay in Holland (1682-early 1689), though they could have met in London at Royal Society meetings before Locke's years in Holland.

35. Locke and Boyle were both critical of ancient atomism. Boyle in Origin of Forms and Qualities clearly distinguishes his position from its ancient precursor--whether for theological or theoretical reasons, or both--though he does refer to ". . . the antient Corpuscularian philosophers (whose doctrine in most other points, /other than their explanation of motion's source, which Boyle must attribute to God as creator/ though not in all, we are most inclinable to) . . ." (Origin. p. 15; also pp. 7 and 12) The atomists of Greek and Roman antiquity were not only pagans; they were also thoroughgoing materialists. That, alone, would have been reason for so pious a Christian as Boyle especially to emphasize his rejection of Democritean atomism and of Epicurianism in their "pure"--their unrehabilitated--forms.

36. There is need to clarify terminology here. "Atomism," as the term was used by Boyle, and by Locke, refers to the ancient Greek theory of matter. "Particle" would be the umbrella term for all such theories of the ultimate nature of matter. "Corpuscularianism" is specific to Boyle's theory. However, as we shall see, Boyle made an important distinction between "particle" and "corpuscle." (Descartes, too, could be said to hold a particle theory of matter, in this theory of elements, albeit one that was idiosyncratic.)

37. This does not deny the awareness, through the centuries, of Epicureanism and of its great literary expression in Lucretius' De Rerum Natura. There would certainly have been familiarity with Epicurus' ideas and Lucretius' poem by the 16th century. However, the concern here is with the renewed inter-

est in the development of a particle theory of matter in the context of the development of the sciences.

38. The history of atomism in England is presented in detail by Robert Kargon in Atomism in England from Harriot to Newton (Oxford: Oxford University Press, 1966); and in considerably less detail in his introduction to the facsimile reprint of Charleton's Physiologia Epicuro-Gassendo-Charltoniana (New York: Johnson Reprint Corp., 1966).

39. John W. Lynes in "Descartes' Theory of the Elements" (Jrl. Hist. Ideas, XLIII, #1, 55-72) discusses the significant differences between Descartes' early statement in La Lumière (1633), and his later fully developed position in The Principles of Philosophy (1647) with its clear position on the three elements, infinitely divisible, the vortex theory of motion, and denial of the void; and its equally clear distinction from atomism, with particles that are (usually) finitely divisible, with a void necessary for motion, and without the related demand for motion that is a variation of the circular (as is the vortex theory). Lynes points to the important theological considerations involved in Descartes' rejection of a more traditional atomism--an issue both of doctrine and of personal safety--considerations that, not incidentally, influenced responses to Gassendi's atomism.

40. It should be pointed out that Descartes and Gassendi, with their differing positions, are cited here as those who worked out particle theories that differed in fundamental ways, though they remained particle theories. And, in fact, it is difficult to think of a single significant thinker of the 17th century who was involved in natural philosophy and who did not hold to a particle theory. (Leibniz's position is equivocal, not only because his particle is a metaphysical one, but also because of the problems of working out his position on matter. These issues will be discussed in chapter 8, below.) Certainly Galileo at the beginning and Newton at the century's conclusion both accepted a particle theory of matter. Could there, indeed, have been a mechanical revolution without a particle theory of matter?

41. Charleton also sought a way of making the moral position of pagan Epicurus acceptable. The result of his efforts was published as Epicurean Morality in 1656. It would be enlightening to consider whether this work might have had an influence on some of Locke's ideas about morality in the Essay; his discussion of pleasure and pain in 2.20, for example. (Although there were books by Charleton in Locke's library at Oates, neither the one on morality nor the Physiologia is listed in The Library of John Locke; the four books that are listed would seem to be medical works. (John Harrison and Peter Laslett, The Library of John Locke, Oxford: Clarendon Press, 2nd ed. 1971, p. 105b, entries 668-669b.)

42. Before 1665, when Hooke published Micrographia, good working instruments were available. (See below, 2.2, for discussion of the microscope's contribution to evidence for the particle theory of matter, evidence that influenced Locke. Recall also that Locke knew Hooke, had met van Leeuwenhoek, and was familiar with the work of Swammerdam--all pioneers in the exploration of what the microscope revealed.

43. De Beers, in his introductory comments to Locke's correspondence, remarks that Locke would have met Boyle by 1660 at the latest, the date of the first extant correspondence. They might have met before that year, without the evidence in correspondence. Both were living in Oxford several years before 1660, though Boyle is known to have been away, attending to his interests in Ireland in the late 1650s.

44. The books by Boyle in Locke's library were, by far, the largest in number of any single author: 63. (Locke's Library, pp. 91-93, entries 413-473a.)

45. Boyle discusses his purpose and his criticisms of substantial forms--a scholastic doctrine interwoven with ideas of Aristotle--in "The Proemial Discourse to the Reader." (M.A. Stewart, Selected Philosophical Papers of Robert Boyle, Manchester: Manchester University Press, and New York: Barnes & Noble Books, 1979, pp. 1-12.)

46. The organization of the work speaks further to the meaning of "history," of the historical, plain method; it is a method of describing what happened, the course of events (here, the events that are the experiments), as any history would seek to describe what happened. And, in addition, the sources of any hypothesis or theory are shown as grounded in experiment and observation.

47. Origin, The Theoretical Part. Works of Robert Boyle, III, 29. (Also, in Stewart, Selected Papers of Boyle, pp. 41-42. Further page citations will appear in text.)

48. Locke in the Essay does not make explicit this distinction between particles and corpuscles; he refers indiscriminately to particles, corpuscles, and the corpuscular philosophy, discussing only the ultimate and individual unit of matter, with the individual unit usually referred to as "particle." A further point, in reference specifically to Boyle's distinction: in so distinguishing between the particle and the corpuscle, Boyle could have been trying to get around the problem of infinite divisibility. The corpuscle is divisible into its component particles; the particle is the minimum--though as Boyle has stated (in the passage from Origin, p. 30), it is divisible in thought and by God.

49. In a later summary, Boyle drops divisibility: ". . . the matter of all natural bodies is the same; namely, a substance, extended and impenetrable." (Origin, p. 35) Consider Locke in the Essay, in his identification of the primary and original qualities: extension, solidity, motion. (E, 2.8 and 23. See also below, 3.2)

50. Locke's distinction between active and passive power will be related to Boyle's position that motion is not an intrinsic property of matter. Locke, of course, does include motion--the passive power of motion--in his primary and original qualities. (See below, chapter 3)

51. R.G. Collingwood delineates three views of nature in The Idea of Nature (Oxford: Oxford University Press, 1946; paperback edition 1956); the Renaissance (16th and 17th centuries) view is a machine (p. 5). This is preceded by the Greek view, in which nature is "alive" and intelligent; and the 19th century modern view of evolution and change. Thus: reason, machine, and then evolution into which the first two enter. (p. 15)

52. Situation and texture are included in Locke's primary qualities, without definition. Boyle's discussion and description clarify the meaning of these two qualities.

53. Boyle considers the possibility of referring to bulk and figure at least as "moods or primary affections of bodies." (Origin, p. 16)

54. "Primitive" is defined in the OED (VIII, 1366) as "original as opposed to derivative," "primary" as "not subordinate to or derived from something else; original, independent, often with connotation of having something derived from it." (Ibid., p. 1358). Thus, both primitive and primary have the same basic senses of original and underived, from which other things are derived.

55. Boyle states also that sense organs, as composed of matter, share all the characteristics of the first type of quality. Here, too, there is the similarity with Descartes' categorizing of the human body as res extensa, and therefore as possessing all those properties which identify extended substance. This is Locke's position, too--though of course he never speaks of res extensa.

56. Both these points will be discussed below, in relation to Locke's analysis of qualities. Whether it is appropriate to designate that third category of quality--for Boyle and for Locke; whether, indeed, there are just two categories--will be considered below, in 3.2 in particular.

57. See above, n. 4, for meaning of "virtuoso." It should be noted that "republic of letters" is sometimes used by Locke and by others at the time.

58. See above, p. 38.

59. The Royal Society, from the time it was chartered (in 1662) and for decades following, had no formal requirements for membership, other than evidence of interest and sponsorship by a member or members in good standing. The French Academy (the one devoted to science) created at about the same time as the Royal Society, was a true academy composed of some of the great scientists and mathematicians of Europe, with membership severely restricted by number as well as qualifications warranting election. (Leibniz, in the 1670s, failed in his attempts to become a member--a situation that would have provided him with an income and thus freed him from the kind of work he had to pursue for the rest of his life, work that severely limited his time for his own philosophical and scientific pursuits.) Before too many decades passed, the Royal Society was to change its membership policy, although it never became as restricted in number as was the French Academy.

Chapter II

The Corpuscular Philosophy of the ESSAY

The corpuscular philosophy is key to Locke's epistemology and to his idea of nature. Given the particle with those properties Locke ascribes to it, how are ideas produced? How does it enter into natural events and phenomena? What, ultimately, is the idea of nature that follows? We need to search the Essay for what Locke has to say about the nature of the particle.¹

There is a point to be kept in mind: Locke's primary concern is with the nature of ideas and not with the idea of nature. That concern is necessitated, first, by his approach to knowledge and its degrees of certainty through ideas as the "materials" of knowledge; and, second, by his rejection of any innate mental content. In Book II, specifically, where there are discussions crucial to Locke's position on matter and on nature, his purpose is, clearly, to explain the origin of the mind's "contents" as alternative to innateness. The specific function corpuscularianism serves in the Essay is to provide the basis for that explanation.

We begin, then, with Locke's starting point: his rejection of innate ideas and innate knowledge, preliminary to dis-

cussion of the corpuscular philosophy as the grounds of his explanation of where, and how, our ideas originate. We will examine Locke's evidence for the corpuscular philosophy, including its status as hypothesis, the process by which particles produce ideas, and Locke's classification of ideas as it is related to his explanation of their origin.²

2.1: Locke's Rejection of Innateness³

After Locke has introduced his Essay with statements of purpose, plan, and terminology, he launches into the immediate and serious issue at hand: the rejection of any innate mental content. What, precisely, does he identify as innate? Who would hold there there is any innate mental content and would, therefore, be the target of Locke's "polemic"?

The precise identification of those at whom Locke directs his polemic has been and continues to be a matter of speculation. Who, after all, would have held that there are primary notions and principles that are innate; specifically those moral and speculative principles discussed in Book I? Candidates have included Descartes and the Cartesians, the Cambridge Platonists, the Scholastics whose influence persisted into Locke's time at some of the Oxford colleges (and, possibly, at Cambridge), and the radical religious enthusiasts. Lord Herbert of Cherbury is the one person identified in the text (E, 1.3.15). There is evidence in the text of the Essay to implicate all of those mentioned--even with the specific mention of Lord Herbert. It is entirely possible, of

course, that Locke had in mind everyone in general and no one specifically.⁴

Locke describes the innate mental content that is his concern as:

. . . certain innate Principles /in the understanding/;
some primary Notions . . . Characters, as it were stamped
upon the Mind of Man, which the Soul receives in its very
first Being; and brings into the World with it. (E, 1.2.1)

A few sentences later, "principles" and "notions" are equated, and "primary" and "original" are used synonymously when Locke refers to "Original Notions or Principles." (Ibid.) What is primary is original, in the sense of underived or as the first in a series or process. Anything primary, then, would be that which is not itself derived from anything else, but is that from which others are derived.⁵ A primary principle or notion that is innate would be one intrinsic to the nature of the soul, in that it is stamped on the mind at the soul's creation.

This Locke rejects, and it is the burden of the Essay's first book to show why this is neither possible nor necessary. Locke's initial argument is that there could be no reason why notions or principles would be so stamped on the mind; our "natural faculties"⁶ are sufficient for obtaining any and all truths as we go about the process of living and experiencing. Just as there would, for example, be no point in having innate ideas of colors when we have the "Power to receive them by the Eyes from external Objects," so too there would be no point in having truths innate when we can obtain knowledge of them through our natural faculties. (Ibid.) Locke grants that our

natural faculties are innate, in the sense that all human beings are born with them.⁷ Not so with what results from the functioning or operation of those faculties. Knowledge of principles or primary notions is as much the result of the utilization of those natural faculties in experience as sensations are the result of the capacities of the various sense organs. There is no mental content--principle, notion, idea--that is original or primary, and thus underived.

In the order of the argument, Locke begins his exploration of the origin, certainty, and extent of knowledge with a series of arguments against innateness: we are not born with the knowledge of fundamental principles in the mind, awaiting the occasion or the development of reason to bring them forth into consciousness. If this were true, there would be universal recognition or acceptance or agreement about those logical, moral, and theological "truths" usually cited as evidence for the existence of innateness. With this denial, Locke identifies his initial and fundamental question: if there is no innate mental content, then where does the mind's content come from? How, especially, can the mind arrive at such truths (and Locke does not deny that these are truths) as the proposition "God exists," or the two principles of identity and contradiction, or the nature of good and evil? Where, and how, do they originate? Locke's reply is to assert the position that is basic to the enterprise of the Essay: knowledge of all truths is grounded in experience, in that it is through experience that the mind acquires those ideas that enter into

knowledge. (E, 2.1.2)⁸ Having so replied, he can then begin the real work and point of the Essay, in showing what in experience is capable of providing the basis of knowledge: those ideas that are its "materials." He must show what is the process in which this happens. And this, in the words of Bishop Stillingfleet, is Locke's "new way of ideas."⁹ In spite of Locke's assertion that he will not concern himself with the physical processes by which the mind comes to have its ideas, he cannot avoid discussion of those processes. For this explanation he turns to atomism--re-emerged in the seventeenth century, with the corpuscular philosophy of Robert Boyle as the formulation that most directly influenced Locke's thinking.

2.2: Evidence for Corpuscularianism

In all his references to the corpuscular philosophy, Locke makes it clear that he regards it as a hypothesis, albeit as one "that is thought to go farthest in an intelligible Explication of the Qualities of Bodies . . ." (E, 4.3.16) It should be evident, from Locke's background and from his convictions as a practising physician--as well as from his rejection of Scholasticism and his embrace of a Baconian empiricism--that every theory was to be regarded as hypothesis, dependent upon experience and observation for its confirmation; that no theory could be used to determine fact.¹⁰ Now, a theory about the nature of matter that posited the existence of irreducible units of matter with properties that are to account for the properties of observable matter--such

a theory must remain in the realm of hypothesis until and unless some means would be found to observe those units. On what basis, then, does Locke proceed to utilize such a hypothesis in the development of his epistemology, of his answers to the problems he sets for himself at the Essay's inception? He does so because he has, at least, two source of evidence that fulfill the criteria of observability and experience. The first source is the evidence of the microscope; the second comes out of Locke's experiences as experimenter and as witness to experiments.

Though the microscope was new to the seventeenth century, by mid-century, and certainly by the 1660s, there were important observations on record, observations made by the serious pioneers in its use: Hooke in England, van Leeuwenhoek and Swammerdam in Holland.¹¹ Locke had made his own observations through microscopes, and was also familiar with the reports of those whose work involved constant use of the instrument.¹² And, those instruments were revealing increasing evidence to support a particle theory of matter.

In the Essay, in Locke's chapter on complex ideas of substances, there is a lengthy passage on what might be accessible to humankind had we only "Microscopical Eyes." Locke writes about what we would be able to see had we vision "1000, or 100000 times more acute than it is now by the best Microscope . . ." (E, 2.23.12) He speculates about

Spirits /that/ can assume to themselves Bodies of different Bulk, Figure and Conformation of Parts. . . . /that/ can so frame, and shape to themselves Organs of Sensation

or Perception, as to suit them to their present Design, and the Circumstances of the Object they would consider. . . . What wonders would he discover, who could so fit his Eye to all sorts of Objects, as to see, when he pleased, the Figure and Motion of the minute Particles in the Blood, and other juices of Animals . . . (Ibid., 13)

Although the context of the passage is not one in which Locke is directly concerned with describing particles, nonetheless he is able to write as he does only because he has actually seen, with the assistance of the microscope, what is inaccessible to vision unaided by such an instrument.¹³

The second source of evidence is experimental. It comes out of Locke's own work in combining different ingredients in the preparation of medicinals; out of the experiments performed at meetings of the Royal Society; most important, perhaps, out of Locke's association with Robert Boyle in which he both witnessed and assisted at experiments in Boyle's laboratories in Oxford and London.¹⁴ Although certainly not all, or even most, of those experiments had verification of the corpuscular hypothesis as their purpose, nonetheless the results of those experiments could be best explained on the basis of the action of particles of matter. In the Essay, for example, when Locke considers the coherence of particles to form visible, extended matter, there is discussion of the weight or pressure of air particles as a possible cause of the coherence of those particles.¹⁵ In another passage, he discusses water in its fluid and solid (frozen) states. In the fluid state, the particles do not cohere; in the solid state, they do.¹⁶ The point here is that Locke was responding to his observations of many kinds of experiments in which results could be explained best

by a particle theory of matter.

Yet nowhere in the Essay does Locke explicitly state that corpuscularianism is more than a hypothesis; the best evidence does not constitute final proof. In at least one sense, where nature is concerned, there can be no final proof of any theory that would account for nature's operations universally.¹⁷

Nevertheless, Locke proceeds into the Essay with, apparently, full confidence about the validity of a particle theory of matter. He is explicit in his position that all matter is made up of irreducible units of matter, of particles that can never be divided to the point where they no longer have the defining properties of matter--extension, solidity, the power to be moved.¹⁸ These units can be neither created nor destroyed by humankind; that human effort extends only to the combining or dividing of mass matter:

The Dominion of Man, in this little World of his own Understanding, being muchwhat the same, as it is in the great World of visible things; where his Power, however managed by Art and Skill, reaches no farther, than to compound and divide the Materials, that are made to his Hand; but can do nothing towards the making the least Particle of new Matter, or destroying one Atome of what is already in Being. (E, 2.2.2) 19

This Locke offers not in the trappings of hypothesis, but as direct statement.²⁰

Let us now turn to how Locke uses the particle to explain how ideas originate.

2.3: Corpuscularianism and the Origin of Ideas

In spite of Locke's opening announcement that he will use the historical, plain method in working out and presenting his position on the origins of knowledge, that he is an under-laborer among the master-builders of his time, and that he foreswears any concern with physical processes involved in the actual production of ideas; in spite of these preliminary and repeated restrictions and disclaimers, Locke does offer his explanation of the process in which the idea--"the object of the Understanding when a Man thinks"--is the result.²¹

To begin with the elements in that process: The mind, Locke tells us, is originally "white paper," a "blank tablet."²² The ultimate source of all the ideas which gradually are accumulated is experience, specifically sensation and reflection which Locke identifies as the two sources of the materials of knowledge.²³ Though these are indeed two separate sources, sensation is temporally prior; ideas of reflection are, initially, the result of the mind's awareness of its ideas of sensation.²⁴ And, finally, Locke distinguishes between what he calls "simple" and "complex" ideas: "ideas enter the mind simple and unmixed"; complexity is the work of the mind. (E, 2.2.1)

Our concern here is not with Locke's epistemology, but rather with the physical process which results in ideas. For the moment, there will be no discussion of Locke's distinction between simple and complex ideas--other than to say that it is a distinction that parallels the relation between par-

ticle and mass matter. In fact, Locke introduces his simple ideas through analogy with those uncreated (by humankind) and indestructible particles:

. . . it is not in the Power of the most exalted Wit, or enlarged Understanding, by any quickness or variety of thought, to invent or frame one new simple Idea in the mind, not taken in by the ways before mentioned; nor can any force of the Understanding, destroy those that are there. (E, 2.2.2) 25

But, how does Locke describe the process in which the simple ideas of sensation are produced in the mind? The particles which make up mass, perceptible matter set up motions in the medium separating object and sense organ; these motions in turn affect the particles of the receiving sense organ, thereby setting off further motions in the nerves and "animal spirits," such motions ultimately reaching the brain where --in a way Locke declines to explain, because it is inexplicable to him--an idea, a simple idea of sensation, is produced in the mind.²⁶

This simple idea of sensation is Locke's epistemological counterpart of the particle; for, as the particle is the indestructible unit of matter, uncreated and uncreatable by humankind, the bearer of all the properties that identify matter, the place of physical causation, so the simple idea cannot be created by the one whose idea it is or, of course, by anyone else; nor can it be destroyed once it exists.²⁷ The simple idea of sensation comes into existence as the result of that series of motions, described above, from object to mind. The mind performs no creative or active role

in the process. It is, as Locke says more than once, "passive" in the reception of simple ideas.²⁸ The simple idea of sensation is the final step in a mechanical process in which matter transmits motion. The mind acts as a receptor of motions which it does not initiate or will. It is in this sense that the simple idea is not created by the mind.

The indestructibility of the simple idea presents more difficult problems of explanation. For, in what sense would an idea, any idea, be indestructible? A possible basis for its indestructibility might rest with its status as an event, an experience; something that has happened. In this way, it could not be destroyed, as any event once past can never be destroyed. But, there is another, and more significant, way of considering its indestructibility; that way is connected with the manner in which the mind--as blank tablet--is "writ upon." The mind must have the capacity to retain its simple ideas. Were the simple idea destructible, then the process through which Locke would explain the origin of the mind's contents would, indeed, be a fruitless one; its purpose would not be fulfilled. But then, even if we consider that Locke requires that any idea, to be an idea, must be a perceived or conscious idea, that an idea of which we are not conscious is a contradiction, isn't it possible that a momentary awareness might pass unrecorded, and in this way slip off into intellectual oblivion? In other words, might not forgetting be the equivalent of destruction?

Locke does state that ideas disappear after "imprinting"

(E, 2.10.2); that they "cease to be any thing, when there is no perception of them." (Ibid.) And, further, he allows for the complete obliteration of some ideas, citing instances in which

. . . Ideas in the Mind, quickly fade, and often vanish quite out of the Understanding, leaving no more footsteps or remaining characters of themselves, than Shadows do flying over Fields of Corn; and the Mind is as void of them as if they never had been there." (E, 2.10.4)

How are we to reconcile the earlier statement--that there is no "force of the Understanding" that can destroy those simple ideas that are in the mind, with the position presented in the later passage, above, that ideas can fade and vanish? Have we trapped Locke in a contradiction? It is necessary to consider this point, even briefly, because of the present position about the twofold connection between the material particle and the simple idea as intellectual particle. A possible key is found in Locke's description of memory:

. . . the Power to revive again in our Minds those Ideas, which after imprinting have disappeared, or have been . . . laid aside . . . Memory . . . is as it were the Store-house of our Ideas. (E, 2.10.2)

Memory, Locke continues, expresses the mind's power to revive its perceptions. That power is effective only where the idea has left its "footsteps." This can happen through basic ability and through repetition. Yet, ". . . there seems to be a constant decay of all our ideas," even where there is a retentive mind and actual repetition: ". . . the Ideas, as well as Children, of our Youth, often die before us." (E, 2.10.5)²⁹

Thus, it seems that Locke holds that our ideas, including

simple ideas, are destructible and are, in fact, actually destroyed. The way around this that would not catch Locke in a contradiction rests with the distinction between a deliberate act of intellectual destruction, in individual consciousness obliterates and idea--anything--and the automatic loss of the idea--of anything--because of a lack of ability to retain it or because of time or other circumstances. Thus, ideas would not be voluntarily destroyed or, more important, voluntarily destructible.

The foregoing raises several points for further comment. First, Locke analyzes thought as he would analyze matter, by seeking its fundamental and ultimate unit; as the particle is to mass matter, so the simple idea is to thought. The simple idea is, thus, the intellectual equivalent of the basic unit of matter; human powers do not extend to the creation or the destruction of either. This leads into the second point: as the particle is not itself the object of direct experience--except, perhaps, under the unusual conditions of the microscope--so, too, the simple idea is not the object of direct experience. Our immediate awareness is of wholes, not of component parts. As we are immediately conscious of the apple as a whole (material) object, and not of the particles of matter of which it is composed, so it is the apple we perceive. It is only when we begin to consider the properties we attribute to the apple that we arrive at the simple ideas of sensation that enter into the full idea of the apple: the specific color, shape, scent, taste, and so on. This is true even

where the focus of attention may be on the color itself, rather than on the totality that is the apple. In order to consider one element in that totality, we do not immediately isolate that element from the totality. The isolation of the color from the object colored requires the focusing of attention on a single aspect of the object.³⁰

This brings us to the third point: what it is Locke is attempting to achieve through the very notion of the simple idea. He is attempting to find an explanation of how the mind gets its ideas. The simple idea, of sensation specifically, is the vehicle for that explanatory process; the answer to the question of how we can perceive--and thus have an idea of--the apple. The simple idea of sensation bears a causal relation to thought that is analogous to the relation between particle and mass matter. But, it also connects causally with the particle itself; for the very properties of the particle--the primary qualities--are what make possible our simple ideas of sensation, which in turn enter into the complexity of human thought.

This brings us to the fourth point: the relation between simple ideas of sensation and those of reflection. The relation, Locke tells us, is a causal one; for the simple ideas of sensation give the mind its initial ideas of what it is doing, and thus is simple ideas of reflection--of the operations of the mind. Together, they bear a causal relation to all other ideas, whatever their degree of complexity, in the sense that they enter into all complex ideas.³¹

There is a final point: the very possibility of the process in which simple ideas of sensation are produced is found in the position that the human sensory system--from the receiving sense organ to the brain--is continuous with the physical world.³² That sensory system is matter, as much as is any object in nature: tree, lump of gold, water. As matter, it is made up of particles; and those particles bear the same properties as do all particles of matter, including the capacity to respond to motion. The human sensory system, as a part of nature, is subject to the same causal processes that prevail in the natural world.

These factors, continuous with Locke's experiences as chemist, alchemist, physician, provide him with his alternative to innateness: a causal explanation of perception--of the ideas which are perceptions--which is possible because all elements in the process are, ultimately, particles with the same qualities and powers. All elements, that is, but one: the human mind itself, spiritual substance. The abyss that separates mind from brain is one that Locke--unlike Descartes--declines to cross.³³

Our concern here has been with the corpuscularian basis for the origin of ideas. Locke's analysis of that origin is consistent with the Baconian spirit and the scientific orientation associated with that spirit. It is a position, as well as an analysis, that can be understood only within the context of Locke's rejection of innateness. Now, Locke begins with his account of the origin of ideas as simple ideas--ideas as

they enter the mind "simple and unmixed." It is important to keep in view the point made previously, that we recognize ideas as "simple" through a conscious process of analysis from their experienced wholeness--their complexity. We perceive tables and chairs and full rooms; trees and flowers and full landscapes. We do not perceive colors, textures, sounds, smells, in isolation, as we do not perceive the individual units that make up mass matter (at least under the usual conditions). The one requires a process of analysis out of the complexity of our mental experience; the other requires instruments that magnify matter--a comparable analysis.³⁴

2.4: Locke's Classification of Ideas

Although our concern is not with how Locke arrives at the extraordinary, unpredictable richness and complexity of ideas that enter into human thought, we will have occasion to refer to ideas beyond the simple. It is in order, therefore, to present Locke's account of that process in which complex ideas are formed from the original simple ideas.³⁵

For Locke, as we have seen, ideas "enter" the mind as simple ideas of sensation. The mind is totally passive in this process; no act of attention or of will is required.³⁶ In Locke's explanation, this is fundamentally a physiological process (though he would seem to place the brain-mind leap on some level other than the physical). We need next to recall that Locke identifies two originating sources for our simple ideas: reflection, or the operations of our minds, in addition

to sensation.³⁷ The initial subject-matter of reflection is provided by the simple ideas of sensation, when the mind forms ideas of its actions in relation to those simple ideas of sensation. These two sources supply ideas which are thus simultaneous with, if not temporally prior to, ideas that are not simple: complex ideas. Now, although the mind is passive in the "reception" of simple ideas, it is not passive in the formation of its complex ideas (all of which are ultimately resolvable into component simple ideas).³⁸ Simple ideas are logically prior to complex; the complex require the simple, in the sense that anything complex, by definition, must be composed of elements that are of a lesser degree of complexity or are simple in the sense that they are not further reducible or analyzable.

And so Locke faces the problem of finding an account of how the mind is able to form the complex out of the simple elements which come to it. This requires some sort of activity, in contrast to the passive reception of simple ideas. Locke identifies and describes three kinds of mental activity in relation to ideas: combination, comparison, abstraction.³⁹ The mind combines simple ideas to form complex ideas of all types.⁴⁰ The mind brings together, without combination, ideas simple or complex to compare those ideas. In abstraction, the mind isolates ideas from the specifics of time and place, and from whatever other ideas are specific to any single experience.

Out of these acts of combination, comparison, and ab-

straction, the mind forms complex ideas of modes, relations, and substances.⁴¹ Of the three, substances alone are ideas of what has existence independent of the mind. Modes and relations both are categories of complex ideas which require substances for actual existence: modes, as properties and activities of substances; relations, as the result of comparisons of substances and of modes.⁴²

Keeping in mind Locke's threefold classification of the "compass of the humane Understanding," substances are the subject-matter of natural philosophy, "The Knowledge of Things, as they are in their own proper Beings." (E, 4.21.1) Thus for Locke any idea of nature must encompass a position on the nature of substance.

But, before examining Locke's position on substance--on material substance specifically--it will be necessary to consider his conceptions of power and of qualities.

Summary

The corpuscular philosophy has now been shown in its relationship to the overall purpose of the Essay as the foundation for Locke's analysis of the "original" of knowledge. That analysis required the rejection of any innate mental content, as preliminary to the explanation of the source of ideas in the particle theory of matter.

Even though individual units of matter would be inaccessible to direct observation, and thus there could be no ideas of the particles themselves--in Locke's terminology, no simple

ideas of sensation of the particles--nonetheless, Locke could call upon experimental evidence to support his use of the corpuscular philosophy. This evidence came from what was seen under microscopes, and from experiments (conducted by, among others, Robert Boyle) which gave support to the theory.

We then considered that process by which the particle produces ideas in the mind--simple ideas of sensation specifically--as Locke's starting point in the process. We saw that Locke's analysis of the origin of ideas required continuity between the natural world and the human sensory system. We concluded by showing how Locke gets from his simple ideas of sensation to the complexity of human ideas and thought. This requires the mind to be active, in contrast to its passivity as the receiver of simple ideas. The results of the mind's active capacities of combination, comparison, and abstraction are three types of complex ideas: of modes, of relations, and of substances.

It is the last that bears upon the present concerns. For, such ideas of substances--of material substances in particular--encompass those ideas that are of what exists in nature. Thus, they will be central to Locke's idea of nature.

Notes

1. In the Essay, Locke usually refers to the "corpuscular philosophy" or "corpuscular hypothesis," and to the "particle" when referring to the individual smallest unit of matter (e.g. E, 4.3.16). Emphasis is on Locke's usual terminology, for he is not always consistent in that terminology. In 2.23, for example, he writes of particles of air, corpuscles of air, corpuscles of aether (sn. 2); particles of water (sns. 25 and 26); particles of matter (sn. 26). He also refers to atoms (sn. 2). It has been noted that Boyle gave differing meanings to "particle" and "corpuscle," meanings that Locke does not follow in the Essay. (See above, p. 46 and p. 64. n. 48)

2. Consideration of the properties of the particle will await the discussion of powers and qualities in chapter III.

3. After writing the following account of Locke's rejection of innateness, yet another approach to the argument suggested itself. It is an approach that works back from Book II into Book I--from a firmly held position on the source of all mental content in experience to a rejection of mental content independent of experience. This approach would place Book I even more firmly with the context of this study's fundamental thesis--that Locke's purpose in the Essay is to work out an epistemology and a metaphysic grounded in the new science. Given that science (and the program of Book II), Locke needs to establish the original condition of the mind as "white paper." (E, 2.1.2) Book II, as the true starting point, would then demand that "polemic"; thus, the necessity for Book I. (It would be instructive to explore how early in the drafts of the Essay the arguments against innateness took on the form they had by the first edition.)

4. However, if the approach discussed in the preceding note is correct, then the specific targets are not significant.

5. OED, VIII, 1358. Notions, principles, even ideas, could be primary in this sense. Later, Locke will show how qualities can be primary and original. (Examples in the OED show that this was a common use of the word in Locke's time.)

6. Faculties are abilities or aptitudes. (E, Glossary, 838a, citing the OED.)

7. Locke recognizes that there are human beings who are born with a faculty (e.g. a sense organ) impaired. Consider, for one important example, his discussion of the "Molyneux problem"--which raised the question of whether two shapes distinguished by touch by one born blind could be immediately iden-

tified visually were sight regained. (E, 2.9.8) In addition, throughout the Essay there are discussions of changelings and others whose mental abilities are so severely impaired from birth that their status as human beings is placed in question. (E.g. E, 2.11.12-13)

8. "Let us then suppose the mind to be, as we say, white Paper, void of all Characters, without any Ideas; How comes it to be furnished? . . . Whence has it all the materials of Reason and Knowledge? To this I answer, in one word, From Experience: In that, all our Knowledge is founded; and from that it ultimately derives it self." (E, 2.1.2)

9. Without reference to the Stillingfleet text, in the Vindication of the Trinity, in which the Bishop used the phrase "new way of ideas," the present source is Locke's quotation of the phrase from his first letter to Stillingfleet. (The Works of John Locke, 10 vols., Darmstadt: Scientia Verlag Aalen, 1963. Reprint of 1823 edition. IV, 72.)

10. E, 2.1.10.

11. It has already been pointed out how and when Locke knew both Hooke and van Leeuwenhoek. (See above,

12. Locke refers in his Journal (22 June 1686) to his meeting with van Leeuwenhoek. Dewhurst write, "He showed Locke some red blood-cells, a human tooth, and the spermatozoa of a dog . . ." (in John Locke, p. 229). Locke would certainly by then have been familiar with the possibilities of the microscope, if only through his attendance at meetings of the Royal Society.

13. Locke's position is that if our senses were as acute as the best microscope imaginable could make them, then we would not be able to function in our "human station": "We are furnished with Faculties . . . to discover enough in the Creatures, to lead us to the Knowledge of the Creator, and the Knowledge of our Duty; and we are fitted well enough with Abilities, to provide for the Conveniences of living: these are our Business in the World." (E, 2.23.12)

14. See above, pp.40-41. In addition, there is evidence that Locke worked with Boyle in preparing for publication various of Boyle's books which recorded experiments.

15. E, 2.23.23.

16. Ibid., 26.

17. The basis for this would be found in Locke's position on substances, and in the nature of our knowledge of nature. Our knowledge of nature is found in our knowledge of "real exist-

ences." Of these, we can have only "sensitive knowledge"--a third degree of knowledge, after intuitive and demonstrative knowledge, that can never achieve the absolute certainty of the first two. This and the ultimate unknowability of the real essences of substances--the "real, internal constitution"--make it impossible for us to have such proof about nature's operations. (E.g., E, 2.23.8-9; 3.6.6; 4.3.9-16) At issue is the serious question of whether, for Locke, there can ever be a science of nature.

18. E, 2.8.9 especially, where the context is the discussion of primary qualities.

19. See also E, 2.12.1.

20. For discussion of Locke's views on the nature of the particles, see 2.3, Corpuscularianism and the Origin of Ideas, and 3.2, The Qualities of Matter. Refer also to 1.3, The Corpuscular Philosophy, which considers other particle theories of matter of the 17th century and earlier, and includes discussion of Boyle's corpuscular philosophy.

21. Locke repeats his disclaimers made in E, 1.1.2 and 2.21.73. Note also 2.8.22, after he has discussed what he promised he would not do: i.e., "meddle with the Physical Consideration of the Mind; or trouble my self to examine . . . by what Motions of our Spirits, or Alterations of our Bodies, we come to have any Sensation by our Organs, or any Ideas in our Understandings; and whether those Ideas do in their Formation, any, or all of them depend on Matter, or no." (E, 1.1.2)

22. E, 2.1.2 Locke does suggest the possibility of a pre-natal process which could produce simple ideas of sensation: "I doubt not by Children, by the exercise of their Senses about Objects, that affect them in the Womb, receive some few Ideas, before they are born, as the unavoidable effects, either of the Bodies that environ them, or else of those Wants or Diseases they suffer;" (E, 2.9.5; note also 2.10.5 and 1.4.2)

23. "Our Observation employ'd either about external, sensible Objects; or about the internal Operations of our Minds, perceived and reflected on by our selves, is that, which supplies our Understandings with all the materials of thinking. These two are the Fountains of Knowledge, from whence all the Ideas we have, or can naturally have, do spring." (E, 2.1.2) Locke goes on, in sns. 3 and 4, to refer to sensation and reflection specifically.

24. "'Tis about these Impressions made on our Senses by outward Objects, that the Mind seems first to employ it self in such Operations as we call Perception, Remembring, Considera-

tion, Reasoning, etc." (E, 2.1.23)

25. The "ways before mentioned" are sensation and reflection. (The passage continues with the quotation which is cited on p. above, beginning "The Dominion of Man . . .")

26. The passages on which the description is based are: in E, 2--1.3, 5, and 23; 3.1; 8.12; and in 4--3.28 (this last especially). It is to be kept in mind that the key element in the process is motion. Locke nowhere refers to the Democritean position that particles from the object strike the sense organ. Although Locke does not give a more detailed account of the process, he seems to accept the position that particles set up motions in other particles, specifically the particles that compose the medium. However, his account is not a clear one, for he does not deal with the problem of motion through space and, eventually, confronts the issue of gravitational attraction between particles by acknowledging that motion by immediate impulse is not the sole means of transmitting motion. (E, 2.8.11, with sn. 11 changed considerably in the 4th edition of the Essay, presumably to conform to Newton's theory of gravitational attraction.

27. E, 2.2.2 and 2.12.1. See 4.10.10-11 for Locke's discussion of whether matter is eternal or created by God.

28. At E, 2.1.24-25 and 2.21.1--for examples.

29. Locke's use of "decay" here is noted, with a reminder of Hobbes' "decaying sense" in Leviathan, chap. ii.

30. "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; . . . Yet the simple Ideas thus united in the same Subject, are as perfectly distinct, as those that come in by different Senses." (E, 2.2.1) This passage expresses also the purpose of Locke's simple ideas of sensation: as an explanation of how the mind obtains its ideas.

31. Not, of course, that each simple idea is a direct or "pure" component of each complex idea; but that all complex ideas are--through a process of deliberate analysis--traceable back to component simple ideas specific to the complex idea.

32. Locke is certainly not the first, in the 17th century in particular, to assert the continuity of the material world and the human body--including the sensory system. With Descartes, the body is res extensa, and thus no different from any other

matter. (Consider, for example, the implications of Descartes' mind/body distinction in the Meditations.) Hobbes, too, in the Leviathan (starting with chap. i) offers an explanation of the genesis of thought that depends on the continuity of matter.

33. Reference is to Descartes' designation of the pineal gland as the site of mind/body interaction. (Passions of the Soul, Part First, Articles xxxi and xxxii.)

34. This would not deny that we do have ideas that would conform to Locke's conception of a simple idea: the tactile sensation of heat or of cold on the skin; the taste of the pineapple; the scent of the lilac; the sound of thunder, the unrelieved whiteness of the new snow on the field. In each case, the sensation fills our immediate attention. But, the central point behind the position that the simple idea is the result of analysis, and that we do not (usually) perceive atomistically, rests with the purpose of the simple idea for Locke and with the fact that it is the counterpart of the material atom. And this is the major concern here.

35. Again, it needs to be emphasized that the concern is not with ideas, but with what ideas are of; specifically, with material substances, and therefore with ideas of material substances.

36. "These simple Ideas, when offered to the mind, the Understanding can no more refuse to have, nor alter, when they are imprinted, nor blot them out, and make new ones in it self, than a mirror can refuse, alter, or obliterate the Images or Ideas, which the Objects set before it, do therein Produce." (E, 2.1.25)

37. See above, p. 68 and n. 2.

38. See, for example, E, 2.12.2: "In this faculty of repeating and joining together its Ideas, the Mind has great power in varying and multiplying the Objects of its Thoughts, infinitely beyond what Sensation or Reflection furnished it with: But all this still confined to those simple Ideas, which it received from these two Sources, and which are the ultimate Materials of all its Compositions."

39. At E, 2.7.2, Locke identifies "the two great and principal Actions of the Mind," thinking (or perception) and willing (or volition). Then, in chap. 12, he tells us that the mind is active in the formation of its complex ideas: "The mind exerts several actions of its own, whereby out of its simple Ideas . . . the others are framed. The Acts of the Mind wherein it exerts its Power over its simple Ideas are chiefly these three . . ." And Locke goes on to describe combination, comparison, and abstraction.

40. The activity of combination is central to the entire process. It would involve the formation of ideas of varying complexity. The action of combination takes place with simple ideas initially, and also with complex ideas in the formation of ideas of greater complexity--greater complexity in the sense of combining more simple and complex ideas, and of being further removed from the original simple ideas.

41. Each one of these kinds of complex ideas may be formed through one or more of the mind's actions. Also, any one of the kinds will lend itself to abstraction.

42. Locke defines modes as ". . . such complex Ideas, which however compounded, contain not in them the supposition of subsisting by themselves, but are considered as Dependences on, or Affects of Substances;" (E, 2.12.4). Relations are the ". . . sort of complex Ideas . . . which consists in the consideration and comparing one Idea with another:" (Ibid., 7). Ideas of substances are ". . . such combinations of simple Ideas, as are taken to represent distinct particular things subsisting by themselves;" (Ibid., 6).

Chapter III

Powers and Qualities

Two topics are central to the discussion at its present state: powers and qualities. Together, they reveal the nature of the particle. They are central to causation in nature. Through their determining influence on Locke's position on material substances, they are key factors in his conception of nature.

The eighth chapter of Book II, "Some further Considerations concerning our simple Ideas," is Locke's first and major statement (though not his final word) on qualities. Although his initial concern is with ideas of qualities, it is in this chapter that he shows how those ideas are grounded in, and generated by, the defining properties of the particle. It is within this context that Locke permits himself the discussion of matter independent of ideas of matter

Any consideration of qualities must eventually turn to Locke's views on powers. This requires scrutiny of what he says in chapter 21 of Book II, "Of Powers," and specifically of what he writes about the powers of matter.¹

We will begin with Locke's discussion of matter's powers, as prelude to the examination of his analysis of matter's qualities. We will then consider Locke's notion of qualities and

the three types of qualities he identifies--primary, secondary, tertiary--focusing our attention on the primary qualities as the defining properties of matter and showing how secondary and tertiary qualities are manifestations of these properties. The concluding section will explore the central issue: the implications of Locke's analysis of powers and qualities for the process of change and therefore of causation in nature.

3.1: The Power of Matter

Locke's concern in the 21st chapter of Book II is with the idea of power:² how and where it fits into his system of the classification of ideas; what is its source; what is its meaning; what are its manifestations in the physical world in relation to matter and in human behavior in relation to mind. Although the idea of power is not the present concern, nonetheless the distinctions Locke draws in his discussion are central to any consideration of matter and of nature. For, those distinctions related to crucial elements in any idea of nature: the source of change, the nature of causation. Locke's position on power, thus, is central to the immediate issues: his conception of quality, with his designation of three kinds of qualities; and his analysis of material substances.

Locke classifies power among the simple ideas, "one . . . that make/s7 a principal ingredient in our complex Ideas of Substances . . ." (E, 2.21.2)³ He finds the source of the idea of power in our perceptions of change:

change of sensible ideas, change of ideas of reflection.⁴ Where there is change, so must there be the capacity to produce that change.⁵ But now there are two aspects of change that Locke identifies through his definition of power as ". . . twofold . . . as able to make, or able to receive any change: The one may be called Active, and the other Passive Power." (Ibid., 2)⁶ There are two additional points Locke makes, which will then put before us the basic elements in his position. First, where there is change, there is activity. Locke identifies two, and only two activities: thinking and motion.⁷ The second point is that there is a fundamental distinction between active power and the activity that is intrinsic to change. The distinction lies not with the fact of activity but rather with whether the source of change is internal or external.

Given Locke's distinction between active and passive power, between the capacity to produce change in a particular way--to begin a series of changes and the capacity to be changed; given the association of change and action, and the further identification of thinking and motion as the two kinds of action that produce change; given these distinctions and associations, our task now is to see where and how matter fits into Locke's distinctions.

We have previously noted that Locke accepts the distinction between matter and mind (between material or corporeal substance and spiritual substance). With some shifting of intellectual feet, Locke makes active power the power exclu-

sive to mind or spirit, and passive power the power of matter. For, even though we would seem to get our idea of active power at least in part from motions and changes in nature (through sense ideas), this is not true active power--the power to initiate change--but is in reality passive power, the power to receive change.⁸ With this, Locke associates himself with others in the seventeenth century, using the action of the billiard ball as his model for the cause of change in matter, and thus for matter's power as passive:

. . . when the Ball obeys the stroke of a Billiard-stick, it is not any action of the Ball, but bare passion: Also when by impulse it sets another Ball in motion, that lay in its way, it only communicates the motion it had received from another, and loses in it self so much as the other received; . . . (E, 2.21.4) 9

Locke's position is that matter changes only through the action of an external agent. The power to begin motion is not in matter itself; a body at rest cannot set itself in motion, but can only receive motion from and transfer it to other matter--from and to other particles. As we shall see, if all change, and thus all activity, in nature takes place through the transfer of motion from particle to particle, then all causation is ultimately not true causation, but only effect. Locke defines cause as "that which makes any other thing . . . begin to be . . ." and effect ". . . is that, which had its Beginning from some other thing." (E, 2.26.2) Causation as creation, as the result of active power in the strict sense, can be found only in that with mind, and thus with thought alone which can truly initiate motion. Causation, in any other sense, where there is no thought, would be the result

of the passive power of motion, the power exclusive to matter, and in this sense would be effect rather than true cause.

All this is but another way of making a basic point: for Locke, all action in nature is mechanical, the result of the transfer of motion, matter to matter, particle to particle. We will return to this point as central to Locke's idea of nature. For the moment, it has been necessary to see how this has its basis in Locke's position on that kind of power which is the power of matter.¹⁰

3.2: The Qualities of Matter

The eighth chapter of Book II is Locke's major statement of the properties of matter and the sources of those properties. The context of that discussion--coming immediately after Locke has described his four kinds of simple ideas¹¹--is the distinction Locke makes between simple ideas of sensation, on the one hand, and the properties of matter, on the other. He here spells out what a simple idea of sensation is an idea of and, in so doing, he spells out the relations between idea and object--including how and why it is possible for objects to produce ideas in us.¹²

A central issue in the chapter is Locke's presentation of his causal theory of perception, a theory which is grounded in the properties of matter. He tells us that he is to distinguish between ". . . Ideas or Perceptions in our Minds" and "modifications of Matter in the Bodies that cause such Perceptions in us." (E, 2.8.7)¹² Consider, first, how Locke

defines "quality," and with it how he distinguishes quality from idea:

Whatsoever the Mind perceives in it self, or is the immediate object of Perception, Thought, or Understanding, that I call Idea; and the Power to produce any Idea in our mind, I call Quality of the Subject wherein that power is. (Ibid., 8) 14

Locke goes on to point out that if he ever refers to ideas as "in the things themselves, I would be understood to mean those Qualities in Objects which produce them in us." (Ibid.) The distinction is clear, at least in terms of Locke's stated intentions: qualities are always of objects or bodies or matter, including the "insensible parts." Ideas are always of mind; their existence, qua ideas, is always in the mind.¹⁵

The mind's immediate objects are its ideas--whether the source be of its own operations or of the "external world." In the context of the discussion of qualities, the focus must be on the mind's ideas of that external world, for here Locke is concerned with explaining how that world can produce those effects which are the ideas. But, then, what are the qualities that are "of the Subject," that are powers that inhere in the subject? Whether those qualities are identified with powers, or are themselves the result of those powers is a question that will be considered below, in light of Locke's discussion of qualities and in relation to what has already been pointed out about the powers of matter.¹⁶

The question that concerns Locke explicitly is how matter can produce ideas in us. The instrument for that explanation is to be found in his discussion of the qualities

of bodies, and in his distinguishing of three kinds of qualities: primary, secondary, and tertiary (the last referred to by Locke as "barely powers").¹⁷ The basic distinction between the primary and secondary qualities is hardly original with Locke, as we have already seen.¹⁸ It is already present in Democritean atomism; it is significant in other particle theories of the seventeenth century; it appears in Galileo's The Assayer, of 1623, though there without specific reference to a particle theory.¹⁹ The distinction is between what is a property of matter, and is therefore independent of thought, and what exists as thought or in consciousness only. The designation of a third category of quality seems to have originated with Boyle.²⁰

Let us look first at how Locke defines the three types of qualities, considering them individually. It should be kept in mind that Locke has identified qualities, all qualities, as powers--in the context of his discussion, those powers specifically which produce ideas in the mind. This holds for the primary qualities as it does for the secondary qualities and for those that are here designated as tertiary, despite Locke's subsequent references to the secondary and tertiary specifically as qualities--mediately and immediately perceivable. (E, 2.8.26)

3.2.a: Primary Qualities

Locke describes the primary qualities as follows:

Qualities . . . in Bodies are, First such as are utterly inseparable from the Body, in what estate soever it be; such as in all the alterations and changes it suffers, all the force can be used upon it, it constantly keeps; and such as Sense constantly finds in every particle of Matter, which has bulk enough to be perceived, and the Mind finds inseparable from every particle of Matter, though less than to make it self singly be perceived by our Senses. . . . These I call original or primary Qualities of Body, which I think we may observe to produce simple Ideas in us, viz. Solidity, Extension, Figure, Motion, or Rest, and Number. (E, 2.8.9)

Locke varies the qualities he identifies as primary with almost every reference to them, within the chapter in which they are first discussed and in subsequent chapters. Extension, figure, solidity, the capacity for motion, and number are the original primary qualities in the first description, above. In the ensuing discussions, bulk, texture, and situation also are referred to as primary qualities.²¹ Later in the Essay, in chapter 23, section 17, Locke will state that figure is reducible to extension. And, although Locke is not explicit on this point, what is extended must have bulk as well as figure at the level of the particle; and when particles are in combination, they must have texture and situation.²² However, Locke persists in distinguishing solidity from extension.²³ Motion, finally, remains separate from all other qualities, a point that will be pursued below.

Holding aside for the moment consideration of what are the precise primary qualities and their interrelations and combinations, the major point is that these "Original or

primary Qualities of Body" are the defining qualities of matter; matter, to be matter, must have these properties.²⁴

They are independent of the quantity of matter, characterizing mountain and particle alike, present in the macrocosm and the microcosm. They persist through all changes matter undergoes. They are precisely what changes, beyond the level of the particle. Although Locke is not specific about this in his initial statement, it will be clear--in the discussion of the tertiary qualities--that all changes in mass matter are the result of changes in the relation of particles to each other (and thus are changes in situation, texture, bulk, and number), which in turn are the result of motion. The question of whether the individual particles themselves might change (i.e., whether there can be changes of figure or of bulk, specifically) is not discussed by Locke.

There is an additional, and crucial, issue to be considered: whether matter is infinitely divisible. In the present context, this issue involves the question of whether a point might be reached beyond which matter's identifying properties would be lost--obliterated. The problem of determining Locke's position on infinite divisibility is compounded by his central concern with the source of our idea of infinity. Thus, the passages to which we might turn for clarification do not speak to the specific point.²⁵

There is, however, a key passage in which Locke's concern is with matter, and not with infinity explicitly. In his initial discussion of the primary qualities, he writes:

Take a grain of Wheat, divide it into two parts, each part has still Solidity, Extension, Figure, and Mobility; divide it again, and it retains still the same qualities; and so divide it on, till the parts become insensible, they must retain still each of them all those qualities. For division (which is all that a Mill, or Pestel, or any other Body, does upon another, in reducing it to insensible parts) can never take away either Solidity, Extension, Figure, or Mobility from any Body, but only makes two, or more distinct separate masses of Matter, of that which was but one before . . . (E, 2.8.9)

A case might be made that there are two separate issues involved here: first, whether matter is infinitely divisible; and second, whether in the process of division (infinite or not), the primary qualities might be obliterated. The passage above can be construed as meaning that the primary qualities can never be denied of matter, whatever the extent of divisibility, but that it neither denies nor affirms infinite divisibility. Thus, matter could be divisible in infinitum, but the primary qualities could never be obliterated, without matter being obliterated with them.

There is a second passage to which we might turn for guidance. (The context of the passage is the conclusion of Locke's discussion of substances, in which he summarizes his position that both spiritual and material substances are, ultimately, unknown to us.)

. . . the divisibility in infinitum of any finite Extension, involving us, whether we grant or deny it, in consequences impossible to be explicated, or made in our apprehensions consistent; . . . (E, 2.23.31) 26

This passage, again, neither asserts nor denies infinite divisibility, concerned as it is with the difficulties of explication and of apprehension of properties associated with

the two kinds of substances.

Locke's position on the infinite divisibility of matter is, then equivocal; it is certainly possible for us to conceive of infinite divisibility, but that does not answer the question of whether matter is infinitely divisible.²⁷

A further, and here final, point needs to be made about the primary qualities: they are not mind-dependent, in the sense that their existence is not dependent upon the perceiving mind; they exist as properties of matter independent of our perception of them, properties on which, as we shall see, our perceptions are dependent. Yet, we recall that "Mind finds them inseparable from every particle of Matter." The mind cannot conceive of matter devoid of the primary qualities--without extension (and thus figure), solidity, mobility. Would Locke then say that mind imposes the primary qualities on the particles, if not on perceptible matter, in the sense that we cannot have a positive idea of matter devoid of primary qualities? Of course we cannot have any sense ideas of the primary qualities as they exist at the level of the particle, even if we refer to the experimental and observational evidence for the particle theory of matter.²⁸ Although Locke affirms the existence of the primary qualities independent of mind, he must also affirm that mind asserts their existence where sense is incapable of providing requisite ideas. Locke would reject any suggestion that mind is creator of those defining qualities. To the extent that there is anything hypothetical about them, they have been and will

continue to be subjected to the tests of experience and observation, as the particle theory itself rests constantly on such tests.

Perhaps Locke's major point is that the primary qualities of matter are what serves to define matter, in that matter is nothing but the original primary qualities; matter is nothing in addition to the original primary qualities. Thus, those qualities can never be obliterated without simultaneously obliterating matter--whatever the extent or limits of divisibility. Matter without the primary qualities would be close relative to the grin that remains after the Cheshire Cat has disappeared.²⁹

3.2.b: Secondary Qualities

The primary qualities of matter are not their sole qualities. Locke continues, with the identification of secondary qualities:

. . . 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, Tastes, etc. These I call secondary Qualities. (E, 2.8.10)

Again, Locke was not the first to make a distinction between those properties of matter that are quantitative or measurable--size, shape, the capacity to move--and those that are associated with a specific sense, even though the terminology--secondary qualities--is associated with him.³⁰ If all Locke were doing were to repeat what his predecessors had already asserted, with the possible addition of the terminology, it

would not warrant particular notice, even though one would still be concerned with the role of the distinction in the Essay. But, Locke does not stop with the distinction, for through it he is articulating what, for him, is one of the most significant elements in the distinction: the process through which specific simple ideas of sensation are produced.

Secondary qualities are powers, and powers only. They exist as the capacities of particles to produce those effects which are the sensations associated with the specific senses. Those producing mechanisms are the bulk (or volume), figure, texture (or structure) of the particles and the motions they set up either in the medium separating object and sense organ, or directly on the receiving sense organ. Our ideas of those secondary qualities are those ideas that are specific to the individual senses: colors, sounds, tastes, smells, tactile sensation.

But now a difficult issue begins to emerge. Locke has defined all qualities as powers; and powers, as we have seen, produce change. Power in matter--in nature--is, ultimately passive, in the sense that all causal efficacy is through the transmission of motion. How are we to distinguish the secondary from the primary qualities when, apparently, both are powers--the powers of particles? What is it that differentiates the secondary from the primary qualities?

The answer is found in how Locke distinguishes the ideas of the secondary from the ideas of the primary qualities. The

source of both is identical; the process is identical; the results are not identical. The ideas of secondary qualities have a different relation to their source than do those of the primary qualities. The secondary qualities produce their effects which are the ideas of secondary qualities in the same way as do the primary qualities--through the action of the imperceptible particles on the sense organs. However, unlike the ideas of the primary qualities, those of the secondary qualities do not resemble what exists independent of those ideas--ideas of the sensible qualities.

But, we need to carry this a step further, emphasizing that both kinds of ideas have the identical source--the particles of which objects are composed; and are produced through the identical process--the motion of those particles. Thus, there is a sense in which the ideas of the primary qualities are as different from their source as are those of the secondary qualities--with the possible single exception of what is seen under a microscope. There is an interesting relationship that follows: between the perceptible extension, figure, and solidity of the perceived object, and those properties of the component and causal particles. (Because texture and situation--and, possibly, bulk--refer to relations between particles exclusively, we would not--except for microscopic views--have resembling ideas of these two primary qualities. Nor, of course, could we have ideas of the primary quality of mobility.)

To summarize before proceeding to the next of the qualities, and before additional consideration of the issues dis-

cussed thus far: All qualities are the powers of matter's particles to produce changes in other matter. Where the affected matter is a human sensory system, the effects are ideas. Those ideas that are specific to individual senses are not resembling. The sense organs are, of course, the sole means of access for all ideas of sensation. What distinguishes the ideas of primary qualities from the ideas of secondary qualities is that the properties of extension, solidity, etc., of perceptible matter are directly determined by the same properties of the particles and thus bear a resemblance to them; whereas the properties of color, etc., of perceptible matter do not resemble properties of the particles.

With this in mind, we proceed to the third type of quality.

3.2.c: Tertiary Qualities³¹

Locke continues:

To these /the previously identified primary and secondary qualities/ 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 which I to comply with the common way of speaking call Qualities, but for distinction secondary Qualities. 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. (E, 2.8.10)

Locke calls this third sort of quality "barely powers"--bare, in the sense of "merely" or "simply."³² They are powers, and nothing but powers, yet as much qualities, according to

the "common way of speaking," and really existing in the subject as are those designated secondary qualities. What Locke says here about the tertiary qualities is, therefore, enough to place them in the same category as the secondary qualities, which are also powers. Both refer to matter's powers to produce changes in matter, always through the action of component particles--those "insensible parts." What distinguishes the tertiary from the secondary qualities is that the latter terminate directly in ideas, in those simple sense ideas of color, sound, taste, smell, touch. The secondary qualities are those powers exclusively in relation to the process of sensation. But, although Locke describes the tertiary qualities, too, in their relation to sensation--as the powers particles have to effect those changes in such other particles as to produce changes in an object that will, in turn, produce changed simple ideas of sensation--they have a status that is independent of sensation. For, particles are particles, wherever they exist; they have the same characteristics; they obey those laws which govern the actions of all particles. Where there are sense organs and the capacity for sensation, the actions of the particles and their specific characteristics have a causal relation to what is perceived. The particles that compose wax or clay or the human sensory system are affected by a process going on continually and continuously in nature. The particles that make up the sun have the power to melt wax whether or not anyone happens to be there to see and feel the changed texture and temperature of that wax. The process itself goes on with

or without the presence of the observer.

Thus, the tertiary qualities are central to change in nature, for they express the process through which change takes place. Secondary qualities are a special case of the power matter has to produce changes in matter; they result in ideas because the matter so changed is part of the human sensory system. Both the secondary and the tertiary qualities are powers, the latter exclusively so, in that they need have no specific association with sense ideas--those ideas of secondary qualities.³³ Both refer to what exists objectively in matter, and therefore in nature: the primary qualities and their powers. The key to change and to causation rests with the primary qualities, and with the power specific to matter.³⁴

3.3: Powers, Qualities, and Change in Nature

We are now ready to re-examine Locke's analysis of matter's powers and qualities, to determine what they reveal about the process of change in nature and about the causes underlying change. We will do so with the realization that change and cause in nature are not Locke's central concerns; that whenever he discusses the process of change it is to justify or elaborate on his explanation of the origin of ideas, or as a point of departure from his central concerns about ideas and knowledge. We will refer to Locke's explanation of the origin of ideas only as part of that process, albeit as a special case.

The instrument of change is motion--the passive power of

motion which is the sole power of matter, motion that is received and transferred, motion on impulse, "the only way which we can conceive Bodies operate in." (E, 2.8.11)³⁵ This holds for all matter, from particle to mass; wherever there is matter, the kind of power and therefore the source of motion will be the same. When we consider changes in the properties of matter and, in particular, the causes of those changes, the explanation of what takes place, and how, is to be found at the level of the particle. We see this in Locke's designation of the tertiary qualities as those powers resident in the "insensible parts" of matter.

Motion is not the sole element in change, even though it is the immediate cause. For, the other primary qualities are also part of the process. Although there can be no change without motion, motion alone cannot account for all aspects of change; it is a necessary but not a sufficient condition. Equally important are the other primary qualities. Let us now consider how these primary qualities are involved in the process.

Locke persists in identifying the primary qualities as the defining properties of matter. But there are puzzles that keep reappearing: puzzles about how Locke defines qualities, all qualities; about what identifies primary qualities as primary qualities; about what are the specific primary qualities. For, as we have already pointed out, Locke is never consistent in his identification of the primary qualities; the list varies throughout the Essay, even in the chapter in which he puts

the primary qualities before us for the first time. Then, there are Locke's many references to qualities as the powers of matter to produce change: changes in the matter that makes up the sensory system and that result in simple ideas of sensation--the ideas of secondary qualities; changes in other matter without reference to sensory matter--the tertiary qualities. And, there is Locke's initial definition of qualities as power: ". . . the Power to produce any Idea in our mind, I call Quality of the Subject wherein that power is." (E, 2.8.8) This, in spite of his repeated designation of the passive power of motion as the sole power of matter. Yet, we can now begin to see what Locke is getting at: what are the true distinctions, and what they reveal about the process of change that is the present concern.

There are three, and only three, original qualities of the particle: extension, solidity, and mobility (the power to receive motion).³⁷ Although Locke includes figure as one of these original qualities, by Chapter 21 he drops it from the listing, and in Chapter 23 he explains why: figure, Locke writes, is "the consequence of finite Extension." (E, 2.23.17) There cannot be extension without shape, and thus figure is included in extension because it cannot be separated from extension.

Number also is included in Locke's initial discussion of the primary qualities. (E, 2,8.9) However, as an idea, its source can be either in matter or in spirit. (E, 2.21.73) Thus, it ought not to be identified with matter exclusively,

and Locke usually omits it from his listings of the primary qualities.

But what about texture, situation and bulk? Texture and situation, when we consider their meanings, turn out to be not properties of individual particles, but relational or derivative properties. They identify the properties which particles have in relation to or in combination with other particles. Thus, a particle alone can never have the primary quality of situation, which is the spatial property--the result of the relations of particles to each other in space.³⁸ Nor can a single particle have the primary quality of texture --which, as structure or constitution, requires particles in combination.³⁹ Bulk, as volume or quantity, presents a different problem. As quantity, it cannot be limited to a single particle. When Locke refers to qualities that are inseparable from matter through all changes, he adds: ". . . and such as Sense constantly finds in every particle of Matter, which has bulk enough to be perceived . . ." (E, 2.8.9) Here, clearly, Locke could not intend "particle" to have its usual meaning as the basic unit of matter which must be imperceptible to sense. Yet, the individual particle through its extension and as three-dimensional, could certainly have bulk.⁴⁰

Thus, these qualities, by their definitions, demand a relation to other particles, or combinations of particles; they can never be properties of a single particle, taken singly. And this is precisely where change takes place--change independent of a perceiver or change which terminates

in ideas. The individual particles never lose their solidity (essential for motion on impulse);⁴¹ nor their extension and, with it, figure; nor their power of receiving and transmitting motion. Nonetheless, they do change position and thus their relations to other particles. And this is what constitutes change: the re-arrangement of particles in relation to each other, caused by their passive power of motion. Strictly, motion alone is the power. The individual particle with its solidity and extension is what has the power to respond to motion--to move. Individual particles do not themselves undergo change, except for change in place.⁴² But, all other changes in nature are explicable as the effects of the particle's passive power of motion which, though itself effect, is able to produce changes even in those primary qualities of matter which require particles in combination and in relation to each other: situation, texture, bulk.

What is omitted from this account is consideration of the originating source of matter's motion: whether motion in nature is self-caused, or uncaused and eternal; or whether there is an original first cause that sets matter in motion or creates matter as moving. Locke rejects any possibility of an originating cause of motion within matter itself. He expresses this rejection in his very definition of matter's power as mobility--the passive power of motion; and in his limitation of active power to that which has thought and volition.⁴³ He rejects it, as he must, for theological reasons. For, as radical as may have been Locke's reputation

in his time on theological issues, he would not deny the place of the Deity as Creator, and thus the original cause of all that exists.⁴⁴ The need for an originating source of motion is, thus, one element in Locke's causal proof for the existence of God.⁴⁵

Summary

The focus of this discussion of powers and qualities has been on what they reveal about the process of change and causation in nature.

For Locke, the passive power of motion, matter's sole power, is central to the process of change. Change takes place through motion received and transferred, particle to particle, mass matter to mass matter. The individual particles themselves do not change; their specific extension and solidity are unchanging and unchangeable. But, what does change are their relational or derivative properties: situation, texture, bulk. Number, as the addition or subtraction of units, is the primary quality that can be regarded both as original and relational. The instrument, and thus the immediate cause, of these changes is the particle's passive power of motion.

The original primary qualities of the particle--the passive power of motion, the solidity essential to the communication of motion, the extension which must characterize anything that is matter--these are the unchanging properties of matter, resident in the particle. The relational properties are equally primary qualities, but they define the particle

in relation to other particles; they are not independent properties of the individual particle.

From these primary qualities arise those properties identified as secondary and tertiary qualities, each powers and the result of matter's power to effect change in other matter: the secondary, resulting in the simple ideas of sensation which are the ideas of the sensible secondary qualities, and possible only because the human sensory system is material and therefore continuous with the physical world of matter in motion; the tertiary, referring to the process of change in nature, changes which come into human observation only as ideas but which exist whether or not there is an observer.

The central elements which account for the process of change are, therefore, the passive power of motion and the extension and solidity of the particle. Motion is the immediate cause of all change in nature (whether or not that change is perceived). The ultimate cause of this passive power of motion in nature must be sought in that which is not matter, which is pure active power--pure mind or spirit: God.

Thus, Locke's account of the qualities and powers of matter explain the process of change and causation in nature, and in so doing show how the origin of human thought is continuous with that process.

We turn now to the final steps in this formulation of Locke's idea of nature: scrutiny of Locke's conceptions of real essences and material substances.

Notes

1. The bulk of chap. 21 deals with the powers of mind and, therefore, lies outside the scope and concern of the present study. Note also that although chaps. 8 and 21 of Book II will be major sources for the present discussion, references will be made to other parts of the Essay in which Locke discusses relevant issues.

2. ". . . my present Business being not to search into the original of Power, but how we come by the Idea of it."
(E, 2.21.2)

3. Locke says also: ". . . Power includes in it some kind of relation, (a relation to Action or Change) . . ." (Ibid., 3) For, all simple ideas of the qualities of matter contain a "secret relation"--among the parts of matter or between matter and perceiver. (Ibid.) For Locke, at least, this does not seem to put in jeopardy the identification and status of power as a simple idea.

4. See, for example, E, 2.21.1.

5. ". . . whatever Change is observed, the Mind must collect /infer or conclude/ a Power somewhere, able to make that Change, as well as a possibility in the thing it self to receive it."
(Ibid., 4)

6. The sources of these as ideas come from the experience we have "from reflection of what passes in ourselves" when we can begin to move parts of our bodies "barely by a thought of the Mind . . ." (This, the source of our idea of active power.) When we observe "the operation of Bodies by our senses" we find only passive power, motion on impulse, motion transferred.

7. There are ". . . but two sorts of Action, whereof we have any Idea, viz. Thinking and Motion . . ." (Ibid.)

8. That shifting of intellectual feet refers to the problem Locke opens up in his consideration of whether matter's powers are, indeed, completely passive. Within the context of his discussion of power, Locke speculates on "whether Matter be not wholly destitute of active Power, as its author GOD is truly above all passive Power; and whether the intermediate state of created Spirits be not that alone, which is capable of both active and passive Power . . ." (Ibid., 2) Much further on in the Essay, in Book IV, Locke becomes more dangerously specific by raising the question of whether matter can think. His purpose there differed, at least in his public statements, from the interpretations given it by others. The context is God's existence and nature, with speculation about the creation of thinking in relation to matter (i.e., in human-kind). Locke had previously avoided speculation about how mo-

tions to the brain produce ideas in the mind. (For discussion of whether matter can think, and the context in which the question is raised, see especially E, 4.3.6; and 4.10.13-19. The issue is a thread running through the correspondence with Stillingfleet, involving as it does the question of the soul's materiality, and therefore its immortality.)

9. The issue of motion on impulse will be discussed in 3.3, below. It is also to be noted that Locke here expresses his acceptance of the conservation of motion; in the transfer of motion from one particle to another, the loss of one is the gain of the other.

10. Reference should be made here to the relation between Locke's position on matter's powers and his simple ideas of sensation, even though it is peripheral to the present context. It has been noted (pp. 76-77, and 81, above) how the human sensory system is continuous with nature, with the material world. It functions as does all matter; the process that results in a simple idea of sensation involves motion transmitted from particle to particle; the process involves passive power, and we see how thoroughly Locke's theory of the original source of ideas is rooted in a conception of the human body as part of nature. Thus, the "blank tablet" does not exert any power of selection over its simple ideas, nor does the gradually imprinted tablet. The process is, fundamentally, a mechanical one. The origin of ideas as simple ideas of sensation is dependent upon the continuity of the human sensory system with nature, with the material world.

11. Simple ideas of one sense, of more than one sense, of reflection, of sense and reflection.

12. The relation here is between simple ideas and an object's component particles. This, as we shall see, is the ground for any assertion that can be made about real existence in nature. (See especially sn. 4.4, below.)

13. Locke makes clear, in his discussion of power (E, 2.21) that the power that determines causation in nature (immediate causation, that is, and not first or ultimate causation), is passive power--the power to transmit, but not to initiate, motion.

14. This is the second definition of "idea" that Locke has given. The first is in E, 1.1.8, where he defines an idea as "the Object of the Understanding when a Man thinks."

15. Locke's reminder needs to be kept in the reader's mind; more than once he refers to qualities when he clearly means ideas.

16. See sn. 3.3, below.

17. For the first time, in E, 2.8.10. (Note that in sn. 24 he calls both secondary and tertiary qualities "Powers barely." This, to emphasize that the secondary qualities, too, are in bodies only powers.)

18. See above, 1.3.

19. ". . . whenever I conceive any material or corporeal substance, I immediately feel the need to think of it as bounded, and as having this or that shape; as being large or small in relation to other things, and in some specific place at any given time; as being in motion or at rest; as touching or not touching some other body; and as being one in number, or few, or many. . . . But that it must be white or red, bitter or sweet, noisy or silent, of sweet or foul odor, my mind does not feel compelled to bring in as necessary accompaniments. Without the senses as our guides, reason or imagination unaided would probably never arrive at qualities like these. Hence I think that tastes, odors, colors, and so on are no more than mere names so far as the object in which we place them is concerned, and that they reside only in the consciousness." ("The Assayer," The Discoveries and Opinions of Galileo, Stillman Drake, transl., Garden City, N.Y.: Doubleday Anchor Books, 1957. P. 274.) Drake comments that this passage--beginning before, and continuing after the portion quoted--is taken by many to link Galileo with both Locke and empiricism to come, and with Democritus past. But, he emphasizes that "Galileo was no philosophical empiricist"; that reason was of "no less importance" than experiment . . ." (ibid., no. 19). This raises interesting issues about the roles of reason and experiment in science, even for Locke--issues that will not be pursued here.

A further point, about Galileo's description of corporeal substance: one is reminded immediately of Descartes' description of "corporeal nature in general," in Meditation I.

20. See above, p.49, for some consideration of whether there is indication of a third category of qualities, in Boyle's Origin of Forms and Qualities. (The question of whether there indeed is a third category is discussed here, in 3.2.c.)

21. There could be a minor industry established to sort out the varying combinations of primary qualities that Locke lists in many parts of the Essay, most especially throughout 2.8. Glenn A.Hartz (Syracuse University), in an unpublished paper dated 6 December 1983, has charted the frequency with which those qualities identified as primary by Locke are mentioned, and where in the Essay each is to be found. Bulk, motion, and figure are mentioned most frequently (28, 36,45), and solidity and texture least frequently (6 and 9)--a rather extraordinary finding, considering that solidity and extension, and motion are Locke's defining qualities of matter.

22. See especially E, 2.21.72 and 2.23.15-17.

23. Locke pauses in his presentation of simple ideas to devote an entire chapter to solidity (E, 2.4). Although he never mentions Descartes by name, the burden of the chapter --the distinction between the extension of body and the extension of space--is evidence of a fundamental disagreement with Descartes, whose res extensa excludes the possibility of space. Nature, for Descartes, not only abhors a vacuum; it excludes one!

24. Sn. 3.3, this chapter, considers in detail the distinction between those qualities that are original and primary, and those that are identified as primary only.

There are additional issues to be noted: whether Locke uses "matter" and "body" interchangeably, or whether he makes a distinction between them; whether matter is anything in addition to the primary qualities--extension, solidity, and mobility--and those qualities that will be referred to as relational properties.

25. E.g. E, in 2: 15.9; 17.18; and 29.16. Locke, in these passages, attempts to show how our ideas of infinity and of infinite divisibility have their origin in simple ideas; and that though we can have ideas of both infinity and infinite divisibility, they are not positive ideas, nor are they "clear and distinct" ideas.

26. The passage concludes: ". . . Consequences that carry greater difficulty, and more apparent absurdity, than any thing can follow from the Notion of an immaterial knowing substance." (E, 2.23.31)

27. Locke's position is, of course, different from that of Descartes, who asserts unequivocally the infinite divisibility of matter. Leibniz will use the issue of finite divisibility as a major criticism of atomism. Whether this is fairly applied to Locke is questionable, in light of his equivocation. (See below, 6.2.c, for discussion of Leibniz's arguments.)

28. See 2.2, above.

29. In Lewis Carroll's Alice's Adventures in Wonderland, chap. 6.

30. See especially 1.3, above. Recall also that Boyle's terminology in Origin of Forms and Qualities is similar, but not identical to, Locke's.

31. Locke never refers to this kind of quality as "tertiary"; his identification is "barely powers." Because it constitutes a category different both from the primary and the secondary, and because Locke uses "barely powers" also for the secondary

qualities (n. 17, above), the term "tertiary" will be used throughout the following discussion.

32. The Glossary in the Nidditch edition of the Essay so defines "barely" according to its 17th century usage (p. 829b).

33. This is said in spite of Locke's identification of the tertiary as the power to produce such changes in matter as will result in changed ideas of those objects--Locke's concern in the Essay. Those changes in matter would take place with or without the observer.

34. Locke's discussion of powers and qualities both helps us to see at least one reason why he must hold on to the existence of material substances. Locke needs material substances to account for the process through which ideas are produced. He needs to make the sensory system an integral part of that process. He needs the way in which matter operates to provide for his explanation of the origin of ideas--in opposition to innateness. Why he must persist with the category of substance--why matter alone would not be sufficient--is a question to be considered in chap. 4, below.

35. ". . . Body cannot but communicate its Motion by impulse, to another Body, which it meets with at rest; . . ." (E,2.23.18. The last phrase presents something of a problem: does Locke mean precisely what he write here, that the second body must be at rest? Is this intentional, or an oversight?)

There is an important change in the passage cited in the text (already referred to in chap. 2, n. 26, p. 89, above)--a change made after the first edition of the Essay, in which the full passage reads: "The next thing to be consider'd is how Bodies operate upon another, and that is manifestly by impulse, and nothing else. It being impossible to conceive, that Body should operate on which it does not touch, (which is all one is to imagine it can operate where it is not) or when it does touch, operate any other way than by Motion." (E, 2.8.11; text changes, pp.135,1.31-136,1.2) It is here suggested that the text changes after the first edition of 1690 were the direct result of Locke's new association and friendship with Newton, and his study of the Principia (even though that study began before the publication of the Essay). Newton's theory of gravitation opened up the question of one body "operating" on another without direct contact, raising protests about the revival of "occult qualities." Locke, in changing the passage, acknowledges the significance of Newton's theory, as well as its influence on his thinking subsequent to the first edition of the Essay. (Locke, in fact, discusses the change in his second reply to Stillingfleet, with reference to the Essay's "next edition"--it would be the 4th--as rectifying his previous position, as a result of his conviction that Newton was correct. /Locke, Works, IV, 467-468/

36. See 3.2.a and n. 21, above, for listing of Locke's varying combinations of primary qualities.

37. In E, 2.21.73, Locke defines mobility as "the Power of being moved" in contrast to motivity, "the Power of moving." The former is specific to body, the latter to mind.

38. See p. 48 above for definition of "situation".

39. See p. 48 above for definition of "texture." It should be noted that we ought not to confuse the meaning of "texture" with the "real internal constitution" of the particle, discussed by Locke in relation to real essence. (See chap. 4, below, especially

40. In this sense, bulk might be synonymous with magnitude.

41. "Upon the Solidity of Bodies . . . depends their mutual Impulse, Resistance, and Protrusion." (E, 2.3.5)

42. As we will see, two of Leibniz's major criticisms of atomism are their finite divisibility and their lack of differentiation. On neither point is Locke completely clear.

43. We need again to be reminded about Locke's ruminations about whether matter can think, the reasons for his raising the question, the ensuing controversy with Stillingfleet about this issue.

44. Locke's theological position and the theological implications of positions taken in the Essay were, from the beginning causes of controversy and attack. We may, today, lose sight of their significance, although recent scholarship brings them to our attention. Consider Yolton's discussion in Thinking Matter; and Jolley's discussion of Leibniz's response to the theological implications of Locke's ideas and their significance for an understanding of the underlying conflict, in Leibniz and Locke. (See above, General Introduction, ns. 4 and 9.)

45. In E, 4.4.10, especially, where the need for a cause of motion in matter is woven into Locke's discussion of whether "incogitative Being" could have produced "cogitative Being."

Chapter IV

Real Essences and Material Substances

Given the particles with their powers and qualities, what now can be said about what exists in nature? In particular, what light does Locke's corpuscularianism shed on his conceptions of real essences and material substances--both central to his position on the natural world?

The discussion in the Essay both of essences and of substances presents difficult problems of interpretation. Each, for Locke, is an inherited category, with a history going back into Greek times and forming a part of a later Scholastic tradition which Locke explicitly rejected.¹ He retained the terminology of essences and substances, but those changes dictated by the corpuscular origin of ideas made the metaphysical categories no longer viable. The resulting differences in meaning have always presented problems for those concerned with Locke's positions on essences and substances: Has he redefined both so that the terms themselves are all that remain of the earlier conceptions? Is Locke's ontology one in which essences and substances have no place? Is his idea of nature one in which those categories have no useful explanatory purpose, serving only to obscure our under-

standing of what exists in nature independent of human apprehension? These questions will be in the background of the ensuing discussion.

The discussion will begin by considering Locke's opposition to the notions of essences and substantial forms. It will then examine the distinction he makes between nominal and real essences, before proceeding to discuss one of the two major considerations here: his conception of real essence. We will then turn to the second major issue: material substances. Examination of the relationship between the two will clarify the meaning of each and the significance of both for Locke's idea of nature through what they reveal about what exists in nature. For, the real issue is what exists; in Locke's terms which categories of our ideas are ideas of what exists independent of those ideas, and how and why.²

4.1: Locke's Opposition to Essences and to Substantial Forms

Locke's discussions of essences are among the most significant in the Essay. Most of what he has to say is critical and rejecting; it leads to a different analysis of the meaning of essences by distinguishing between the nominal and the real; it results in his skeptical conclusions about the possibility of our ever knowing the real essences of substances. That analysis and the skepticism will concern us in subsequent sections. The issue addressed here is the question of what underlies Locke's criticisms of essences.

What are the reasons that lead him to its rejection?

Before considering the grounds of that rejection, it is useful to clarify the traditional meaning of the term that is the focus of Locke's position. The term and the issues it answers have a long history, going back to Aristotle, but with roots in Plato's Forms: what makes anything what it is and the kind of thing it is? How are we to know the individual as one of a kind? Over the centuries, and into the seventeenth century, the terminology that became attached to the issues included--in addition to essences--substantial forms, nature (in the sense of the nature of anything), and even substance in one of its meanings.³ In the Essay, Locke's discussion of "substance" is not explicit about this aspect of the term's meaning. Nor does he discuss the issue in terms of "nature." He does refer, though not frequently to "substantial forms"--the terminology Boyle uses in The Origin of Forms and Qualities. That work, as we have seen, not only presented lengthy theoretical arguments against the traditional explanations of what accounts for the properties of objects, but also offered extensive experimental evidence to support the corpuscular basis of those properties.⁴

The issue underlying Locke's discussion of qualities (in E, 2.8 initially and especially) is most closely related to the rejection of substantial forms. It is in this context that Locke, following Boyle, explains the various properties of objects through the qualities and powers of their component particles. The problem of essences, while concerned

with the same fundamental questions, bears a greater burden of argument and idea in the course of the Essay, because it is with essences that Locke comes to grips with two central aspects of the entire problem: first, the question already pointed to--what accounts for what anything is, as individual and as kind; and, second, what is the source of our ideas of things and of kinds. The answers to both questions lie with the corpuscular origin of all ideas and of all properties of material things.⁵

Related to both questions is the position that everything that exists is individual, determined by what is specific to it: its component particles with their powers and qualities, and its "unknown but real internal constitution." Universality and generality, however, are the work of the mind, and not of nature. Their formulation is possible only because the mind has the capacity to abstract from its individual ideas those qualities or properties which the mind finds are common to others of its ideas.⁶ The mind can separate its particular ideas "received from particular Objects . . . from all other Existences, and the circumstances of real Existence, as Time, Place, or any other Concomitant Ideas." (E, 2.11.9) Thus are formed abstract or general ideas, to which, Locke tells us, general terms or names are applied. So too are formed "Universals, whether Ideas or Terms . . ." (Ibid.) Central to this process is the third of the mind's active and creative powers over its simple ideas: its capacity to abstract.⁷

Locke, however, does not relinquish the term "essence," nor, as we have just seen, the term "universal," as he does the phrase "substantial form." In fact, he finds a central place for essences, but only by distinguishing between what he designates the nominal from the real essence, and then applying that distinction to the different categories of complex ideas which he has identified. And, he continues to find a central place for substances. His purpose in maintaining the terminology would seem to be a corrective one: to show what the terms really mean through the analysis of the empirical origins of the ideas to which they are applied. The corpuscular philosophy makes obsolete--and inaccurate--all explanation of the properties of things by ways other than their corpuscular components, and the powers those corpuscles have to affect other corpuscles--including those that make up the sensory systems of human beings.

That same corpuscular philosophy shows that just as particulars, and only particulars, exist in nature, so all our ideas begin as individual ideas. Locke's discussion of essences, and the distinction he makes between the nominal and the real, are predictable consequences of his particle theory of matter. The mind may find similarities in things existing in nature; what actually exists, and what explains individual and specific properties, remains always individual: the specific particles with their qualities and powers.

4.2: The Distinction Between Nominal and Real Essences

It is in Book III, Of Words, that Locke presents his most extended discussion of essences. In his consideration of the meaning of general terms in the third chapter, he introduces the distinction between nominal and real essences, and the grounds for that distinction.⁸ However, Locke had already written of real essences at the conclusion of Book II, when making the distinction between adequate and inadequate ideas in chapter 32. And, in chapter 30, in his discussion of "real and fantastical ideas," the fundamental elements underlying the nominal/real essence distinction are to be found.⁹ An adequate idea is one that truly represents its archetype (that of which it is an idea); and an inadequate idea does not do so.¹⁰ A real idea is one that has "a Foundation in Nature; . . . a Conformity with the real Being, and Existence of Things, or with their Archetypes." (E, 2.30.1) Of all kinds of ideas simple and complex, those of substances alone are inadequate, and may also be "fantastical" rather than real, insofar as they are not combinations of simple ideas that are united and coexist in things. (Ibid., 5) Simple ideas are both real and adequate.

Yet, even earlier in the Essay, in 2.23, in the discussion of substance, Locke had already laid the grounds for his designation of real essences as distinct from the nominal, and from names of things, through his frequent references to the real or the internal constitution of things.¹¹ By chapter 31, Locke writes explicitly of the "real Essence, or in-

ternal Constitution" on which qualities depend. (E, 2.31.6)¹²

In fact, by the time we arrive at Book III and the analysis of words, including the relationship between words and ideas, and what each refers to, we are prepared for the position Locke will now develop: essences are what something is; but in almost all instances what is signified is determined by the meaning of the term we use to identify that thing. Meanings of terms, as definitions, are human creations, and not the work of nature.

Let us turn to Locke's statement of the distinction:

. . . Essence may be taken for the very being of any thing, whereby it is, what it is. And thus the real internal, but generally in Substances, unknown Constitution of Things, whereon their discoverable Qualities depend, may be called their Essence. This is the proper original signification of the Word . . .

. . . The Word Essence has almost lost its primary signification; and instead of the real Constitution of things, has been almost wholly applied to the artificial Constitution of Genus and Species. . . Things are ranked under Names into sorts or Species, only as they agree to certain abstract Ideas, to which we have annexed those Names, the Essence of each Genus, or Sort, comes to be nothing but that abstract Idea, which the General, or Sortal . . . Name stands for. . . These two sorts of Essences . . . may not unfitly be termed, the one the Real, the other the Nominal Essence. (E, 3.3.15) 13

Locke, in his view, is bringing the meaning of "essence" back to what is its original and still appropriate meaning: what it is that makes anything what it is. The essence of anything is what determines its "discoverable Qualities." This leads him to distinguish between what the name designates and what anything is independent of the name. Further, he introduces a modification in terminology to mark that distinction: the real

essence, which determines the properties of anything--of any specific thing; and the nominal essence, by which we identify the individual as one of a kind or sort--as one of a species.¹⁴ The underlying basis for Locke's distinction rests with his position on the individuality of everything that exists, and the related analysis of the origins of ideas. All ideas have their genesis as individual ideas of individual things experienced individually. (E, 3: 1.6 and 3.5-6) Yet, all words, or names (except for proper names signifying individuals), are general. Ideas in their origin as simple ideas are the work of nature; words are the work of the mind. The link between mind and nature in this context is the mind's capacity for abstraction; the mind forms abstract ideas by dropping out what is peculiar to individual ideas, and by retaining what many ideas have in common. Words--general terms--signify abstract ideas, even though we may and do apply those words to individual objects, events, actions, properties.¹⁵

Another way Locke uses to express the distinction in the passage quoted above is through what he terms the artificial, as distinct from the real constitution. The genus and the species are the artificial constitution ". . . the Essence of each Genus, or Sort, comes to be nothing but that Abstract Idea, which the General, or Sortal . . . Name stands for." (E, 3.3.15) This is the nominal essence. The real constitution is that "on which any collection of simple Ideas co-existing, must depend" (ibid.); and it is this that is the

real essence. Mind creates the nominal essence through its capacity for abstraction, for ranking things "under Names into sorts or Species." (Ibid.) The real essence is "the very being of any thing, whereby it is, what it is." (Ibid.)

The nominal essence, then, is the abstract idea that the name, as the general term, stands for; the real essence is what actually determines the properties of anything. As we will soon see, with modes and relations and with simple ideas, the nominal and real essences are the same--although the reasons differ; with substances, they are different.

To return to the distinction between what mind creates and what exists independent of mind. For Locke, there is one, and only one, classification for what exists independent of mind--what he designates as the concern of physike, or natural philosophy, at the conclusion of the Essay, and what in the Essay's categories is substance. In addition, simple ideas bear a direct--and related--connection with what has independent existence. All other ideas are mind-dependent, mind-created, in the sense that what they are does not have an existence separate from what is designated by the words which name them. In Locke's system of ideas, these are modes and relations.

With our ideas of mixed modes and relations, the names that refer to those ideas refer not only to their nominal essence--to the kind or sort--but also to their real essence. Locke's reason for this is that as he has defined modes and relations, each mode and each relation is what we define it

to be. The word "triangle" refers to an idea (an idea of a mixed mode). We have so defined the word as to make it signify that idea and no other; not a square, not a circle not an inch, not a tree. When we define the name of a mixed mode or a relation, we have identified and determined precisely what that idea is and is of. Even though my idea of a triangle cannot be identical with anyone else's idea, in the sense that it is an idea in my mind, the definition of the name "triangle" enables us to refer to a shape with certain precise properties. What defines "triangle" must enter into everyone's idea if, indeed, the term is to be grasped. The name must always signify the same set of properties that the idea encompasses. The nominal and real essences of modes and relations are the same.¹⁶

With simple ideas we have a different kind of problem.¹⁷ Obviously, we do give names to our simple ideas: red, sour, sharp, putrid, shrill. This, in spite of Locke's early admonition that many, if not most, simple ideas do not have names.¹⁸ Now, each name of a simple idea, like all names, signifies an abstract idea--as it can also refer to a particular simple idea. For example, the idea to which "white" refers can be either particular or abstract: the white of this-here snow; the white of all newly fallen snow. This is the case with all names, of course; any name, as a general term, signifies an abstract idea. But, unlike names of modes and relations, there is no way to define the names of simple ideas. For, a definition requires other names, each referring to a component

idea of what is being defined.¹⁹ A simple idea cannot have such component ideas and still be a simple idea. The sole way of grasping the meanings of the names we give simple ideas is to actually experience the particular idea--to have the sensation--which the name signifies. And, that sensation will itself be the result of the real essence; for it is the direct, the immediate, effect of the powers of the real internal constitution of its cause to produce that particular simple idea in us. There is no way to grasp a simple idea, other than to experience it; unlike modes and relations, to understand the nominal essence of a simple idea it is necessary to experience that idea--to be affected by its real essence.²⁰ This hold even though, as Locke assures us, ". . . in the Species of simple ideas and modes, they /nominal and real essences/ are always the same."²¹ (E, 3.3.18)

Further, in the "receiving" of simple ideas, the mind is passive. It is the one kind of idea for which none of the mind's active powers is required. Because the mind cannot create a simple, it must have its origin in what is not the mind.²² In contrast, the ideas of modes and relations require the mind's active powers--its capacities to compound, compare, abstract.

When we come to substances, we are faced with problems different from those of modes, relations, and simple ideas. And, in examining those problems, in looking at what Locke has to say about the real essences of material substances and the distinction between real and nominal essences, we are

brought closer to Locke's conception of nature, in terms of his position on what exists independent of our ideas.

With this in mind, we need now to turn to real essence itself, to consider what Locke means by real essence; how real essence is related to particles, to powers and qualities; and--as the basic issue--what real essences are the real essences of. All of this, in preparation for exploring the relationship between real essences and material substances.

4.3: Real Essences--What They Are, and Are Of

Nominal essences, thus, are creations of the mind; real essences (of simple ideas and of substances), the creations of nature. This much is clear in the Essay. But, the issues of what is a real essence, and what precisely it is the real essence of--these are matters of some confusion, for Locke is not always clear nor is he consistent in what he says about them.

The most extensive discussion of real essences is in Book III, and in three chapters especially: 3, 4, and 6. However, and as we have already seen, the distinction between real and nominal essences is first made at the end of Book II, in chapters 31 and 32; and real essences by equivalent phrase (real and/or internal constitution of things) enters into the discussion even earlier. The designation of real essence as the real or internal constitution of things persists throughout all discussions, though with some variation. Always cited is "constitution"; a reference to "inner" or "internal"; "real";

at times, "unknown"; and, in the fullest of the discussions in Book III, Locke writes of the "real, but unknown Constitution of . . . insensible Parts." (E, 3.3.17. This, not incidentally, is in contrast to the artificial constitution of genus and species.)

In attempting to clarify the meaning and significance of Locke's conception of real essences, there are several issues to be explored. (1) What is the relation between real essences and qualities? And powers? Between real essences and properties? (2) Are real essences individual? Or, are real essences to be associated only with kinds--kinds as actually existing in nature, not kinds expressed by nominal essences? (3) Are real essences to be identified with the particles? If not, what is the connection between them? (4) If real essences are identified with particles, then is it possible that their "unknown" status might eventually change--given sufficiently acute instruments of visual or of chemical/physical investigation? Are they forever unknowable to humankind, or are they, at least potentially knowable? (5) What, if any, is the relationship between what is accessible to us through sensation and real essences? In other words, does Locke continue to use the term "essences" for a purpose other than the one mentioned above?²³

Let us begin by considering the relationship between real essences and powers, qualities, and properties. On this matter, Locke is clear: the relationship is a causal one. Powers, qualities, and therefore properties of existing things

result from the real essence or the unknown constitution of things. He tells us, and repeatedly, that powers and qualities, and properties, all "flow from" and "depend on" the internal constitution of things or real essence.²⁴ Whatever that internal constitution may turn out to be, it will in some way determine what are the powers of a thing and, therefore, its qualities--its secondary and tertiary qualities, most clearly, both of which Locke defines as powers.²⁵ We must include also primary qualities, insofar as motion is a primary quality; and also the relative and derivative qualities of texture, bulk, and situation--those qualities which, as we have seen, define the individual particle in relation to other particles.²⁶ Motion and power, of course, are fundamentally interrelated; in matter, there is "mobility," the passive power of motion. The properties of anything, we find, consist "mostly in the active and passive Powers, it has, in reference to other Things . . ." (E, 2.32.24) This passage is in Locke's discussion of true and false ideas, specifically of substances, in which he shows a major error made when we judge that a complex idea (of a substance) "contains in it the real Essence of any Body existing . . ." (Ibid.) We are able to know only few of the properties of any existing thing--those properties which result from those powers that have the specific effects on us which make up our complex idea of that particular thing. There will be other properties which are not accessible to us as ideas of secondary qualities that make up that complex idea; in particular, those properties resulting

from and affecting other matter--properties of that thing of which we do not have ideas.

This first point, then, is that real essences have a causal relationship to powers and qualities and, therefore, the properties of things, though they are not to be identified with those powers, qualities, properties.

Next, let us consider whether real essences are specific to individuals and shared with no other individual thing. Locke is ambiguous about this. Consider the following passage (quoted at length because it raises a number of points that need to be pursued and clarified):

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, 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; v.g. Supposing the nominal Essence of Gold, to be a Body of such a peculiar Colour and Weight, with Malleability and Fusibility, the real Essence is that Constitution of the parts of Matter, on which these Qualities, and their Union, depend; and is also the foundation of . . . other Properties accompanying that complex Idea. Here are Essences and Properties, but all upon supposition of a Sort, or general abstract Idea, which is considered as immutable: but there is no individual parcel of Matter, to which any of these Qualities are so annexed, as to be essential to it, or inseparable from it. . . . take away the consideration of its being ranked under the name of some abstract Idea, and then there is nothing necessary to it, nothing inseparable from it. Indeed, as to the real Essences of Substances, we only suppose their being, without precisely knowing what they are: But that which annexes them still to the Species, is the nominal Essences, of which they are the supposed foundation and cause. (E, 3.6.6) 27

How can we, after all, speak of the essence, real or otherwise,

of an individual? In this passage, Locke is continuing his criticisms of the notion of essence as accounting for what anything is. Things existing are what they are because of their "inner constitution," and not because of any separate, external, or prior essence. Those properties we find in different things (in different complex ideas of particular substances) enable us to form abstract ideas to which we apply general terms; and those properties are indeed "essential" in the sense that to be so included in the abstract idea and designated by the term, the properties must be present. But, an individual is precisely that--individual; and once we start talking of essences, we are relating the individual to others which we put into the same classification. Those properties which identify any specific piece of metal as gold are indeed essential to that piece of metal if it is to be so identified and recognized as gold. This, after all, is what Locke means by nominal essence; here, those properties that define gold--that enable us to identify the object as that sort of metal to which we (correctly) apply the name, "gold." But, those properties are not essential to that piece of matter as that piece of matter. Any individual thing is precisely what it is; what makes it what it is (and not the kind we identify it as) is the specific "real, internal constitution of its insensible parts." Thus, it is appropriate to use the term "essence" as real essence to designate the "real, internal, but generally in Substances, unknown Constitution of Things, whereon their discoverable Qualities de-

pend . . ." (E, 3.3.15); but it is not correct to indicate that there is any quality essential to that thing as an individual, in the same way that an individual cannot be defined. Any individual object has a real essence, but that real essence must be separated from how and why we classify the individual as one of a kind.²⁸

But, what about properties? In what sense are they not individual? Properties are not individual only when they must be present to identify anything as a particular kind of thing. Specific properties are, indeed, essential for an individual to be a kind, or sort, and those properties--as do all properties--result from the inner constitution of that individual. In this sense only can it be said that properties belong only to species. This does not, however, preclude each and every individual substance from having its individual and specific properties.

We can now turn back to that puzzling statement in the passage just quoted: the real essence is "that particular Constitution which every Thing has within it self, without any relation to any Thing without it." Central to the position developed here is that a part of the inaccessibility of the real essence of anything is that all particles are part of the continuum of matter in nature; that even allowing for a void, there can be interactions between and among the units of matter. (This is critical to Locke's tertiary qualities, those qualities that account for change in nature.) If Locke now means us to take literally that the real essence is what it is

without any relation to anything else, then the whole significance of particles as interacting, and of the passive power of motion, must be challenged. The explanation that would enable us to persist with the present interpretation is that Locke's reference here is to the complete individuality of everything that exists, and to the real essence of anything as specific to that thing and not shared with anything else. It would not and could not exclude motion, the original primary quality which demands actual interaction--here, the motion of particles in relation to other particles to produce the specific properties of specific objects. This contrasts with the nominal essence which relates things to others through specifying the properties of the species or sort, and which is imposed on things because of the mind's capacity to form abstract ideas.

To return to real essences: We have seen, thus far, that the real essence of anything determines the powers and qualities, and therefore the properties of anything; and that the real essence is specific to the individual thing, even though those properties ultimately determine the nominal essence when they are selected as identifying any sort of thing. But, consider, is the real essence to be identified with the particles, identified in the sense of being identical with those particles? There is a yes and a no answer to this. For, the particles as individual particles cannot be identified with the real essence of anything. It is only when particles come together, when they are united to form those individuals of our

experience which Locke designates as particular substances (the complex idea of a particular substance)--it is only in this sense that the particles constitute the real essence of a particular thing. And this underlies and underlines the designation of the real essence as the unknown internal constitution of a thing. The constitution of anything refers to the inner structure of that thing; to what, in this sense, constitutes that thing.²⁹

Again, to distinguish real essence from the individual particles, we refer to a passage in which Locke discusses the inevitability of change in nature:

. . . the real Constitutions of Things . . . begin and perish with them. All Things, that exist, besides their Author, are all liable to Change; . . . that, which was Grass to Day, is to Morrow the Flesh of a Sheep; and within few days after, becomes part of a Man: In all which, and the like Changes, 'tis evident, their real Essence, i.e. that Constitution, whereon the Properties of these several things depended, is destroy'd, and perishes with them. (E, 3.3.19) 30

But we know--for Locke has made this clear at the outset of Book II--that the particles once created are indestructible, at least by humankind.³¹ (If they are destructible in nature itself, this would be through the ultimate agency of God.) Now, if the real essence, the inner constitution can be destroyed--in fact will be destroyed, as all specific existing things will be destroyed ultimately, in that they undergo changes--it clearly is not the component particles which are destroyed, but the combination that constitutes objects and the specific properties resulting from that combination.

If this is so, then the real essence would be that spe-

cific combination or unity which determines all the qualities, the properties, which are the result of that specific combination.

But, now consider: If indeed the real essence is the combination itself of the component particles, must it be permanently unknown? Is it, in fact, unknowable? Might not there be at some time in the indefinite future (in Locke's indefinite future) sufficiently powerful microscopes or instruments of chemical and physical analysis that might make the real essence of anything accessible to us? This is a difficult problem, one that for the moment must be considered from Locke's perspective (to the degree to which this is possible). And he would seem to deny the ultimate accessibility of real essences, even with "microscopic eyes" (though perhaps the faculties of angels and other spirits might be of some assistance!). Those microscopic eyes would make accessible to us only what is--potentially--visible; the inner structure is not necessarily identifiable with or limited to the visible.³²

Consider the two central properties of body: cohesion and mobility; that which binds together the individual particles to form the objects we experience, and that passive power of motion that is the communication of motion on impulse and that in some way is related to what accounts for the properties of those objects. Again, Locke denies access to what would explain both properties.³³ We must keep in mind that we would have to have some way of obtaining simple ideas of sensation of each, were we to have, ultimately, knowledge of them, and

Locke in his time could not envision the possibility of this. But, there is an even stronger reason for denying the possibility of ever attaining such knowledge. And this lies in Locke's speculations about the influences on matter from the furthest reaches of the universe:

. . . how much the Being and Operation of particular Substances in this our Globe, depend on Causes utterly beyond our view, is impossible for us to determine. We see and perceive some of the Motions and grosser Operations of Things here about us; but whence the Streams come that keep all these curious Machines in motion and repair, how conveyed and modified, is beyond our notice and apprehension; and the great Parts and Wheels, as I may so say, of this stupendious Structure of the Universe, may, for ought we know, have such a connexion and dependence in their Influences and Operations one upon another, that, perhaps, Things in this our Mansion, would put on quite another face, and cease to be what they are, if some one of the Stars, or great Bodies incomprehensibly remote from us should cease to be, or move as it does. (E, 4.6.11) 34

Uncharacteristically poetic as its expression may be (uncharacteristic for Locke, that is), the passage is deeply rooted in positions established earlier in the Essay, in particular in the particle's passive power of motion. We have already seen that this power is central among the primary qualities in terms of its relation to the secondary and tertiary qualities and to change. Those motions that effect change by affecting particles are chains of motions, in the sense that there is a continuity of motion throughout the universe. Those motions that result in the sound I hear, for instance, are themselves the results of other motions.³⁵

Whatever the ultimate basis for Locke's claim of the unknowability of the real essences of substances,³⁶ the fact

of that claim is consonant with his purpose and position in the Essay from its outset: description based on experience, observation, experiment where possible. The historical plain method is, after all, a compilation of just these results.

And this brings us, finally, to the last of the five questions raised: the question of the significance of Locke's real essences, both within the context of the Essay as part of his correction of the received doctrine of essences and more broadly in terms of its implications. The real essence of anything is specific to each existing thing; it is the cause of all the properties of that or any particular thing --including (perhaps especially) those properties accessible to us as simple ideas of sensation; it is not only unknown, but it is also unknowable. If this view of real essences is correct, then Locke indeed separated species or sort from the real essences of substances. Existence is individual; what determines the properties of each individual thing is its real, internal constitution. Those similarities among things that Locke explains as the grounds of nominal essences do not reveal the real essence, even though all properties of individual things are the result of their real essence. Species are created by human minds, seeking what is common to different experiences--seeking what, as experienced, has no connection. Species are not the work of nature. Locke's particle theory of matter makes this inevitable, for those particles that make up individual things determine all properties of each individual thing.

It is possible that Locke, through the notion of real essence, is struggling with the idea that there is an inaccessible reality underlying that reality which is accessible to human experience through sensation. This would be a metaphysical pronouncement--one following from that science which is the corpuscular philosophy. This is an interesting point, and one we will return to at the conclusion of this chapter.

4.4: Material Substances and Real Essences

Locke's doctrine of real essences is his answer to the question of what makes anything the specific thing it is, as distinct from the kind of thing it is. We have already seen that the resulting distinction between the real and the nominal essence is significant in just one category of ideas: complex ideas of substances. With all other categories of ideas (all complex ideas of modes and relations and all simple ideas) the real and the nominal essence is the same. In turning now to Locke's doctrine of substance, our focus will continue to be on material substances specifically, on material substances as those things actually existing in nature; not on complex ideas of material substances, but rather on what those ideas are ideas of.

Whatever problems and difficulties there may be in Locke's position on substance, it is here that we must search if we are to work out his position on what exists in nature. The purpose, then is to delineate that position on material substances, referring to what has been established about real

essences in the process and keeping in mind that it is the real essence of any individual existing material substance that accounts for the specific properties of that particular material substance. There is a sense, after all, in which Locke's position on substance is not complete, nor is its basis at all clear, until he has given his real-nominal essence distinction--some chapters after the initial major discussion of substance.

Locke's initial discussion of substance is in his presentation of complex ideas, their types and sources, and how they are formed by the mind.³⁷ His concern is with the source, and through that the meaning, of the complex idea of "pure substance in general," that epitome of abstraction, the (supposed) necessity for the existence of anything, the bearer of properties without which those properties could not exist.³⁸ Locke then proceeds to identify other complex ideas of substances, each expressing a less comprehensive category of abstraction: after pure substance in general, corporeal or material substance and spiritual substance; particular kinds of substances; particular substances.³⁹ It must again be emphasized that Locke is concerned throughout with the ideas of each, and their sources. Nonetheless, and as we have seen in other contexts, he cannot avoid consideration of what those ideas are ideas of, and the relation between the ideas and what actually exists in nature; what is revealed about nature through our ideas. His position on substance, as it develops, is completely consonant with his subsequent analysis of es-

sences; and follows from his earlier analysis of the sources of all ideas as simple ideas, with complex ideas the result of the mind's actions. In fact, and this is the important point, that position on substance cannot be understood without reference both to simple ideas of sensation, on the one hand, and to the doctrine of real essences--that unknown internal constitution of the insensible parts of matter--on the other hand. And, underlying everything is the particle, with its powers and qualities.

All complex ideas are the result of the mind's active powers, a contrast to all simple ideas in which the mind is passive. The mind's passivity is central to the whole process in which light enters Locke's dark room of the understanding;⁴⁰ and it is in the "reception" of simple ideas that human beings exhibit continuity with the material world, with nature. The ideas we have of particular material substances (of individual apples, cats, human beings, gold rings) result from the unity the mind creates from the motions from sources external to the human sensory system--what will be simple ideas of sensation once they have made that leap from brain to mind. The properties of the specific objects are the qualities, primary and secondary, resulting from the powers of component particles. The mind fuses those individual simple ideas of sensation through its innate active capacity of combination, thereby forming that complex idea to which, eventually, English-speaking people will apply the term "apple" or "cat" and so on. This last-cited act of the mind

will be preceded by a complicated process of abstraction through which is formed that abstract idea to which the term is applied.

It is the particular, again--the individual apple, cat, and so on--that exists in the world and that we have access to in our experience through the process which results in the complex idea. The particular material substance as perceived is perceived in its particular way because of the mind's powers--because of that unity provided by the mind. All ways in which substance is designated beyond that particular are exclusively the result of the mind's active powers, now its power of abstraction. The sole work of nature is the particular material substance; that alone exists in the world. All degrees of abstraction are the work of the mind. In this way, what Locke refers to as the particular material substance--as distinct from the particular kind--parallels his distinction between real and nominal essence. The real essence is to the particular substance as the nominal essence is to the particular kind or species. Substance in its higher levels of abstraction will also bear a relation to nominal essence, though not the nominal essence that is related to a particular kind.

But now we have to consider the question of what, precisely, it is that is the particular (and existing) material substance. The answer to this question will bring together what has been discussed about particles and their powers and qualities, about real essences, and, not incidentally, about simple ideas of sensation. It will enable us to see along

the way the sense in which Locke holds a position of direct realism, as opposed to a representational theory of perception. For, although our concern here is not with Locke's epistemology, his position on the source and nature of knowledge is so deeply interwoven with his conception of the natural world that some comment on the former is unavoidable. Let us, in our discussion, use a specific object as the instrument in which we can focus our analysis; a "something" to which we learn to apply the general term "apple" when it fulfills the requirements of the nominal essence expressed in the definition of that term. It must be emphasized, first, that there is a gap between this-here-something and the general term; and that gap is the abstract or general idea; and second, that that something is, in Locke's terminology, a complex idea of a particular material substance, a complex idea that is for this purpose without name, though we will use a name in referring to it (as we will use names in referring to its specifically identifiable properties).

First of all, my perception, and thus my idea, is of the whole object.⁴¹ It is only when I consider how that idea is formed that I find its component (simple) ideas: its specific shape and size, which jointly determine the area it occupies (its extension); its hardness; the fact that when it is placed on a level surface it will be without motion--only when it is struck by a moving object or when it is placed on an incline will its motionlessness be disturbed; its specific colors--part red, part green, white when cut open; its smooth

surface; its specific taste--its apple-taste; its scent; the sound when I bite into it. Each one of these properties is identified as an idea, a "simple idea." But, when I begin to think in terms of what the idea is of, as separate from the idea itself, I must refer to what it is that constitutes anything material; specifically, particles imperceptible to the five ways in which the human sensory system may be affected by what is external to it. Those specific particles of matter which constitute the "something" which has those properties I refer to in my description cohere one to the other and at this moment; whatever it is that accounts for that coherence so that I do perceive a whole, discrete object --that I cannot have an idea of. Certainly, the instruments of vision and of analysis so far reveal nothing that would explain that coherence. Further, those specific constituent particles of matter have the capacity to affect other particles; those within the object which all those particles constitute; those in other objects, including those of which my sense organs and nerves (as matter) are composed, so that I have the responses which ultimately will produce those effects in my sensory system which my mind will fuse into a single idea--a complex idea. Those particles will also affect particles of other objects as they affect particles that constitute my body; some of which effects I will perceive (e.g. when the apple affects the liquid into which I put it), some of which I will not perceive (e.g. when the apple falls from the tree, breaks open, and all its usual identifiable properties

change as it decomposes and as it is covered by and then ingested by insects).

What is it that enables particles to affect other particles? There must be some sort of motion involved. For, how can anything produce any effect without motion? How can there be any change, any activity, without motion? How, in particular, can anything have an effect without direct contact? Those particles that constitute the apple do not, themselves, have to move to my eyes in order for me to see the size, shape, colors of the apple. But, there must be some route and process before this takes place; even some motions in the particle of light between object and eye.⁴² If there is motion, then there must be some cause of that motion; because matter (including the matter of which my sensory system is composed) is not self-moving, that motion must itself be a response to the motions of adjacent particles.⁴³

There are other points we need to recall: particles all have extension, solidity, the capacity to move on impulse; they also have those relational properties of texture, bulk, situation. All of these qualities make up the specific properties of specific objects; they cause those responses Locke identifies as simple ideas of sensation in human beings; they cause other responses in other living and non-living matter, some of which are accessible to human beings through their sensory systems. However, all a human being experiences are the effects of those qualities of objects. Not accessible are the chains of responses that precede those specific ef-

fects we call ideas (chains that occur, and have occurred, perpetually, from the beginning of creation). What is not accessible is the inner structure of matter from which those effects are produced and which also affects the structure of other matter.

We can respond to the effects of matter's powers; we cannot have access to those powers other than through their effects.⁴⁴

What makes anything what it is--its real essence, the powers on which its properties depend--is inaccessible to us. The particles that compose anything are specific to that thing, responding in time and in space to surrounding particles, and therefore responding in terms of the specifics of its time and place, part of a continuum of motion in nature. To have access to the totality of the continuum would require, not the "microscopic eyes" of spirits, but the omniscience of the Creator. The very nature of the natural world (here, the particles and their qualities and powers) makes inaccessible to human apprehension the full chain of causation that results in particular objects and events in nature.⁴⁵

Thus, every individual thing is the result of its component particles and those motions that determine its properties. Although there certainly are similarities among existing things, nothing can be identical with anything else. Each simple idea is itself an individual occurrence; it is the direct result of those powers in nature to produce certain effects--here, those effects Locke calls simple ideas of sensa

tion. Because simple ideas are part of that continuum of activity which is the natural world, they do not represent what is external to the mind. They are, rather, the result of that continuity. If those simple ideas were not the direct results of the chain of motions from objects to brain and mind, our simple ideas could be said to intervene between mind and objects, representing objects more or less adequately and truly.⁴⁶ The causal process which has as one of its effects simple ideas of sensation provides that access to nature--to everything external to mind--which we would otherwise lack.

The grounds for designating Locke a direct realist are here: in simple ideas which are the "materials" of thought and which are the immediate and direct effects of the chains of motions from objects to brain and mind. It is in this specific sense that they do not "represent."

There is a related issue: how and why what Locke calls sensitive knowledge (through our simple ideas of sensation) is admitted as knowledge, even with his qualification that it is a lower degree of knowledge (in terms of certainty) than are intuitive and demonstrative knowledge.⁴⁷ To grasp why it is knowledge--and knowledge of what really exists--we need to combine the preceding discussion of simple ideas of sensation with an earlier one.⁴⁸ The passivity of the mind in its "reception" of simple ideas and the fact that the mind does not and cannot create simple ideas combine to provide us with certainty of the existence of the causes of simple ideas of sensation when we are actually experiencing them. If we have

those simple ideas of sensation, then there must be that which has the power to produce those ideas in us, for we could not produce them ourselves.

But how does this help to clarify Locke's position on substance--on particular material substances specifically?

Stillingfleet, in his Vindication of the Trinity, accuses Locke of denying the existence of substance. Locke writes in reply to this criticism:

. . . as long as there is any simple idea or sensible quality left, according to my way of arguing, substance cannot be discarded; because all simple ideas, all sensible qualities, carry with them a supposition of a substratum to exist in, and of a substance where in they inhere. 49

This repeats, almost verbatim, what Locke writes in the Essay, at the beginning of his chapter on complex ideas of substance:

. . . not imagining how these simple Ideas can subsist by themselves, we accustom our selves, to suppose some Substratum, wherein they do subsist, and from which they do result, which therefore we call Substance. (E, 2.23.1)

Yet, when we consider what else Locke says about substance in the Essáy, his reply to the Bishop sounds less than ingenuous. For, in what sense can substance be said to exist? And, what can be affirmed about a substratum? How are substance and the substratum to be distinguished--if at all? Locke does deny the existence of substance at any level beyond the individual. Everything he says about the genesis of abstract ideas and general terms (and of nominal and real essences) confirms this. If we focus our attention at the level of the individual, what can then be said about a particular material substance, and about a substratum in which those specific simple

ideas/sensible qualities exist? To explore these questions, we need to look at what a substance and a substratum could be in addition to or apart from those sensible qualities.

In the passage from the Essay just quoted, substratum is stated as having a causal relation to simple ideas (and thus to sensible qualities), which not only "subsist" in, but also "result" from that substratum. On this basis, one could posit a two-fold meaning for substratum: first, it would be identified with real essence, as the cause of the specific qualities of specific objects; and, second, as that in which those qualities subsist, it would also be identified with the particles, those "insensible parts" of bodies. The problem, however, is that Locke will (in the Essay) distinguish between the real essence of anything and the component particles of that thing, by referring to the "real, but unknown Constitution of their [i.e., of all natural things] insensible Parts, from which flow [their] sensible Qualities . . ." (E, 3.3.17) Those "insensible parts" have a "real, but unknown Constitution"; they are not themselves that constitution. How reconcile this distinction with their apparent identity in what Locke calls the substratum? (E, 2.23.1)

Before suggesting an answer to this, let us consider the issue of substance. "Substance" is the term we apply to the object as a whole, that unity of the simple ideas/sensible qualities as the complex idea/particular object. Substance, as actually existing, is the particular (material) substance, the whole, discrete, and identifiable object. Nature is so

constituted that it causes simple ideas; the mind is so constituted that it provides for uniting simple ideas into complex wholes--complex ideas. Taking this a step further, "substratum" would refer to what exists in the natural world; "substance" to what is the work of the mind, in the sense that the mind's active powers are required for the uniting of the parts into the whole.⁵⁰

This raises an important issue, one that strikes deeply into the problem of the substratum initially, and eventually affects the conception of substance. Complex ideas (of particulars) are the result of the mind's capacity to unify simple ideas which "enter" the mind "simple and unmixed." But, given Locke's discussion of qualities, and then considering what he says about the substratum, what can be said about the unity of qualities as they exist independent of our ideas? Is the sole unity provided by the mind's active capacity to fuse its simple ideas into complex ideas? Is it possible that this is the significance of Locke's statement that the substratum is "supposed"? Further, is Locke redefining substance as activity--that activity which, under certain conditions, will result in simple ideas of sensation? Before considering this last question, let us return briefly to the apparent twofold meaning of "substratum" outlined above. Does that twofold meaning indicate confusion or forgetfulness on Locke's part? Again, an unanswerable question. However, we do need to remember that Locke discusses the substratum within the context of his analysis of complex ideas of substances, in Book II; that it is

later in chapter 23 that he begins to write of a real inner constitution; and that the explicit reference to "real essences" emerges only at the very end of Book II, in chapters 31 and 32, to be developed in Book III. Thus, one could interpret "substratum" in this context (in 2.23) to be an as yet unanalyzed concept, awaiting the discussion of real essences--as Locke's discussion of substances must await the distinction between the real and the nominal.

We need now to draw together all these elements to show the direction Locke is pointing to in his concept of material substances, and through this to show how that direction reveals something important about his idea of nature.

When we probe Locke's descriptions and discussions of material substances, a point that begins to emerge is that activity, and the power that produces activity, are central. For, every individual existing object in the natural world is both the result of power and the transmitter of power; power that has its locus in particles. The activity of matter is motion, the result of the passive power of motion which is specific to matter and which has its source in particles. Although Locke seems reluctant to relinquish the category of substance, fundamental to the Essay is the attempt to probe what that category really is, given a particle theory of matter. In fact, Locke does not even have to relinquish that category. What he has done is provide the basis for a redefinition of the meaning of substance. That redefinition results in a concept of substance as activity. What a thing is,

is what it does: those activities which produce those changes which result in the ever-changing properties of matter at the level of the particular existing thing. For, what is any particular material substance, apart from its qualities--including those which in human being result in simple ideas of sensation? The question cannot be answered--except, perhaps, by referring to some unknown, and unknowable, "constitution" on which those qualities depend.⁵¹

It is impossible to determine whether or not Locke continued seriously to accept the reality of substance as something in addition to those specific simple ideas/sensible qualities that must constitute the individual existing thing; and real essence as knowable (even potentially) for an individual, let alone for a kind. If he did actually maintain these positions in spite of the implications of the Essay, it is not of great consequence. What is important is that what he affirms explicitly about both is consistent with the corpuscularianism he brings to the Essay. That "corpuscularian Hypothesis . . . which is thought to go farthest in an intelligible Explication of the Qualities of Bodies;" (E, 4.3.16) required the enterprise that brought the Essay into existence. Locke used that hypothesis to radically redefine those two fundamental concepts of substance and essence. He would not be the first, nor would he be the last, to have failed to grasp the full implications of his ideas, nor to follow his thinking to its full conclusions.⁵²

Summary

We have sought, in the chapter just concluded, to follow the corpuscular philosophy through to the position Locke holds on essences and substances. The specific concern was with the real essences of particular material substances. This has taken us into issues central to any idea of nature: what exists, and what determines what any existing thing is.

We have seen, first, that Locke retains the terminology both of essence and of substance, but proceeds to "correct" the meaning of each on the basis of corpuscularianism. Thus, those powers and qualities whose locus is the particle lie behind his distinction between nominal and real essences; between how we identify the kind and what determines the individual. The burden of Locke's argument is that everything that exists in nature is individual, specific to the powers of component particles and including the capacity of those particles to respond to other particles. Kinds, or sorts, are the work of the mind, and not of nature; they are dependent upon the mind's capacity to grasp similarities in things and to form abstract ideas. Nominal essences identify those properties according to which we rank things into kinds and which determine how anything is defined. Real essences, on the other hand, are the work of nature. The real essence of anything is what actually determines all the properties of any single thing, whether or not those properties are accessible to the mind (as simple ideas of sensation). The real essence itself is not accessible. Thus, as the nominal essence of anything is imposed on things,

and in this sense is extrinsic to everything to which it is applied (even though it does have its source in observed and observable properties which make up the abstract idea of the thing), so the real essence of any one thing is intrinsic to it.

The nominal/real essence distinction helps to clarify Locke's analysis of substance. If the real essence is that which determines what the precise properties of anything are, and if those properties have their locus in component particles which act in response to the motions of surrounding particles--with all particles subject to the effects of motions from the furthest reaches of the universe; if this is what determines what any particular substance is, then each substance must be unique in the universe.

A question emerges that is as fundamental to Locke's analysis of substance as is the uniqueness of each substance: what could a particular substance be in addition to its powers and qualities? Although Locke never gives up the term "substance" (as, also, he continues to speak of a "substratum") it is not clear what substance could be, separate from those powers and qualities. This suggests that Locke was on the way towards a conception of substance as activity. If any particular material substance is the unity of its sensible qualities, and if the sensible qualities exist as powers of objects to produce those effects which are the simple ideas of sensation, then we are faced with a conception of any individual existing substance as the totality of its quality-

producing powers. A particular substance is what its component particles do; what they do is move, or act, be that action idea-producing or change-of-quality producing.

Finally, the substratum which Locke refers to as cause of sensible qualities can be seen as identical to real essence --the source of the properties of a thing.

Locke's redefinitions both of substance and essence on the grounds of his corpuscularianism leaves us with implications not developed in the Essay: a conception of substance as activity and of real essence as the inaccessible reality underlying the phenomena of human experience. As the first might be regarded as a backward glance to Aristotle, expressed in terms of the seventeenth-century corpuscular philosophy, so the second might be considered a look ahead to Kant.

Notes

1. James Gibson, in Locke's Theory of Knowledge and its Historical Relations (Cambridge: Cambridge University Press, 1968, reprint of 1917 ed.), explores the influence of scholasticism on Locke's thinking with reference to specific discussions in the Essay, including substance, essence, and substantial forms. Gibson's position is that, much as Locke rejected doctrines of the schools, those doctrines persisted in their influence; that Locke never broke completely free of them. (See especially chap. VIII, sns. 2,8,10, and 11.) Richard Aaron, too, in John Locke (Oxford: Clarendon Press, 3rd ed., 1971) would not entirely disregard the influence of scholasticism; he finds that, much as Locke broke with scholasticism, he could not shake off the influence of his early training at Oxford, and that he built on its foundation. (P.8) The biographical record of Locke's attitude towards his Oxford education, as well as comments throughout the Essay, express his attempt to discard the influence of scholastic ideas; these have been indicated (see above, p.32 and n.9). The problem, perhaps, is that Locke could not, and did not, reject all the terminological trappings; that the influence hovers in the background--if only through the language.

2. Although it is peripheral to the present concern, we will see, through the discussion of real essences and material substances, why Locke can assert that our sole knowledge of real existence is through sensitive knowledge. This is the basis on which some recent commentators can say that Locke is a direct realist. Consider, for one important example, Maurice Mandelbaum's "Locke's Realism" (in Science, Philosophy and Sense Perception, Baltimore: Johns Hopkins University Press, 1964).

3. The definition of "substantial form," which is cited in the Essay's Glossary (p. 856b) and also in the notes to the New Essays (p. lxxiv)--both taken from the OED--is: "The nature or distinctive character in virtue of possessing which a thing is what (specifically and individually) it is."
"Essence" (essentia) is defined, in part, in the Latin/English Glossary of Selections from Medieval Philosophy (Richard McKeon, ed. and trans., 2 vols., New York: Charles Scribner's Sons, 1929. II,453) as: "that through which the thing is constituted in its species and distinguished from other things, and therefore it is something primary in the thing and the root of all its properties; . . . Essence, therefore, is something common to all natures by which diverse entities are collocated in diverse general and species . . ." There is a further point, cited through a quotation from the Summa Theologica, (I, qu. 29, a.2, ad 3): "Essence properly is that which is signified by definition . . ." --an issue reflected in Locke's designation

of nominal essence, and Leibniz's distinction between nominal real definition, rather than essences.

4. See 1.3, above. Locke, in the Essay, makes few explicit references to substantial forms, and then to disparage the conception: in his chapter, "Abuse of Words" (E, 3.10.14), for example; and in "Adequate and Inadequate Ideas" (E, 2.31.6) --where the idea of substantial form is inadequate.

5. Locke would also reject any argument from essences and substantial forms in accounting for the properties of spiritual substances, although this clearly gives him a more difficult and serious problem--and one worthy of discussion apart from the present context.

6. Locke never denies the existence of similarities in nature. He writes, e.g.: "I would not here be thought to forget, and 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." (E, 3.3.13)

7. Combination and comparison are the others.

8. Evidence is that the distinction is Locke's own, although it certainly could have been made by such predecessors as Hobbes, and could go back to William of Ockham--to those in the nominalist tradition. However, this does not necessarily make Locke a nominalist, "pure" or extreme. (Gibson, in Locke's Theory of Knowledge, states that Locke's position "cannot be identified with that of extreme Nominalism." /p. 202/)

9. It might seem as though these final chapters 29 through 32 of Book II are an afterthought, tacked on without any clear connection to what precedes them--ideas of relations. However, they do take up a central question, the relation between ideas and what they are ideas of. In this sense, they do follow the preceding chapters in Book II, and they do prepare the way, first for Book III, but more directly for Book IV.

10. Locke is not the first to refer to adequate and inadequate ideas. It has been pointed out that adequation goes back through medieval philosophy--Ockham, especially--to the Aristotelian tradition. For Spinoza, truth is the adequation of thing to intellect. (Ethics, Part 2, Definition III)

11. For example: ". . . the Bulk, Texture, and Figure of the minute parts of Bodies on which the real Constitutions and Differences depend . . ." (E, 2.23.8) Also, "real constitution" (ibid., 11); "internal constitution" (ibid., 12, 32, 37); and others.

12. See n.3, above, where the conception of "essence" as that

which is signified by definition is cited.

13. As Locke relates "species" to "sort." so he relates "genus" to "general." (E, 3.3.15)

14. It is not clear whether Locke was the first to make this distinction between real and nominal essences. Leibniz, in his comments on Locke's distinction, accepts real and nominal definition as the correct and proper distinction--already pointed out in n.3, above. (NE, 3.3.15 and 18) See also Discourse on Metaphysics, 24 (PPL, p. 319) and Meditations on Knowledge, Truth and Ideas (PPL, pp. 292-293) for Leibniz's discussions of the distinction between real and nominal definition. (Both these works date back to the 1680s.)

15. E, 2.11.9; 3: 2.2; 3.1; 3.6; 5.7. The capacities for abstraction and for language are essential to facilitate thought and to communicate those thoughts to others--two of the main functions of language which Locke discusses in Book III, in chapter 2, especially.

16. This brief description of how and why the nominal and real essences of a mode and a relation are the same is intended only to summarize Locke's position, but without evaluation of that position.

17. Although Locke does not, throughout the discussions in 2.29 and 30, and in 3.3 and 4, distinguish between simple ideas of sensation and reflection, it should be understood that most of his discussion is concerned with simple ideas of sensation (and later with material substances). Simple ideas of reflection would be tied in with spiritual substance, bearing a relation to spiritual substance that is analogous to that of simple ideas of sensation to material substance. Neither simple ideas of reflection nor spiritual substance is of concern here.

18. E, 2.3.2 Note also 3.4.7 and 11, where Locke discusses why, where we do have names for simple ideas, the name is distinct from the idea itself, and the name is, ultimately, undefinable.

19. Names of all complex ideas of substances, as well as of modes and relations, are subject to definition through the names of their component ideas. (E, 3.4.12) Consider also that when those component ideas are pushed back to simple ideas, definition stops.

20. See E, 3.3.18; also, 3.4.2-4 and 17.

21. This, in spite of Locke's assertion that the names of simple ideas and modes (and relations) signify their real as well as nominal essence. (E, 3.3.18 and 3.4.3) The difference lies

with the undefinability of the name of any simple idea and, therefore, the actual experience is necessary to comprehend the name of any simple idea. (E.g. 3.4.7 and 11) With modes and relations, this is not the case; by grasping the meaning of the word, through definition (the enumeration of those ideas entering into the abstract idea that is the nominal essence), we also grasp the real essence.

22. This, we will see, is central to the positions of those who classify Locke as a direct realist.

23. See above, pp. 123-124.

24. See, for example: E, 2.23.11 and 30; 2.31.6; 3.6.6.

25. In E, 2.8 especially, and also 2.10 and 23-25. But Locke refers to those qualities as powers in other sections of the Essay, in particular in his discussions of substances and ideas of substances.

26. See above, 3.2.

27. There is a statement in this passage to which we will return shortly: the real essence as the particular constitution which a thing has within itself and without relation to anything "without."

28. Consider the following, which precedes the lengthy passage quoted: ". . . What is sufficient to make an essential difference in Nature, between any two particular Beings, without any regard had to some abstract Idea, which is looked upon as the Essence and Standard of a Species? All such Patterns, and Standards, being quite laid aside, particular Beings, considered barely in themselves, will be found to have all their Qualities equally essential; and every thing, in each Individual, will be essential to it, or, which is more true, nothing at all." (E, 3.6.5)

29. A question might be raised about whether "texture," as one of Locke's primary qualities, is in any way to be identified with the inner constitution. Recall that texture, as a relational or derivative quality, results from individual units jointed together. Locke uses the term where one might expect inner constitution: he refers to "that Texture of Parts, that real Essence, that makes Lead, and Antimony fusible . . ." (E, 3.6.9) From our understanding of the meaning of texture we recognize that it means (in Locke's time) the inner structure or constitution of anything. It does seem unlikely, however, that Locke identify real essence with texture as a primary (if not original) quality.

30. Locke, in this passage, shows the contrast with the meaning of essence as remaining always "ingenerable and incorrupt-

ible," a position he rejects and which his nominal/real essence distinction is meant to correct.

31. E, 2.2.2 and 2.12.1. See also, 2.3, above.

32. Announcement has been made of an electron microscope which would reveal the atomic structure of most solids for the first time. (New York Times, Jan. 24, 1983, p. A12) Whether even this would make accessible real essences on Locke's terms is questionable. For, still inaccessible would be that power which produces motion.

33. Locke discusses and then denies the possibility of understanding cohesion and motion on impulse, in E, 2.23.23-29 especially. (The context is the equally unintelligible communication of motion by thought, and thinking itself, in a comparison of the ultimate unknowability of the two primary qualities associated with material substance and spiritual substance.)

34. Lovejoy discusses Locke's position on the chain of being with reference to Locke's discussion of the continuity of species (E, 3.6.12). The passage quoted here suggests another "chain," that of influence grounded in motion. (A.O. Lovejoy, The Great Chain of Being, New York: Harper & Row, paperbound ed., 1960. /Published originally by Harvard University Press, 1936./ pp. 184, 228)

35. It is possible that in the passage quoted Locke is responding to Newton's principle of gravitation. For, gravity operates through the vast reaches of the universe, affecting what comes within our purview--as well as what does not do so. However, it is difficult, perhaps impossible to verify Newton's direct influence on Locke's ideas--a matter already considered above (chap. I, n. 21). Other than those passages in which there were changes after the Essay's first edition (1690), and in which there is clear indication of Newton's influence (see above, chap. III, n. 35), it would be necessary to scour the Essay's drafts and the journals for evidence of changed ideas and positions that could have resulted from Locke's reading of the Principia.

An additional point about the passage quoted: it warrants comparison with many of Leibniz's ideas about the monad. Even though Leibniz, through the pre-established harmony, denies the direct interaction that is asserted by the particle's passive power of motion, there is a sense in which each monad's unique perspective asserts a not dissimilar point. This, although Leibniz's reasons differ from those of Locke. (See discussion of the monad in chap. VIII, below, in particular section 2.)

36. In asserting that real essences of substances are unknowable, we take the meaning of knowledge in Locke's strict sense

of certainty, and not probability--no matter how high its degree. However, given that Locke does allow for sensitive knowledge--knowledge through sense ideas--does he leave open the possibility of a true knowledge of the real essences of, at least, material substances? The answer would have to be no, and for several reasons, including Locke's strict limiting of knowledge to a comparison of ideas. Sensitive knowledge and the knowledge of the real essences of substances involve the connecting of ideas and objects.

37. In E, 2.12, Locke introduces the subject of complex ideas. The extended discussion of complex ideas of substances is 2.23.

38. E, 2.23.2, especially.

39. Collective substances, though they merit a separate chapter in the Essay, are in a somewhat different category as collections of the same particular; e.g. army, flock.

40. E, 2.11.17.

41. "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." (E, 2.2.1) Simple ideas, we recall, are central to Locke's causal explanation of how ideas are produced; they are intellectual atoms, analogous to the material particle, and bearing a similar relation to the complexity of thought. (See above, 2.3) Note also that Locke identifies ideas and perceptions: ". . . having Ideas, and Perception being the same thing." (E, 2.1.9)

42. Consider Locke's discussion of the motion of light (in the context of the "Peripatetick" definition of motion) in E, 3.4.10.

43. See above, chap. III, n. 35 for some discussion of the problems Locke had to face after the Essay's first edition. Newton's principle of gravitation opened up the possibility of action at a distance through gravitational attraction. Locke, in response, modified his position of motion through direct contact. (E, 2.8.11)

44. Locke's account of our idea of power is somewhat equivocal. In the order of the chapters, it seems to be a complex idea of relation (E, 3.21.3). The idea of cause (to which the idea of power is related) is clearly identified as a complex idea of relation. (E, 2.26)

45. Reference is made again to the passage in E, 4.6.11 (quoted above, p. 141), in which Locke speculates about the continuum of causation in the universe.

46. There are many passages in which Locke is explicit about the relation between simple ideas of sensation and external matter; e.g. E, 2.8.11-14; 2.23.10 and 15; 3.4.11 and 14; 4.2.4; 4.4.4.

47. See, for example, E, 4.2.14; 4.3.5; 4.11.3. Locke never calls sensitive knowledge merely "probable." How can it be more that probably yet less than certain--at least less than the certainty of intuitive and demonstrative knowledge? The answer must lie with the fact that the relation asserted in sensitive knowledge is between idea and what is not idea--object or thing; and with the fact that the knowledge that is sensitive knowledge is not of what it appears to be--it is not of the color, for example, but of what must be the power to produce the idea of the color.

48. In 2.3, above.

49. Locke's First Reply to Stillingfleet. (Works, IV, 7)

50. ". . . not imaging how those simple Ideas can subsist by themselves, we accustom our selves, to suppose some Substratum, where they do subsist, and from which they do result, which therefore we call Substance. (E, 2.23.1)

51. There is a temptation to suggest that Locke, through his conception of real essences, has arrived at something close to Kant's noumena--with the warning that Locke's real essences are rooted in the corpuscular philosophy and thus would have different grounds than those of the noumena. For, what are real essences if not the realities which underlie everything we experience--what we experience directly as simple ideas? Those simple ideas are the direct result of the real essence of the particular thing; the real essence itself must exist if we are to have those simple ideas. In this way, the real essence is the inaccessible, but necessary, presupposition for all simple ideas/sensible qualities.

52. In discussion of Leibniz, we will be faced with a similar question--whether he, too, saw the implications of his concept of the monad, specifically in relation to matter and its possible redefinition.

Part One
Summary and Conclusions

The concern, thus far, has been to show how Locke's epistemology was grounded in the science that was separating itself from philosophy during the seventeenth century. That science determined not only the epistemology which is the explicit purpose of the Essay, but it also had implications for metaphysics--including a conception of nature.

In order to demonstrate this basis of Locke's thinking, attention has been given initially to his scientific orientation: to his methodological convictions, his medical training and experience, to the corpuscular philosophy--with emphasis on the influence of Robert Boyle in particular, and to his view of himself as a member of the commonwealth of learning. We have examined this background at work in the Essay, as it entered into ideas and positions that are key to Locke's epistemology.

The central element is the corpuscular philosophy--atomism in its seventeenth-century incarnation. The particle serves not only as the cause of the origin of ideas--through simple ideas of sensation--but also as a model of the simple ideas. For, the simple idea stands in relation to thought

as the particle stands in relation to mass matter and to natural phenomena. Further, the corpuscular philosophy is essential to Locke's positions on powers and qualities, and on essences and material substances. Each of these aspects of Locke's thought is comprehensible only in light of their corpuscular basis.

But, Locke was not only redefining the traditional metaphysical categories of essence and substance in light of the new science. He was drastically altering their meaning and their significance--even though he does not always carry the implications of those changes through to their conclusions. The distinction Locke draws between real and nominal essences--between what precisely determines the nature of something and what is expressed or determined through definition; the fact that this distinction is significant for substances but not for modes and relations, and not for simple ideas (though for different reasons); the relation between powers and qualities, and material substances specifically: the central metaphysical categories of essence and substance reveal how crucial the corpuscular philosophy was to Locke's thinking.

The question to consider now is: given the science which underlies the Essay, which is its *raison d'etre*, what are the implications for a conception of nature?

There are two elements in the study that enter into the formulation of an idea of nature: existence and change. How

do we explain the cause and nature of change? Let us consider each of these elements.

Existence is of individuals. Locke never discusses the possible distinctions among individual particles, but, other than the original qualities of extension, solidity, and the passive power of motion, the primary qualities of size/bulk, texture, situation, figure, and number (those here referred to as relative or derivative qualities) will differ, even though what determines those differences must be inaccessible to human knowledge. Whatever the degree of differentiation among the "insensible parts" of matter, the objects which are composed of those parts--those particles--and the natural phenomena in which they are involved are individual.¹ The reasons for this lie with the central place of power, specifically the passive power of motion as the power specific to matter. Any object is the result of those powers of motion which bring together the specific particles of which it is composed, thereby determining its (the object's) specific properties; any natural event would be the result of the motions of particles and their interactions. Although objects and events do display similarities, their corpuscular basis rules out identity. For, each object, each event, is composed of or is the result of the joining of specific particles through specific motions. Here, certainly, are the grounds of Locke's nominalism. Further, individuality, the inaccessibility of what it is that accounts for the specific properties of objects, and the role of power, all feed into

Locke's position on the unknowability of the real essence of particular material substances--on what it is that determines all properties of individual existing things.

Causation, and with it change, have their source at the level of the particle. Here, too, matter's passive power of motion is central. Matter has the capacity to transmit or communicate motion, but not to initiate it. Although Locke does use the analogy of the billiard ball moving on impulse as descriptive of the motion of particles, he modifies that position after the Essay's first edition. Whatever the reasons that led to that modification, he opens up the possibility of motion transmitted through means other than direct contact--especially in his speculations about the possible effects of events from afar in the universe on what is observable.² This does suggest the acceptance of a continuum in the universe; a continuum of influence and activity, though not of matter; of chains of interactions among particles, but not necessarily through direct contact.

Existence, and change and causation, raise related issues--issues not explored here, but issues that will be significant for Leibniz's criticisms of Locke, and for comparison of their ideas of nature: first, God's existence and the role of the Deity in nature; and, second, whether events in nature display purpose or design, or are arbitrary.

For the first point, the passive power of motion as the crucial element in immediate causation must once more be mentioned. Because matter cannot initiate motion, either motion

must be eternal or there must be a nonmaterial first cause of motion in the universe. In addition, matter itself must have a cause. (Recall that human beings can create neither a simple idea nor a particle of matter.) This need for an original source of motion and for the creation of matter is central to Locke's proof for the existence of God. An omnipotent, eternal Deity is necessary as first originating cause: of motion and of matter. This leads to an important consequence: motion would not be inherent in matter. Matter is dependent on mind or spirit for the initiating of motion; on finite thinking beings, and ultimately on infinite thinking Being. Without a nonmaterial originating source, there would be no motion in matter.

Consider now the issue of teleology. Does Locke's natural world reveal design or purpose, or are events and existences arbitrary? Nowhere in the Essay does Locke express a teleological view of nature and of events in nature. Although he never explicitly says so, one could assume that any position on purpose in nature would be relegated to the realm of metaphysical speculation--beyond human knowledge, without purpose. And, in fact, Locke refers to the "arbitrary Will . . . of the Wise Architect." (E, 4.3.29)³ But, does this necessarily imply a universe of chance, a universe in which things and events exist without discernible reasons for being what they are? Locke's discussions of God's existence, of whether matter might think, of whether the originating first cause was matter or spirit or both--all point to a rejection

of chance, a rejection of existence and events as being without determining causes. Certainly, Locke seems neither bothered by nor concerned with the kinds of issues that, as we shall see, concerned Leibniz (including the question of why there is something rather than nothing). The inaccessibility of divine wisdom to finite minds leads inevitably to an assertion of God's "arbitrary Will," and with that assertion, to an absence of teleology in Locke's idea of nature.

Yet, even without teleology, Locke's discussions of revelation indicate a rejection of a universe that is completely arbitrary, even to a finite mind ignorant of the divine will. For, revelation must stand the test of reason; as, it might be added, miracles would require a questionable suspension of those laws which natural phenomena evidence.⁴ There is nothing arbitrary about nature, though human finitude and the limits of human knowledge may place divine motivation beyond the "compass of the humane Understanding."

We turn now to Leibniz, to examine both his response to Locke and the position that emerges from his metaphysical unit --the monad.

Notes

1. This, in spite of Locke's frequent assertions that if we could know the real essence of (material) substances, then we would be able to deduce all properties--those which we use in categorizing individual substances--to determine sorts, as well as those of the individual qua individual. This does not change the uniqueness of the existing individual.

2. It has been pointed out above that Locke had, in opposition to Descartes, accepted the existence of space distinct from matter; that he accepted the existence of a void. (See above, p. 118, n. 23.)

3. The full passage is: ". . . the coherence and continuity of the parts of Matter; the production of Sensation in us of Colours and Sounds, etc. by impulse and motion; nay, the original Rules and Communication of Motion being such, wherein we can discover no natural connection with any Ideas we have, we cannot but ascribe them to the arbitrary Will and good Pleasure of the Wise Architect." (E, 4.3.29)

4. Locke's position on laws that would govern nature is stated in a passage which follows shortly after the one quoted above: "The Things that, as far as our Observation reaches, we constantly find to proceed regularly, we may conclude, do act by a Law set them; but yet a Law, that we know not: whereby, though Causes work steadily, and Effects constantly flow from them, yet their Connexions and Dependances being not discoverable in our Ideas, we can have but an experimental Knowledge of them." (Ibid.)

Part Two

Leibniz's Response to Locke

and

The Idea of Nature in the 'New Essays'

Introduction

The purpose of the present inquiry is to develop the implications of atom and monad for a conception of nature, in light of differing conceptions of the relation between science and metaphysics. In turning to Leibniz and the New Essays on Human Understanding,¹ we will explore the metaphysical and scientific grounds for his rejection of the particle theory which is central to the Essay's epistemology and metaphysics; and we will then examine the monad, the metaphysical unit, as Leibniz's solution to those problems he identifies in his criticisms of Locke. This will enable us to consider the question of how and why, in Leibniz's response to Locke, there is an idea of nature that differs in fundamental approach and outlook.

There are two approaches, at the least, that might guide the delineation of Leibniz's position: we might limit ourselves completely to Leibniz's comments on those ideas and positions of Locke which were discussed in Part One of the present study; or, we might consider those ideas and positions of Leibniz which would enter into the formulation of his conception of nature but without limiting the discussion to the specific issue considered in Part One. Both approaches will be used. Thus, our attention will be on passages in the New Essays in which Leibniz singles out for comment those of Locke's

nature-related positions. And, we will also delineate Leibniz's positive position which emerges out of his concept of the monad, but without the limitations that would be imposed by the specific issues considered in the discussion of Locke's ideas.

Although Leibniz's response in the New Essays must provide the major source for the discussion here, this will not prevent us from referring to others of Leibniz's works when his remarks in the New Essays are too sketchy for clarity or completeness. Leibniz expresses the same basic ideas in many of his writings, in their varying stages of development and with varying degrees of clarity. This makes it possible to move around from one work to another in the search for clarification of a particular position.

Leibniz never wrote an extended work in which his thinking was developed fully and systematically.² He seemed best to develop his ideas in shorter forms and in response to the ideas of others.³ One searches his correspondence--not incidentally with the most important philosophers and scientists of the time--for discussion and clarification of his ideas.⁴ He sought out, he encouraged such exchanges; he persisted even when his correspondent indicated he was ready to drop the whole thing.⁵ In addition to his correspondence, there were articles written for that form of publication new to the late seventeenth century--the scholarly journal.⁶ Again, although articles could be lengthy (as were many of Leibniz's letters), and even though Leibniz used those articles to present and

develop ideas important to his thought, the nature of the scholarly article would preclude the possibility of extended discussion and development, of systematic presentation of many subjects which a book-length work would have made possible.⁷

Thus, the New Essays has a place in Leibniz's writings that is both characteristic and unusual: the former as a response to the thinking of another; the latter as a response extended to book length.⁸

After a brief introductory chapter in which the background of the New Essays and the development of Leibniz's thought by 1700 are considered, the discussion proper will begin with a detailed examination of Leibniz's criticisms of atomism. The inadequacies of atomism will be examined in terms of general metaphysical principles and problems specific to atomism which enter into Leibniz's rejection of all particle theories of matter. (It should be emphasized that not all of the grounds for rejection that will be explored here are explicit in Leibniz's writings.) We will then go on to look at the question of substance, initially in terms of the problems identified in Descartes' position--problems to which Locke, as well as Leibniz, responded; and then Leibniz's criticisms specifically of Locke's position on substance. Because Locke's position on causation and existence in nature formed the core of Part One, we will bring in Leibniz's comments on those of Locke's ideas which entered into those positions--his ideas on powers and qualities and on essences, specifically. Leibniz's criticisms of substance lead directly into discussion

of his positive doctrine: his fundamental and nonmaterial unit and his solution to the problems of substance: the monad--the monad in nature specifically.

The focus in the first part was Locke's corpuscular philosophy: the atom as the basis of his epistemology and as the central fact underlying his idea of nature. The inert unit of matter which provides Locke with his causal theory of perception, which also determines his positions on essences and substances, and whose properties are central to the processes of change and causation in nature--this inert unit is wholly inadequate to account for the phenomena and the problems whose solutions concerned Leibniz. The material unit gives way to the metaphysical unit, the unit of force, Leibniz's monad--the "true atom of nature." The monad is the vehicle for and the expression of a different conception of nature, the result of a different way of understanding, of different demands for understanding, but also of different problems and requirements for the solution of those problems. This has now to be demonstrated.

Notes

1. The English title of the Essay was translated into French as "Essai sur la connaitre humaine." Leibniz's title has been translated into English with sur rendered as "concerning" or as "on."
2. Leibniz's two book-length works--the Theodicy and the New Essays--were restricted in purpose and scope. The Theodicy (published in 1710, though in writing much earlier--possibly at the time Leibniz was at work on the New Essays) was written as an exposition of his theologically related ideas for the Queen of Prussia; the New Essays, of course, as a commentary on Locke's work. (Loemker notes that the Theodicy was both commentary on and refutation of Pierre Bayle. /PPL, p. 356/)
3. See also, PPL, pp. 355-356. The best evidence is a review of Leibniz's work. At least as far as published writings are concerned, consider how many take their point of departure from the works of others, including ideas expressed in correspondence. Loemker, in his introduction to Leibniz's Philosophical Papers and Letters, has commented: "His own insights came most readily in reaction to the view of someone else whom he read or with whom he corresponded or conversed." (Ibid, p.10)
4. Consider, for example, the voluminous correspondence with Huygens, de Volder, Des Bosses; the briefer, but important correspondence with Arnauld and Samuel Clarke. The correspondence with Clarke did have a somewhat different purpose than that with others, related as it was to the dispute with Newton about the calculus during the most bitter period of that dispute. (Some commentators have considered the question of whether Clarke's words came directly from Newton. Hall, in Philosophers at War, does not find evidence to support this. /P. 220 and n. 23/)
5. Witness the conclusion of the correspondence with Arnauld, which began with discussion of issues raised in the Discourse on Metaphysics and continued until Arnauld stopped replying to Leibniz's letters. (Arnauld's last letter is dated 28 Aug. 1687. There are three subsequent letters addressed to Arnauld by Leibniz: 9 Oct. 1687; 4/14 Jan. 1688; 23 Mar. 1690. /Leibniz-Arnauld Correspondence, H.T. Mason, ed. and trans., Manchester: Manchester University Press, and New York: Barnes & Noble, 1967./)
6. Articles by Leibniz appeared in the Acta eruditorum, Journal des savants, Nouvelles de la république des lettres--among others. (These, and others, are cited by Loemker, PPL, p. 11.)
7. There must have been a relationship between Leibniz's use of such vehicles for the expression of his ideas and the fact

that his time for philosophical and scientific work would be limited by his official responsibilities to his various employers. (Note also Loemker's remark cited above, n. 3, about the conditions that seemed to inspire or provoke Leibniz's thinking.)

8. It might be noted that the length of the New Essays is determined by the length of the Essay itself; that the New Essays is made up of comments (not all of which are interrelated) on those of Locke's ideas that stimulated Leibniz's thinking. The New Essays reads like a series of episodes. However, of all the lengthy works which inspired Leibniz's response (including Descartes' Principles of Philosophy) the Essay is the only one for which his comments were extended to book length.

Chapter V

Leibniz and the 'New Essays'

We will prepare the way for our consideration of the idea of nature that both underlies and is expressed in the New Essays through discussion of two issues: first, the immediate background of the writing of the New Essays, including the history of Leibniz's response to the Essay and to Locke, and his major concerns in the work; and, second, consideration of where Leibniz was in his thinking by 1700 when the French translation of the Essay freed him to begin his intensive study of the work--his interests, the problems that concerned him, the solutions he had by that time worked out and which provide the context for his response to Locke's ideas.¹

5.1: The Background of the 'New Essays'

When the first French edition of An Essay Concerning Human Understanding appeared in 1700, Leibniz had accessible to him, finally, the entire work. Emphasis should be placed on "entire." For, Leibniz knew about the ideas and position of the Essay, and had already written, though briefly, about some of them. By 1701, there were at least four responses by

Leibniz to the Essay.² Although these responses read more like summaries of what Locke was saying than criticisms or analyses, they show that Leibniz was aware of what Locke was doing before he had the full Essay in a language in which he was fluent. Whether the French abrégé, written by Locke for and published in the Bibliothèque universelle of 1688³ was Leibniz's sole source of the Essay's content; whether, in addition, he had read commentaries and reviews of the complete Essay after it was published in 1690;⁴ whether, perhaps, he had even tried to get what he could from the English editions, there is no way of determining anything more than that he did have available the abrégé, and that he could have--and undoubtedly did--read about the full work after 1690, and before 1700.⁵

Whatever was actually the case, by 1697 Leibniz was attempting to open correspondence with Locke about the Essay. The intermediary was Thomas Burnett, friend and correspondent of Leibniz and Locke both.⁶ Leibniz sent Burnett a brief commentary on the Essay, with the request that it be given to Locke.⁷ How Locke received Leibniz's first commentary (of 1696) is on record in the former's correspondence with his friend, William Molyneux: without enthusiasm.⁸ Whether Locke's resistance to correspondence with Leibniz was entirely the result of that lack of enthusiasm, or might also have been influenced by his (Locke's) situation at the time--responsibilities as a member of the Board of Trade; the preparation of new editions of his works (including the Essay); poor health

and advancing age--in any case Locke did not reply to Leibniz but instead eventually let Burnett know that he was not interested. The matter was dropped.⁹

All this, as preliminary to considering what Leibniz is doing in, and through, the New Essays. It has already been noted that Leibniz's thinking--his own ideas--seemed to emerge in discussion with others. So, it would seem that Leibniz sought to do, in the book that the New Essays turned out to be, what was refused him in correspondence: a dialogue with Locke, a dialogue in which each would explore and respond to the comments, criticisms, positions of the other. Locke's lack of interest could not still the voracious intellectual appetite of Leibniz; dialogue he wanted, dialogue he was refused, dialogue he would create.

The New Essays can hardly be called a dialogue in the sense of a spontaneous exchange of ideas which a skilled writer might have been able to simulate. Leibniz's writing abilities were hardly up to creating the illusion of spontaneity in the dialogue intended to be read; he had neither the genius of Plato nor the grace of Berkeley and Hume. Locke's ideas are presented in words which are, for the most part, out of the Essay directly, or in paraphrase, or in précis. Further, Leibniz is selective in what he will comment on; there are many ideas in the Essay, many entire sections, that elicit no response at all. Some of these ignored sections are important for coming to grips fully with Locke's ideas. Of course, Leibniz need not be expected to comment on everything. Still, his

selectivity has a bearing on our understanding of his interest in, and interpretation of, what Locke was about in the Essay.¹⁰

But this brings us to yet another point, the question about Leibniz's purposes in the New Essays.¹¹ For, consider: what was it that would have drawn him to the Essay in the first place--even when we keep in mind that Leibniz seemed to need the ideas of other for the development of his own ideas? Leibniz's interest in the Essay, and thus his persistence in attempting to foster a dialogue with Locke, was sparked by, at least, two specific interrelated reasons, both fundamentally related to the primacy of metaphysics. First, Locke was using a particle theory of matter (a theory which, as we shall see, Leibniz had rejected in his youth) as the basis for an epistemology which, in turn, had crucial ramifications for metaphysics. By exchanging ideas with Locke, Leibniz would be doing battle with a contemporary whose work was attracting great attention and having great influence. Yet, the basis of Locke's thought was a position which led to problems Leibniz had long struggled to overcome (and, by 1700, was convinced of his success in so going) in the building of his own system. Leibniz would be engaged in yet another exchange over a position he found seriously flawed.

Moreover, an epistemology had been constructed by Locke out of that very position. And this brings us to the second point: Leibniz would be using his exchange with Locke as the vehicle for the development and expression of his own epistemological position--one whose grounds would be totally different

from those of Locke. As Leibniz seemed always to develop his thinking out of his exchanges with others, so too Locke would be foil for the working out of his own ideas on perception and on ideas themselves.¹² In the New Essays, great attention is paid to epistemological issues: the origins of ideas, whether innate or from experience; questions of logic, of language; unconscious knowledge and unconscious perceptions --for examples. And, most important, the New Essays presents, and for the first time, Leibniz's distinction between perception and apperception.¹³

But, we are here engaged in a consideration of Leibniz's idea of nature, as it emerges primarily out of his "exchange" with Locke in the New Essays. The purpose of that work is certainly not to expound a position on the natural world--no more than it was Locke's purpose to do so in the Essay. Yet, as we saw in the examination of Locke's work, it was impossible to avoid implications for a position on nature, given Locke's starting point and his purpose. So, too, with Leibniz: given the work he is responding to, given the issues which had concerned him throughout the course of his intellectual development, and the point at which he had arrived in his thinking, a position on nature would underlie his response to Locke, and would be reflected in it.

Now, one of the problems one faces in using the New Essays as a means of presenting Leibniz's idea of nature, in contrast to that of Locke, is that certain of the former's ideas which are central to his thinking are not fully ex-

plored and presented in the New Essays. It has already been pointed out that Leibniz's concerns in the New Essays are not primarily with nature. Thus, he does not develop certain concepts that must be central here; frequently, Leibniz gives these concepts in summary form. Or, they are not mentioned at all. For this reason, it will be helpful to present in brief and summary form those of Leibniz's ideas that enter into his response to Locke, even though they are not discussed or supported within the New Essays itself. What we need to do, in other words, is consider for a moment where Leibniz was by 1700 when, translation in hand, his "dialogue" with Locke began in earnest, and at length.

5.2: Leibniz in 1700

By the time the full text of Locke's Essay was accessible to him in its French translation, Leibniz was in the full maturity of his thought.¹⁴ Perhaps under the probing questioning of his many correspondents (struggling, undoubtedly, to make sense of what he was saying), Leibniz seemed to be tying together the many strands of his thought--mathematical, logical, physical, scientific, ethical, legal, theological--showing their interrelationships, spelling out their underlying principles and laws. Many of the basic ideas go back to the early years of his thinking; it is, for example, possible to discover the germ of the monad, including Leibniz's ways of describing it, as early as 1676, in the Paris notes.¹⁵ Given the range of his thinking and his interests, by 1700 Leibniz was being

as systematic as he possibly could be in explaining his concept of substance, in working out his dynamics, in showing how fundamental metaphysical principles underlay basic physical and mechanical considerations.

Much of Leibniz's correspondence was with the leading Cartesians of his day; it is significant that many of his ideas had their genesis in problems he found in Descartes' positions on the nature of material and spiritual substances, and on their interrelationship. For, it was Descartes who was an early major influence on his thinking, and it was in opposition to Descartes that he began to develop those concepts that are so characteristically Leibnizian.

There are two rejections, not just one, for the early period of Leibniz's intellectual development: the rejection of Descartes' identification of material or corporeal substance with extension and, even before that, the rejection of atomism. The rejection of the first, of matter as extension, was but one element in Leibniz's criticism of Descartes--albeit a central element with important ramifications for others of Descartes' ideas and for the kinds of problems Leibniz would be dealing with through most of his life. The rejection of atomism came, Leibniz writes, in his youth; in one comment when he was 15.¹⁶ Although on the surface it is not as profound a disagreement as was the one with Cartesianism, it was signal for the direction Leibniz's thinking would take. For, what seemed central to Leibniz's thinking was the issue of activity and, with it, the issue of force or power that would

account for that activity. Both atomism and Cartesianism presented Leibniz with inadequate explanations of activity and of force--inadequate mathematically, physically, and most important, metaphysically. (Were our subject different, we might consider whether these inadequacies which Leibniz recognized so early in his life are indeed the threads running through his entire intellectual quest.) We have already seen that Locke, when faced with at least some of the problems that concerned Leibniz, was able to shrug them away--primarily because of his different purpose, his different intellectual demands and the kinds of questions and objections he might raise because of those demands. Thus, Locke was able to say that a motion to the brain produces an idea in the mind, without attempting to answer the question of how matter could act on mind; or, what mind could be in addition to brain. Leibniz, however, could not and did not stop there. He was driven to find explanations where Locke was not; but then the kinds of explanations Leibniz sought and accepted would never have been acceptable to Locke. They would have been in the realm of those hypotheses Locke explicitly rejected (as did Newton); they would have stood outside the range of sense experience from which all knowledge drew for its materials.¹⁷

We have seen that Locke also rejected the Cartesian identification of matter and extension, Locke's concern was with the distinction between matter and space--a distinction Descartes had obliterated through his denial of the void and his own particle theory. For Descartes, this collapsing of

space into matter was intrinsic to his theory of motion. For Locke, this ran counter to experience, and to his own purposes in the Essay. Thus, Locke added impenetrability to extension, and then distinguished between the extension of matter and that of space which he then referred to as expansion.¹⁸ Leibniz, again, saw a totally different problem in the identification of matter and extension: such a position could not account for the phenomenon of force, of that which produces matter's motion. As we shall see, this eventually brought Leibniz to a different conception of material and spiritual substance, and eventually to the monad, that metaphysical unit.

Thus, by 1700 Leibniz had long since given up any kind of particle theory of matter, as he had totally rejected the void; witness a major argument against Newton's principle of gravitation--action at a distance. (What his position was on the nature of matter is another question, one we will consider below.) He had also by then worked out his theory of substance, obliterating the distinction between material and spiritual substance (although not the distinction between substance and matter); and with it the mathematics and metaphysics of force. The mathematics will not be of concern here; the metaphysics will.

And, by 1700 he had accumulated a veritable army of metaphysical laws and principles which entered into all aspects of his thinking and even, perhaps, provided the structure of his system. If we are to consider that any system, to be a system, must have all its elements in a kind of harmony, or at least consistent one with the other, then there must be some unifying

structure for the whole. Leibniz's principles fill this function; they could not be violated by the individual elements; all those elements must conform to those principles, as those principles must unify the elements. The principles that will enter into the ensuing discussion are: sufficient reason, continuity, identify of indiscernibles, plenitude, and pre-established harmony. This does not exhaust Leibniz's principles; it is limited by the present subject and purpose. The significance of these principles will be considered in relation to those positions of Leibniz which will be discussed in the chapters which follow.

There are, of course, others of Leibniz's ideas that had been worked out by 1700. His distinction between truths of fact and truths of reason--between contingent truths, derived from experience, and necessary truths, dependent solely on reason--had already been made by 1675, and perhaps earlier.¹⁹ The significance of that distinction, its ramifications for the possibility and extent of human knowledge (compared with divine knowledge) had been discussed many times before 1700; it appears again throughout the New Essays, though it will not be a central issue here. However, if we remove from the distinction the vital theological component in Leibniz's thinking, we find ourselves with a distinction with which Locke could have been at home. Consider, for example, the limits Locke places on the extent of certainty. Locke, as well as Leibniz, recognized and accepted the limitations of knowledge grounded in experience and referring to experience. There is,

thus, a similar basis in the limits of experience as a source of knowledge. The tremendous--and telling--difference is that where Locke is content to rest (rest even in skepticism), his goal achieved, Leibniz builds a broader framework, placing human finite knowledge within the totality of infinite divine knowledge.

There is yet another--and central--element in Leibniz's thought that was worked out and intact by 1700, although the last word had not been said. And that is the entire issue of infinite divisibility with all its mathematical, physical, and metaphysical ramifications. It enters into so many aspects of Leibniz's thinking that one questions whether the mathematical/scientific concept or the metaphysical context is the basic and central one. In any case, it is intrinsic to the calculus; to his position that there is no true rest--that motion may be reduced infinitely but never to total rest; to his conception of unconscious perception--one cannot get from a state of no perception whatever to perception with full consciousness; to his rejection of a finitely divisible material particle.²⁰

This brings us to yet another, perhaps not unrelated, point: Leibniz's rejection of any category, any theory, which would seek explanation through the positing of what is undifferentiated: mind, time, space, substance, the state of rest, those ultimate units of matter called atoms or particles. The rejection rests on objections that are, again, metaphysical and mathematical. Each feeds into the other; in some instances the metaphysical would seem prior; in others, the mathematical.

We will see the mathematical taken up with the metaphysical in Leibniz's arguments against atomism.

Thus, Leibniz in 1700, when he began his one-way discussion with Locke, had reached that point in his thinking at which all his basic ideas, with all their complex interrelationships, had been worked out. The one new element that would be developed out of that artificial dialogue was the epistemological. But, that element was consistent with everything that had previously been propounded.

The Theodicy, Leibniz's second book-length work, was to closely follow the New Essays; it is certainly possible that he was still working on the New Essays--revising it--at the same time as he was at work on the Theodicy. The very late and final statements of Leibniz's total position--the Monadology of 1714 and The Principles of Nature and Grace of the same year--were, indeed, just that: final statements. Nothing appeared in either that had not been said earlier. And, there was the correspondence with Newton's friend and, possibly, spokesman, Samuel Clarke, with its dispute between absolute and relative space and time, and its theological discussions--these, and other disputes.²² Even though the correspondence is exceedingly important to the working out of Leibniz's idea of nature, it will not enter directly into the present discussion. For, because the purpose here is to find implications for the idea of nature, as those implications emerge from the Essay and the New Essays, and in terms of whether metaphysics or science is primary, the discussion will be held to Leibniz's ideas

in the New Essays and in what preceded that work where clarification is in order. Leibniz's thinking by the first few years of the eighteenth century must be the guide.

Notes

1. Precisely when Leibniz would have worked on the New Essays is a matter of some dispute. Remnant and Bennett, in the Introduction to their translation, write that Leibniz did not "seriously" start reading the French translation until mid-1703, and that he also began writing "the more extensive critical commentary which eventually became the New Essays on Human Understanding" at about that time. (P. xii) L.J. Russell, in his Encyclopedia of Philosophy article on Leibniz cites 1704 as the date of the writing. (Vol.4, p.431) This date, most likely, is determined by Russell's citation (incorrect) of 1704 as the date of the Essay's French translation. At the other extreme, L.W. Beck states that the New Essays was written in the 1690s. (Early German Philosophy, Cambridge: Belknap Press of Harvard University Press, 1969. P. 201) Beck's date is also, and clearly, incorrect. Even though there are brief comments from the 1690s, the evidence is that Leibniz could not have begun his detailed commentary until he had Coste's French translation of 1700. Whether the writing did not begin until 1703 is another question.

There is also dispute about the completion date. Beck's statement might imply that he would date completion also in the 1690s. Those who (correctly) place the start of the writing in 1700 at the earliest, place its completion between 1704 and 1708. Remnant and Bennett write: "The first draft was finished in mid-1704." There were revisions, with completion by about the time of Locke's death (in October 1704), and Leibniz continued working on his manuscript until 1705. (NE, xii. Remnant and Bennett cite the Introduction to the Academy edition of the New Essays as their source. [P.xi, n.17]) And, finally, Loemker: "The New Essays . . . was probably completed as Leibniz left it by 1708." (PPL, p.62, n.58) In any case, when Leibniz learned of Locke's death, he apparently decided against publication. (One might wonder whether the inability of Locke to respond made moot the work's public appearance.) Unpublished it remained until 1765.

One final comment, this from Leibniz: Writing to Nicholas Remond in 1714, he refers to his "rather extensive thoughts on Locke's work on the human understanding." He goes on to say: "I have a repugnance against publishing refutations of dead authors, however, for such refutations should appear during their lives and be sent to the authors themselves." (PPL, p. 656) Thus, Leibniz seems to have considered the New Essays a "refutation" of Locke.

2. Leibniz's first comments were dated 1695. The second were written in 1698. The third appeared in the Monatliche Auszug of Sept. 1700 (a short-lived monthly containing abstracts of newly published works. The fourth is a brief comment in the

same Monatliche Auszug, in 1701. The third and fourth would have been written after the French translation of the Essay. (All four responses are included in Gerhardt, GPS, Vol.5, pp. 14-37; information about their writing is given in Gerhardt's introductory comments, in the notes, pp.6-7. English translations, including Gerhardt's introduction, are in Langley, pp. 3-38.)

3. Vol. VIII, pp. 49-142. Locke, in his correspondence, also refers to it as an "epitome." He sent copies to friends in and out of the commonwealth of learning, much as one would send out reprints of a journal article today. (See above, chapter I, n. 21, for previous comments about Locke's connection with the Bibliothèque Universelle.)

4. There was, in fact, a review of the Essay in the Bibliothèque Universelle, Vol. XVII, pp. 399ff), written by Jean LeClerc, the founder of the Bibliothèque who was a close associate of Locke's during the latter's five years in Holland, from the end of 1683 to early 1689.

5. To comment further on when Leibniz might have written the New Essays--this time in light of his own evaluation of his ability to read English: Leibniz wrote to Thomas Burnett (see below, n.6) in 1696 that he wished he had the same knowledge of English that he did of French, but that "all I can do is to understand passibly the books written in this /i.e., the English/ language." (Quoted in Gerhardt, GPS, vol.5, n.***, pp. 7ff; and in Langley, p.7, n.5)

6. Thomas Burnett, in what was typical 17th century practise--typical when one considers others such as Oldenberg of the Royal Society and Mersenne in France, who acted as intermediaries in correspondence between those who were not personally acquainted --transmitted the messages between Locke and Leibniz from the mid-1690s when Leibniz first attempted to open correspondence with Locke. Locke's name was mentioned frequently in the letters between Leibniz and Burnett, even when there was no message to be transmitted, and even after Locke's death in 1704.

In many of his letters to Burnett, Leibniz discusses the development of his ideas and positions about those of Locke. The correspondence (mainly in French and spanning the years from 1695 until 1714) appears in GPS, Vol.3, pp.161-329. It has not yet been translated into English.

7. Locke ended up with three copies of the first of Leibniz's commentaries, the last with changes in Leibniz's hand. (Locke, Correspondence, vol.VI, Appendix I, p.777) In spite of the evidence contained in the correspondence between Leibniz and Burnett, and then between Locke and Burnett, Leibniz wrote to Remond (in the letter cited in n.9, above) that he did not know how Locke got hold of his comments on the Essay.

8. Locke wrote: ". . . Mr. Leibnitz's great name had raised in me an expectation which the sight of his paper did not answer, nor that discourse of his in the acta eruditorum which he quotes /Meditations on Knowledge, Truth, and Ideas, Nov. 1684/ and I have since read, and had just the same thoughts of it, when I read it, as I find you have. From whence I only draw this inference, that even great parts will not master any subject without great thinking, and even the largest minds have but narrow swallows." (Correspondence, VI, 86-87; #2243, 10 Apr. 1697) The tenor of Locke's comments on Leibniz, and the further comments of Locke's correspondent, William Molyneux, were that both thought that Leibniz, "large mind" that he may have had, did not really understand what Locke was doing in the Essay. As, it must be added, Locke and Molyneux failed to understand what Leibniz was about. They were separated by more than language and the English Channel. (See also, ibid.: #2202, 22 Feb. 1697, pp.8-9; #2221, 16 Mar. 1697, p.41.)
9. Locke, on 2 May 1700, returned Leibniz's commentary to Burnett with a letter that included the following: "If . . . you have an opportunity of writing to that very learned and civil gentleman, I desire you give him my most humble service and let him know how much I value the honor he does me in bestowing any part of his time and thoughts upon what I have writ/ten and/ think the pains I have mislaid on my scribblings not wholly lost if /they/ might serve to excite him to write a just treatise on a subject which he has so maturely considered and which I have made so imperfect an essay." (Correspondence, VII, 794; #2724A) One wonders whether Locke's comment might have been relayed to Leibniz verbatim; whether it, in addition to coming at the time of the newly published French translation, might have led Leibniz on the course to the New Essays. In any case, Leibniz, undaunted by Locke's rejection of dialogue, continued to discuss the issues in correspondence with Burnett. Then, in 1703, he began a correspondence with Lady Masham, in whose home Locke lived for the last ten years of his life. Lady Masham then became the bearer of polite messages between the two. (GPS, vol.3, pp. 336-375 presents what, one must assume, is the full correspondence between Leibniz and Lady Masham. Leibniz engaged Lady Masham in that correspondence not only because of her friendship and proximity to Locke; she was, after all, the daughter of Ralph Cudworth, and the impetus of the correspondence came, at least in part, from that connection.)
10. Remnant and Bennett, in their edition of the New Essays, indeed provide Locke's text where Leibniz has paraphrased or otherwise abbreviated that part of the Essay on which he is commenting and where Leibniz's words--in their judgment--convey a meaning different from the Essay. It remains an interesting exercise to examine Leibniz's restatements of Locke's words for their absolute accuracy and fairness to Locke's meaning. Not that Leibniz would have deliberately mis-presented Locke's ideas.

But there is always open the possibility of misunderstanding of Locke's ideas. Each was capable of serious misunderstanding of the other.

11. The reader is referred to the discussion of this central question in the introduction to the present work, especially pp. 6-9, above.

12. This does not imply that the New Essays is Leibniz's initial venture into epistemological issues. Consider, for example, the Meditations on Knowledge, Truth, and Ideas, of 1684, mentioned above (n.8). Issues that touch upon epistemological questions provide threads through his thought--in his conception of truth, for example; of perception as one of the two activities of the monad, and what issues from that conception.

A problem in working out Leibniz's position on knowledge is the usual fragmentary nature of his discussions--with the possible exception of the New Essays, although even there the nature of the comments as responses to Locke's views affects the way in which Leibniz's ideas are developed. (Loemker notes a fading of Leibniz's logical interest after publication of Newton's Principia and Locke's Essay, and its replacement by physical studies of the issues and the subordination of logic to epistemology. PPL, p.13)

13. This is a distinction which has its roots in Locke's discussion of perception (crucial in simple ideas of reflection), in which the mind is conscious of its ideas. (E, 2.9. Also, PPL, p.62, n.50) Loemker points out that in the New Essays, the term translated into English as "apperception" comes from Coste's own rendering into French of Locke's "perceives" as "s'apercevoir." Thus, Coste would have made explicit in his French translation of the Essay a point implicit in Locke's original: that all ideas of reflection, starting with the basic one of perception, require an awareness of what the mind is doing. (In making, and then building upon, the distinction, Leibniz also is making a basic distinction between the rational monad and all other monads; the rational alone has apperception.)

14. Loemker states that 1690 is "the line of demarcation between Leibniz's early period of eclecticism and discovery and his mature system." (PPL, p.353)

15. Leibniz writes, in Feb. 1676: "Every mind is of unbounded duration. Every mind also is implanted indissolubly in certain matter. . . . All the mundane species are perhaps endowed with mind; . . . Everywhere there are innumerable minds. There are minds in the human egg even before conception, and they are not lost even if conception never takes place." (PPL, p.160) Whether Leibniz might have begun to think through the problems to which the monad gave answer much earlier than 1676 is unanswerable--at least as long as all of his papers remain unpublished. In any

case, Leibniz did not use the term "monad" until 1696, in correspondence with Fardella; and in a published work, in 1698, in On Nature Itself. (PPL, p.503, and p. 508, n.11)

16. See chapter VI, no.1, below, for a summary of Leibniz's changing youthful positions on atomism.

17. Locke would not identify knowledge with experience--except for simple ideas of sensation as the source of what he calls "sensitive knowledge." (E.4.11, especially) But, this is the crucial kind of knowledge where nature is concerned.

18. E, 2.13.26--where Locke makes explicit the distinction between the extension of matter and the expansion of space.

19. Letter to Simon Foucher (PPL, pp.151-154). The terminology is not yet explicit.

20. This last will enter into our discussion of the rejection of atomism.

21. See above, n.2 and n.9 for the dating of each work.

22. The correspondence between Leibniz and Clarke began with Leibniz's first letter of Nov. 1715 and concluded with Clarke's fifth reply of Oct. 1716. Leibniz died in Nov. 1716.

Chapter VI

The Inadequacies of Atomism

We know from Leibniz's comments recorded in his correspondence and in his published papers that as a very young man he had accepted and then rejected atomism. This was a signal step in Leibniz's intellectual development. For, in the immaturity of his thinking, he had already begun to think through the reasons why he would reject the particle theories of matter that were central to seventeenth-century natural philosophy. Those reasons, reported in retrospect, expressed the germs of ideas that would be developed gradually and throughout the course of Leibniz's life and writings.¹

As Leibniz's thinking became more complex and sophisticated, and as he developed those elements of interest and position that he saw as interdependent, his criticisms of atomism sharpened, becoming more deeply interrelated with his theories on the nature of matter and the source of the force that would account for its motions; and increasingly interwoven with his mathematics, his physics, his metaphysics. Atomism was an inadequate explanation of matter and of natural phenomena dependent on the nature of matter.

By the time Leibniz had before him the complete text of

the Essay in its French translation, he was able to call on the full force of the arguments that would support his rejection of atomism. For, those arguments could carry their full weight for him only within the complex pattern of his system; like the monad itself, those reasons for rejecting atomism would mirror the other elements that went into the totality of that system.

The challenge of the present chapter is to uncover those criticisms of atomism which Leibniz brings to his response to the corpuscular philosophy of Locke's Essay. Although we will focus our attention on criticisms expressed in the New Essays, it will occasionally be necessary to refer to other works of Leibniz for clarification and supplementation.

Two categories of criticism will be considered. First, those metaphysical principles and laws which atomism violates and which are central to Leibniz's thinking: the principle of sufficient reason, the identity of indiscernibles, principle of plenitude, and the law of continuity.² And, second, specific characteristics or properties of atoms: solidity and hardness, cohesion, finite divisibility, perfect unalterability, and inherent inertness.

6.1: The Metaphysical Principles Violated

The discussion which follows will be limited to four principles which provide the basis for criticism of atomism on metaphysical grounds. The four principles are: sufficient reason, identity of indiscernibles, plenitude, and continuity. It must

be emphasized that they are not the only principles significant in Leibniz's thought; nor should there be any implication that they are the most important. They are singled out for consideration here because each makes a point central to Leibniz's rejection of atomism.³

The identification of Leibniz's principles requires a certain amount of detective work. Leibniz himself nowhere provides the reader with an explicit discussion and presentation of the subject; at times it is difficult to determine where one principle leaves off, the other begins. The principles are basically interrelated, so that each seems to express a different aspect of the same point. Consider, for example, the law of continuity and the principle of plenitude: Is one justified in identifying these as separate? Or, is the one a special case of the other? They will, in this context, be treated as separate principles.

No attempt will be made to justify the principles individually, nor to consider what qualifies a principle as a principle. These would be issues of concern were the subject explicitly Leibniz's principles. The position here--and it is stated without support--is that Leibniz's principles provide the theoretical, the metaphysical structure for his thinking (and possibly even the logical structure).⁴ These functions provide the justification for the present consideration of Leibniz's grounds for rejecting atomism.

6.1.a: The Principle of Sufficient Reason

The principle of sufficient reason is a primary principle for Leibniz, one with universal application in that there is nothing that can escape its reach.⁵ The principle asserts that there must be a reason for everything: why anything is; why it is as it is; why it is not other than it is. Using other terms, it asserts that every effect must have a cause sufficient to produce it as it is.⁶

In the New Essays, Leibniz states the principle in a brief and direct (though not completely clear) way: "nothing happens without reason" (NE, 2.21.13;179); and, "the author of things . . . does nothing without harmony and reason. (NE, Preface, 56)⁷ Through the principle, Leibniz expresses a position fundamental to his thinking, and which forms one of his major criticisms of Locke's thinking in the Essay (at least as Leibniz understands it)--as well as a major criticism of any particle theory of matter): the denial of an arbitrary universe, the denial of anything arbitrary in the universe.⁸ God is Supreme Reason. Everything that happens in nature must be in accordance with reason; if not, recourse to miracles would be necessary.⁹

To continue:

. . . within the order of nature . . . it is not at God's arbitrary discretion to attach this or that quality haphazardly to substances. He will never give them any which are not natural to them, that is, which cannot arise from their nature as explicable modifications. (Ibid., 66)

The reference of Leibniz's remark is to Locke's position on substances--specifically, the qualities of substances. Leib-

niz is explicit in pointing out that Locke's distinction between primary and secondary qualities asserts a relationship that is completely arbitrary. In Leibniz's view, all qualities must arise from the nature of substances.¹⁰ But, now, if we think back to Locke's distinction between the primary and the secondary, we find the link to the particle: the primary qualities are, as we have seen, qualities of particles; the secondary--the sensible qualities--are the effects particles have on the human sensory system. Locke finds a causal relation between the two, though denying access to how this happens. Leibniz rejects this as arbitrary, as a violation of the principle which asserts that there must be something intrinsic to the nature of the primary quality which would ground in that nature the nature of the secondary quality.¹¹

But the burden here is on the principle of sufficient reason as a basis for rejecting atomism--for rejecting any particle theory of matter, including that of Locke. Atomism asserts the existence of the undifferentiated--undifferentiated, that is, except for place and time. (Two atoms, two particles, cannot be in the same place at the same time.) And, there is no sufficient reason for the existence of two of anything undifferentiated. What this does is provide the grounds for the identity of indiscernibles, the principle to be next considered. In Leibniz's thinking, atomism is one of many positions of Locke that assert the existence of the undifferentiated, and that are to be rejected for reasons that are, ultimately, the same.¹² Atomism must be rejected be-

cause there is no sufficient reason for God to have created two of anything differentiated solely numerically. But, what does differentiate between individuals--as opposed to the why of that differentiation, grounded by Leibniz in the principle of sufficient reason (and which itself must follow from God's perfection)? For that, we turn to the principle of the identity of indiscernibles.

6.1.b: The Identity of Indiscernibles¹³

The identity of indiscernibles asserts that things--anything--cannot be distinguished only numerically; that numerical differentiation is insufficient to determine the identity of the individual as individual; there there must be other, intrinsic distinctions which may or may not be revealed through the extrinsic. To go full circle, where there is no intrinsic distinction, there can be no extrinsic--except for those distinctions that are relational, that result from the individual in relation to every other individual.¹⁴

The principle is central to Leibniz's conception of what constitutes an individual. It provides him with a theoretical basis from which all individuality must follow. It enables him to deny the existence of the undifferentiated; to affirm that the undifferentiated can be abstraction only.¹⁵ But the principle itself requires an idea central to Leibniz's thinking and on which intrinsic differentiation rests: imperceptible variations in all that exists. Leibniz writes, in the Preface to the New Essays:

. . . in consequence of imperceptible variations, no two individual things could be perfectly alike, . . . they must always differ more than numerically. This puts an end to the blank tablets of the soul, a soul without thought, a substance without action, empty space, atoms, and even to portions of matter which are not actually divided, and also to absolute rest, completely uniform parts of time or place or matter . . . and hundreds of other fictions which have arisen from the incompleteness of philosophers' notions. (NE, Preface, 57)

It is all-pervasive in existence; Leibniz's ontology must exclude duplication. This extreme of individuality then becomes a major issue in Leibniz's criticism of positions central to Locke's thinking--as the passage quoted expresses: the blank tablet, the soul that does not always think, particles (atoms), the vacuum.¹⁶ There are issues mentioned here that will be raised again for somewhat greater scrutiny. But, for this moment, we turn our attention to the atom--to Locke's particle.

The key passage in the New Essays in which Leibniz offers major criticisms of atomism are to be found in his response to Locke's discussion of identity.¹⁷ Leibniz writes, in reply to Locke's statement "that one thing cannot have two beginnings of existence, nor two things one beginning . . . in time and place:¹⁸

In addition to the difference of time or of place there must always be an internal principle of distinction: although there can be many things of the same kind, it is still the case that none of them are ever exactly alike. Thus, although time and place (i.e. the relations to what lies outside) do distinguish for us things which we could not easily tell apart by reference to themselves alone, things are nevertheless distinguishable in themselves. (NE, 2.27.1;230)

Let us stop to compare what Leibniz says with Locke's position on the primary qualities of particles: extension (including figure), solidity, and mobility (the passive power of motion)--the

original primary qualities; texture and situation--the derivative or relational qualities. Extension, solidity and mobility indeed define the individual particle for Locke. They are absolute properties in the sense that the particle, to be a particle, must be extended and solid and have the capacity to be moved. Were these to be taken away, what would remain? One might then ask whether particles might differ in size and shape, opening up the possibility of variations (even Leibniz's infinite variations) in extension and, with it, figure. Locke, however, never discusses such a possibility; nor, for his purposes and approaches, would there be reason for him to consider it.

But, perhaps individuality could be found with those of the primary qualities that are relational, in that they would require particles in combination, forming corpuscles.¹⁹ Again, there is no clue about whether or not Locke might accept individuality at the level of the corpuscle (as the combination of particles). Theoretically, Locke could agree to differentiation through the relational properties in combination, and through mobility. But, this would be extrinsic differentiation, with the particle intact and unchanged, and Leibniz requires a principle of differentiation that is intrinsic. Extrinsic differentiation has totally different grounds from those required by Leibniz, whose position has its basis in those "imperceptible variations": variations of time, of place, of relation; variations with roots in infinite divisibility; variations which deny the proliferation of identities. Leibniz's grounds express a

completely different concern, and different criteria of evidence--logical and mathematical, as well as metaphysical. Locke's response would be in terms of his epistemological and practical concerns with their scientific base: How could we know about intrinsic differentiation? Could we ever have simple ideas of such differences? Wouldn't that be on a level of explanation similar to that required for cohesion? For the real internal constitution of things? And, even if we could know, what difference would it make in our ideas and experience?

To continue:

The "principle of individuation" [of the 'Schools'] reduces in the case of individuals, to the principle of distinction of which I have been speaking [a way of distinguishing 'among things of the same kind']. If two individuals were perfectly similar and equal and, in short, indistinguishable in themselves, there would be no principle of individuation. I would even venture to say that in such a case there would be no individual distinctness, no separate individuals. That is why the notion of atoms is chimerical and arises only from men's incomplete conceptions. For, if there were atoms, i.e. perfectly hard and perfectly unalterable bodies which were incapable of internal change and could differ from one another only in size and in shape, it is obvious that since they could have the same size and shape they would then be indistinguishable in themselves and discernible only by means of external denominations with no internal foundation; which is contrary to the greatest principles of reason. In fact, however, every body is changeable and indeed is actually changing all the time, so that it differs in itself from every other. (NE, 2.27.3;230-231)

Locke's particles are, indeed "perfectly hard and unalterable"; could possibly differ only in size and shape, though not necessarily differing infinitely in size and shape; nor (as has been pointed out) does Locke ever comment on whether there could be proliferation of particles of the same size and shape. All

change for Locke is indeed through motion, but that motion is not intrinsic to the particle. For, again, particles do not have an intrinsic principle or power of motion. To use Locke's terms, they have mobility, but not motivity--the latter the active or inherent power of motion.

On the basis of Leibniz's criteria, then, all particle theories of matter, including the one Locke accepts, are to be rejected. Two particles could be perfectly alike; the differences among particles could be no more than numerical; they have no intrinsic source of change. Particle theories of matter are to be rejected because they fail the criterion of the identity of indiscernibles--as they fail to meet the principle of sufficient reason.

6.1.c: The Principle of Plenitude

The third of the principles underlying the inadequacies of atomism is the principle of plenitude. It is a principle which, as we shall see, is closely related to the law of continuity in at least one of the latter's aspects. In this context, we shall separate the two, for they each make somewhat different points.

The principle of plenitude asserts the fullness or completeness of existences in the universe.²⁰ Leibniz's clearest statement of the principle appears in a work written some years after the New Essays, The Principles of Nature and Grace (1714). There he writes:

Everything is a plenum in nature. Everywhere there are simple substances [i.e. monads] actually separated from each other by their own actions, which continually change their relations. . . . everything is connected because of the plenitude of the world. 21

In the New Essays, Leibniz does not refer explicitly to the principle of plenitude. He writes, commenting on a "'vacuum of forms' or among species": "In nature everything happens by degrees, and nothing by jumps; and this rule about change is one part of my law of continuity. (NE, 4.6.12;473)²² Earlier passages (in 3.6, specifically, where Leibniz also discusses the "vacuum of forms"), could be construed as referring to continuity among species exclusively. Certainly, the context is Leibniz's response to Locke's discussion of real and nominal essences of substances, and therefore of the entire problem of the status of species and genera. However, the fundamental point expressed by plenitude may be used as an argument against undifferentiated particles; the very conception of the monad --the reference to "simple substances" in the 1714 work quoted-- is evidence of the appropriateness of the argument. The plenum Leibniz discusses is not a plenum of species or forms exclusively; it is a plenum of all existences.

Thus, when we consider plenitude in relation to atomism, we see how it would affect Leibniz's position on the proliferation of what is, fundamentally, without differentiation. We have already seen, in the previous discussion of the identity of indiscernibles especially, that particles are basically undifferentiated, even allowing for some variation in size and shape, and in time and place. Particle theories of matter rest on the

basic unit as fundamentally undifferentiated, with differentiation emerging only with different levels of combination. This denies plenitude, in Leibniz's sense, for plenitude requires complete individuality; it denies that proliferation of the identical which is crucial to particle theories of matter.

The principle of plenitude is, in this way, connected with the identity of indiscernibles. It is linked also with the principle of sufficient reason. For, violation of plenitude would be a violation of the principle of sufficient reason: God would have no reason for creating many of the same.

6.1.d: The Law of Continuity

The last of the four principles is the law of continuity, a law which is fundamental to Leibniz's physics and mathematics and to his metaphysics. There are many statements of the law in his writings, and in many contexts (though frequently not so identified). In its most general form, it is: "as the data are ordered, so the unknowns are ordered also."²³ A statement more specific to atomism occurs in the Specimen Dynamicum (1695):

. . . whatever happens in substances must be understood to happen spontaneously and in an orderly way. With this is connected the principle that no change occurs through a leap. If this is established, it follows also that there can be no atoms. 24

And, in the New Essays itself:

. . . no body is either hard or fluid in the ultimate degree --we find in it no invincible hard atoms and no mass which is entirely unresistant to division. The order of nature, and in particular the law of continuity, equally pull down both alternatives. (NE, Preface, 60) 25

Earlier in the Preface, Leibniz had written:

Nothing takes place suddenly, and it is one of my great and best confirmed maxims that nature never makes leaps. I called this the Law of Continuity when I discussed it formerly in the Nouvelles de la republique des lettres. There is much work for this law to do in natural sciences. (Ibid., 56) 26

Finally, later in the New Essays, and more than once, Leibniz writes of the law of continuity in relation to a vacuum of forms: "The Law of Continuity states that nature leaves no gaps in ordering which she follows . . ." (NE, 3.6.;307) And, "In nature everything happens by degrees, and nothing by jumps; and this rule about change is one part of my law of continuity." (NE, 4.16;473)

But, the question is how this applies specifically to atomism--so specifically that it is basic to Leibniz's rejection of it. Atomism is a viable theory only if it includes a void or vacuum. For, motion is necessary for the changing combinations and recombinations of atoms--for all change in nature. These changes could not take place in a spatial plenum; they could not take place without a void.²⁷ Atomism brings with it the necessity for that leap in space which the law of continuity rejects. Where, with Leibniz, change requires continuity, for atomism change requires a void.

The justification for the law of continuity rests with infinite divisibility. Thus, the law has mathematical grounds that are rooted in Leibniz's infinitesimal calculus. Leibniz extends the law to encompass the rejection of "leaps" of all kinds: through empty space, of forms, in the "order of nature."

It is transformed into a metaphysical principle, in that it is a principle to which all existents must conform. It is central to many of Leibniz's major positions, including his position that substance is always active--that there can be no state of complete rest.²⁸

All of Leibniz's principles express one or another aspect of the order of nature--and beyond that, of the universal order. Atomism must be rejected for it violates a basic principle of nature, the law of continuity. Atomism stands outside the order of nature.

However, atomism's violation of basic metaphysical principles is not the sole reason why it is rejected. Equally important are several specific and defining characteristics of atoms which, in Leibniz's analysis, raise equally serious problems. Although some of these are related to principles discussed above, they require consideration independent of those principles.

6.2: Specific Characteristics Criticized

We turn now to the atom's specific characteristics--those important to Locke's conception and singled out by Leibniz for discussion in the New Essays.²⁹ The procedure here will differ from the one in the discussion of principles. For now there are specific characterizations of the particle in Locke's Essay--specific positions and discussions, some of which Leibniz commented on, others not. Although some of these properties have already been considered in Part One, we will begin each

discussion with a brief summary of Locke's position before presenting Leibniz's criticisms.

The properties to be considered are: solidity and hardness, cohesion, finite divisibility, unalterability, and inherent inertness.

6.2.a: Solidity and hardness

Locke, at the beginning of Book II of the Essay, interrupts his presentation of the simple ideas of sensation for an extended discussion of one of those ideas: the idea of solidity, one of the original and primary, and therefore defining, qualities of matter. (E, 2.4) Although Locke is never explicit about why solidity alone of the primary qualities is singled out for extensive discussion, the probable reason enters into the present discussion. Solidity, as a property Locke finds essential for motion, is excluded from Descartes' position that extension is the essence of matter.³⁰ Thus, Locke's discussion of solidity so early in the Essay, when he is beginning to set out his theory of the origin of ideas in simple ideas of sensation, can be associated with his criticisms of Descartes.³¹ Leibniz, in turn, will criticize both Locke and Descartes in his response. What is at stake is more than one of the (possible) defining properties of matter (in Locke's analysis, a property of the particle, as the ultimate unit of matter). More significant are problems central to motion. These are important in Leibniz's response to Locke: as Locke has found Descartes' identification of matter with

extension inadequate to express the nature of matter, for it would not account for mobility, the capacity to be moved which is the power of motion specific to matter, so now Leibniz finds Locke's position equally inadequate to account for motion.³²

Locke defines solidity (a simple idea of touch) as "that which hinders the approach of two bodies moving towards one another." He consents to use also "impenetrability," though this "is, perhaps, more a consequence of Solidity, than Solidity it self." Although the mind gets the idea of solidity from "grosser sensible bodies," (thus, through the senses), it, along with figure, is attributed by the mind to the "minutest Particle of Matter that can exist." (E, 2.4.1)³³ Now, in addition to this definition of solidity, and its relation to impenetrability, Locke makes other distinctions. First, he distinguishes between the idea of pure space and the extension which the solid body occupies. We do have separate ideas of space as empty and space as occupied, between the extension of space and the extension of body. (E, 2.4.3 and 5) And, second, he distinguishes between solidity and hardness. Solidity excludes other bodies from the space it occupies; hardness is "a firm Cohesion of the parts of Matter, making up masses of a sensible bulk."³⁴ Further, it is relative "to the Constitution of our own Bodies." (E, 2.4.4) For Locke, then, solidity is a defining property of matter, existing independent of the knowing mind; hardness is a secondary, mind-dependent quality. Finally, and as though to underscore the underlying issue of motion, Locke states that the mutual impulse, resistance and

"protrusion" of bodies depends on solidity. (E.2.4.5)³⁵

Resistance is especially significant because of its relation to the source of the idea of space; space is that which is without solidity, for it is the place which may be entered without resistance.

Thus, although Locke is concerned with the source of the idea of solidity, he does attempt to deal with the phenomenon itself, touching on issues of concern to science--to motion, specifically.

Leibniz responds to Locke's discussion of solidity with all the ideas and scientific sophistication that he had been developing for decades. His remarks attempt to probe the sources of solidity in a way that Locke, clearly, was neither interested in nor prepared to do. He brings to the discussion his thinking not only about reason and sensation as sources of ideas, but also about motion and force, and about the nature of matter. He, too, rejects Descartes' position on the identification of matter and extension, but he does so with a sharper understanding of the issues and after having struggled with the problems of motion and force. And, in addition, his rejection of the "hard" atom is reflected in his explanation of solidity and its relation to hardness, based upon his own thinking about matter.

Leibniz picks up on the following issues: resistance and its sources; what hardness is; the nature of matter; whether or not there are two extensions (space and body), rather than the Cartesian sole extension (body); and the sources of our

ideas of solidity and hardness. We will touch on each of these, keeping in mind that Leibniz's comments on Locke's discussion of solidity are central to his rejection of atomism. For Leibniz there is a close relation between solidity, the nature of matter, and the problems of motion and force that were central to his thinking about dynamics and metaphysics.³⁶

Locke had been content to ground resistance in solidity. Leibniz identifies four sources of resistance--three, in addition to impenetrability which, it will be recalled, Locke makes synonymous with solidity. Two of these sources are within matter itself: inertia (which Leibniz says is passive and constant); and impetus (active and changing). (NE, 2.4.1; 123) The third of Leibniz's additions is external, in that its source is in "neighboring bodies": what Leibniz calls "bonding," or "firmness." (Ibid.) Bonding has a significance in addition to being a source of resistance; for, bonding is a part of the chain that produces hardness and then cohesion. Thus, it enters into more than one of the problems emerging from atomism--problems associated with the explanation of how individual units can join together to form groupings and, ultimately, mass matter.

In any case, where Locke will speak only of resistance as arising from the solid nature of body, which prohibits two bodies--two atoms, or particles, ultimately--from occupying the same space, Leibniz shows how resistance is related to motion and force. The two inner sources of resistance are central to Leibniz's working out of the problem of force, and, again, crucial to his rejection of atomism. The solid atom has no inner

source of change; the source of motion is external to what is moved--all motion is impact motion. For Leibniz, change, activity, force--all come from within. (As we shall see, this is where the monad--the metaphysical unit--enters into Leibniz's "solution.") Even though Leibniz does admit an external source (bonding), and does allow impenetrability (the "reluctance of two bodies to share the same place" [*ibid.*7]), still, the two inner sources (inertia and impetus) are evidence of how and where Leibniz seeks his solution to the problem of force.

Locke had distinguished between hardness and solidity; solidity as the property intrinsic to the nature of matter, and hardness a relative quality, relative "to the constitutions of our own bodies." (E, 2.4.4) Leibniz rejects the distinction, denying that solidity is an inherent, essential property of matter (NE, 2.4.4:124); and denying that the nature of matter is solid. He offers, in addition, fluidity as equally essential to the nature of matter, thereby rejecting the positions both of Locke and Descartes. (*Ibid.*, 125)³⁷ Again, he rejects the position that hardness is relative, referring to the attribution of hardness to atoms by "many philosophers." (*Ibid.*) Leibniz, however, then proceeds to explain hardness in different terms; he expresses a preference for "firmness," or, more generally, for "stability" or "cohesion." (*Ibid.*) What he does in rejecting the position that there is an unchanging and relative or absolute property of matter is to offer a position on what does give that firm-

ness or cohesiveness to matter which the senses indeed "convince us . . . also actually occurs in nature." (Ibid.) We will defer this explanation until we consider the issue of cohesion.

There are two additional points to mention here. First, Leibniz rejects Locke's position that our ideas both of solidity and of hardness have their sources in sensation. Yes, our senses may convince us of what occurs in nature; with hardness and/or solidity, sight is as useful as is touch. (Ibid., 124)³⁸ He states also that our senses may provide the mind with the stimulation to search for what is already present in a state of preconsciousness.³⁹ But, solidity and hardness are known through reason, and not through our senses.⁴⁰

The second of the additional points is Leibniz's denial that there are two extensions--one of matter, the other of space independent of matter: "I distinguish extension from matter . . . but I do not believe that there are two extensions." (Ibid., 128)⁴¹ Further consideration of this point would lead into consideration of Leibniz's position on the relativity of space, and of where Locke stands on that issue; but this is not the place to pursue this.

6.2.b: Cohesion

Any particle theory must face the problem of what it is that holds together the individual particles, from two particles to the level of mass, perceptible matter.⁴² Locke considered the problem of cohesion a central one for the partic-

ular theory which he accepted and which was fundamental to his position on the nature of matter. The extension of body is, in fact, "nothing but the cohesion of solid parts"--each "part" with its own extension. (E, 2.23.27) Nonetheless, how are we to explain the cohesion and--equally important--its opposite, the separation of particles once cohered? This latter must be viewed as having an importance equal to that of cohesion. For, those activities--those effects--of particles described as the secondary and tertiary qualities depend on the motions of individual particles.⁴³ Thus, neither cohesion nor non-cohesion is a permanent condition of mass matter.

For Locke, the explanations of cohesion and of separation are beyond the possibility of human comprehension; there can be no knowledge of what holds particles together for there can be no way of tracing such ideas back to their source in simple ideas of sensation. This, however, does not stop Locke from considering the possible explanations of cohesion; for example, the pressure of particles and corpuscles of air.⁴⁴ But, it remains speculation, and we continue in ignorance of how we are to account for and comprehend the extension of body. The danger Locke would avoid is the hypothesis without the appropriate evidence in observation and experiment; the hypothesis that is speculation and nothing more. His requirements for explanation leave him without an answer to a basic problem in any particle theory of matter.⁴⁵

Not so Leibniz, who, rejecting atomism, does have a theory of cohesion which is continuous with his explanation

of solidity and hardness, and which, in addition, is the source of resistance in matter. That theory is bonding, and it shall enter into the present discussion of Leibniz's criticisms of Locke's position.

Leibniz would agree with Locke on the inexplicability of cohesion on the basis of the latter's conception of matter. For, as Locke conceives of his ultimate material unit--solid, moving only on impulse and in a spatial vacuum--there is no way of explaining what holds the particles together and allows them to separate. Thus, pressure or, perhaps, some other material functioning as "glue" serves only to transfer the problem to another level at which the same problem remains.⁴⁶

Leibniz's basic point is that Locke's position that "the tiny parts of matter are rigid" cannot account for the cohesion of those particles; that Locke is wrong when he goes even further to define extension as the cohesion of solid parts. He writes, "this gifted author goes so far as to believe that rigidity or the cohesion of its tiny parts constitutes the essence of body." (NE, Preface, 59)⁴⁷

Leibniz's discussion of cohesion in the Preface (one of several such discussions in the New Essays) takes place in the context of his comments on motion and space. As cohesion cannot be explained if matter is "rigid," so, too, motion in a plenum cannot be explained under such conditions. Leibniz disagrees with Locke by denying the existence of a vacuum, of empty space--as we have already discussed; then, agreeing with Locke, he denies a material plenum. The former condition--a

vacuum--raises the question of how matter can act without direct contact, without impulse or constant "pushing." A vacuum violates the law of continuity. It raises the problem of action at a distance; recall the charge of "occult qualities" leveled at Newton's principle of gravitation. But, a material plenum raises equally difficult questions for Leibniz.⁴⁸ His position on the inherent fluidity of matter is his solution--perhaps, his compromise--to the problem of vacuum versus solid matter.

Thus, in response to Locke's discussion of cohesion in his chapter on substance, Leibniz makes a distinction between primary and secondary matter: primary matter is "matter in the abstract, considered as an original quality like motionlessness." What Leibniz has termed "perfect fluidity" is appropriate only to primary matter. (NE, 2.23.23;222) This is in contrast to secondary matter,

matter as it actually occurs, invested with its derivative qualities--for I believe that no mass is ultimately rarefied and that there is some degree of bonding everywhere. This is produced by motions, when they all run the same way so that any division would have to set up crosscurrents, which cannot happen without some turbulence and resistance. (Ibid., 222-223)

The point here is not to open up the complexity of Leibniz's distinction between primary and secondary matter, and the even greater complexity of what he means by matter--for these, along with fluidity, will be taken up in the discussion of matter (in 8.3, below)--but rather to allow us to state that, for Leibniz, motion is the key element in his "solution" to the problem of cohesion/separation, and that fluidity also is

involved in that solution (as it is involved the conception of matter). Although, theoretically, and in the abstract, matter is fluid and without motion, yet in nature (because there can be no perfect rest, no motionlessness), fluid matter bonds or is firm, in Leibniz's synonymous use of these terms. (NE,2.4.1; 123) Firmness--solidity, rigidity--is not an original quality of matter for Leibniz, but is the result of motion which in turn occurs in a material--a fluid material--plenum. Locke's solid particles, in motion or at rest in a spatial vacuum, devoid of Democritean "hooks," though not necessarily of Epicurean "swerves," have no inherent source of cohesion. And there is nothing Locke cites that is extrinsic that could account for this fact of physical reality.

6.2.c: Finite divisibility

The next problem underlying Leibniz's rejection of atomism to be considered here is the issue of divisibility.

Locke's position on the finite or infinite divisibility of the particle is not completely clear. A thorough analysis of where he stands on this issue would require careful study of his discussions of infinity in Book II of the Essay.⁴⁹ A key distinction he makes is between the actual infinite and the infinite in thought. Thus, increase and decrease both are infinite in thought, dependent as we are for these ideas on the infinity of number.⁵⁰

But, what can be said about the divisibility of Locke's particles? What evidence do we have that he conceived of the

particle as finitely divisible--and thus in the tradition of ancient atomism, revived by Gassendi, the tradition with which Leibniz explicitly associated Locke? The clearest evidence is in his discussion of the sources of simple ideas, in his distinction between the primary and other qualities of matter.

(E, 2.8) Thus, the primary qualities are those

such as are utterly inseparable from the Body, in what estate soever it be; . . . such as Sense constantly finds in every particle of Matter, which has bulk enough to be perceived, and the Mind finds inseparable from every particle of Matter, though less than to make it self singly be perceived by our Senses. (E, 2.8.9)

Locke goes on to identify those qualities as solidity, extension, figure and mobility--those qualities we have already discussed as the original, primary qualities of matter.⁵¹ He then asserts that division "can never take away" these qualities--these defining properties of matter. Then, in his discussion of our idea of infinity, he writes:

All our positive Ideas of any Quantity, whether great or little, have always bounds; though our comparative Idea, whereby we can always add to the one, and take from the other, hath no bounds. . . . A Pestle and Mortar will as soon bring any Particle of Matter to Indivisibility, as the acutest thought of a Mathematician . . . (E.2.17.18)

Thus, any positive idea of the divisibility of a particle is a finite idea--be it the idea of an apothecary or a mathematician; matter as infinitely divisible can be only a comparative idea--an idea formed by the mind's capacity to divide anything in half, ad infinitum.

If, then, one were to seek an answer to where Locke stands on the issue, that answer could be equivocal. It is possible, in thought, to divide any quantity infinitely, be-

cause of the infinity of number, on the one hand; Yet, matter, to be matter, must have extension. If a degree of divisibility might be reached that would obliterate extension, matter would be obliterated by depriving it of three of its defining qualities (three, because presumably figure and solidity would be lost with extension).

Leibniz, of course, rejects any position that asserts finite divisibility. Infinite divisibility is a central and crucial element in his thinking, underlying his most characteristic ideas. Anything quantitative--anything admitting of degrees--is infinitely divisible; the very conception of quantity demands infinite divisibility, in actuality. Thus, Leibniz accepts the actual infinite.⁵² And so there is no rest, no substance without activity, there is always perception (albeit "minute"); and there is the infinitesimal calculus. The finitely divisible atom, as a quantity with limited divisibility, must be rejected as contrary to reason, which is the ultimate arbiter of reality.

Although Leibniz does comment on Locke's discussion of ideas of infinity--of space, duration, number--he does not take up the issue of the finite divisibility of matter in the New Essays; those comments of Locke which might be interpreted as expressing this position are passed over by Leibniz.⁵³ However, scattered throughout the New Essays are remarks that express his rejection of the finite divisibility of matter. In the Preface (57), he includes "portions of matter which are not actually divided" in an enumeration of positions that are to be

rejected. Shortly after, he writes:

. . . we should think of space as full of matter which is inherently fluid, capable of every sort of division and indeed actually divided and subdivided to infinity . . . we find in /matter/ no invincibly hard atoms and no mass which is entirely unresistant to division. (NE, Preface, 59-60)

Then, later into the New Essays, in a comment on Locke's discussion of substance in which he (Locke) asserts the limitations of our senses as consonant with our needs, Leibniz refers to matter as "actually divided to infinity." (NE, 2.23. 11/12;219)⁵⁴ The basis, always, for Leibniz's position rests with the logical and mathematical demand on the infinite divisibility of any quantity; any position about the nature of matter which would deny or contradict that demand must, then, be rejected as contrary to reason.

Leibniz's position on matter's infinite divisibility presents him with one of the problems out of which the concept of the monad will emerge. If matter is infinitely divisible, then where is to be found that which gives matter its unity? Without some source of unity, all matter--of whatever size--would be no more than an aggregate. How are we to account for activity in relation to a whole? How are we to account for body as organic, as living, as able to express and to fulfill a purpose? Although there is a sense in which nature is mechanical, operating through efficient causation, Leibniz never removes final causation even from nature, to provide direction for the efficient.⁵⁵

However, the focus here is not on how Leibniz manages to

overcome the problems of matter's infinite divisibility; it is, rather, on Leibniz's position that the finitely divisible atom must be rejected, as must any quantitative unit that requires finite divisibility.⁵⁶

6.2.d: Perfect unalterability

Another of the properties Leibniz attributes to the atom --one not unrelated to finite divisibility and to the identity of indiscernibles--is unalterability:

. . . if there were atoms, i.e. perfectly hard and perfectly unalterable bodies which were incapable of internal change, and could differ from one another only in size and in shape, it is obvious that since they could have the same size and shape they would then be indistinguishable in themselves and discernible only by means of external denominations with no internal foundation . . . (NE,2.27.13;230-231)⁵⁷

The particle cannot change externally or internally, by any external agent or from any inherent cause. This is a fair attribution; the very notion of the atom demands that it be the unchanging unit or core of that which changes.

Now, Locke is not clear about where he stands on the issue of unalterability. Some modification of the "parts" of matter is possible, as a result of the motion of other parts. He writes, for example, of the alteration of the primary qualities of bodies--of the "Bulk, Figure, Number, Situation, and Motion of the parts of Bodies," without clearly indicating whether the primary qualities so altered are those of the "parts" themselves, or of the particles in combination. If the latter, then the primary qualities changed would result from the rearrangement of the particles through motion.

(E, 2.23.9) Further, considering the distinction between corpuscles and particles, and between the original as distinct from the derivative, primary qualities, it would seem that the ultimate unit (the particle) is indeed unalterable; but that the corpuscle (as a cluster of particles) is alterable.⁵⁸ Situation and motion/rest are, clearly, primary qualities which by definition will change, but without affecting the basic unalterability of the particle. Bulk, size, and number would require particles combined and would be subject to change. Texture and figure thus remain the sole possibilities for change--change that would have to be externally produced by the motion of other particles through impact.

And so the "perfect unalterability" of the atom may or may not be correctly applied to Locke's basic unit.

Nonetheless, Leibniz regards unalterability as a property required of any atomism--one that contributes to its unacceptability as an adequate theory of the ultimate nature of matter. What does he mean when he refers to the atom as "perfectly unalterable"? Because he refers specifically to the fact that it (the atom) is "incapable of internal change," we can assume that the reference is to external change. This includes its finite divisibility; in fact, one can refer to the atom as the smallest unit of matter beyond which its properties as matter would no longer exist. This basically Locke's position.⁵⁹ Finite divisibility is, as we have seen, one of Leibniz's major criticisms of atomism. Further, Leibniz's references to the perfection of its unalterability would have to refer to every possible aspect

of change, including that texture and figure about which Locke is not at all clear.

But, the question remains: why is that unalterability an important reason for Leibniz's rejection of atomism? The fundamental reason is that it would deny Leibniz's conception of reality, of existence. What exists must, by definition, be in constant change. Thus, the position that matter itself, in its basic component unity, is unchanging, is a denial of the very nature of existence. Infinite divisibility is central to external change. The monad, as the force inherent in matter, will be seen as central to internal change.

6.2.e: Inherent inertness

The next and, here, final grounds for the inadequacy of atomism is that atoms are inherently inert. There can be no change, no movement, from within.

Locke's position is that all change must have an external source. Consider his tertiary qualities--those "barely powers" of the eighth chapter of Book II; and his designation of passive power as specific to matter, in Chapter 21. With each, as we have seen, change is fundamentally through motion transmitted --motion on impulse--which then results in the rearrangement of the basic units and (possibly or) the transmission of motion to other units.⁶⁰ Thus, the key factors in change with Locke's particle are motion and cohesion, with both determined externally, and involving no change in the unit itself. Cohesion, as has been pointed out, is inexplicable for Locke. Motion on

impact alone is, by the fourth edition of the Essay, a limitation put under question by Newton's principle of gravity.⁶¹

What kinds of problems does this characteristic of the material atom--its lack of an inner source of change and of inner change itself--result in, for Leibniz? These properties of the material atom leave inexplicable the problems of force that had concerned Leibniz for decades. And, on a different level, they lead to a conception of the universe and of reality that were unacceptable to him. The issue to be emphasized here is the one involving force. As the problem of divisibility was mathematical, but with implications for Leibniz's dynamics, epistemology and metaphysics, so the issue of force would find expression in many contexts in Leibniz's thinking. There will be further consideration of these contexts in the discussions of substance and of the monad in nature, both of which will follow. For the present, the emphasis is on the incompatibility Leibniz finds between the internally inert atom and the demands of force. Leibniz works out his own solution to these problems through the conception of the monad as the inner source of force in matter, though it is not identical with matter.

The problem, nonetheless, is why the inert atom is rejected. The fundamental reason is that a material unit moving solely on impact does not explain that force which is necessary to produce motion. It cannot explain the conservation of force--Leibniz's critically important correction of Descartes' position on the conservation of motion. It is not motion (its unchanging quantity) that is conserved; it is, rather, the quantity of

force that remains unchanged. Leibniz never denies that matter obeys the laws of mechanics; but the laws of nature do not derive from the laws of mechanics.⁶⁷ For, mechanics alone cannot account for force and the conservation of force. Mechanical laws are adequate for billiard-ball motion; for that kind of motion, perhaps, that an inert material atom would have. But mechanics--and with it, the material atom--are insufficient to explain the physical and metaphysical problems which concerned Leibniz. Matter qua matter is inert. Matter as it exists has its inner source of change for Leibniz: the monad.

This, of course, is not the place for discussion of Leibniz's solution to the problem posed by the inherent inertness of the material atom. That solution will require not only a different conception of matter and a different unit--the monad; it will also require a different conception of substance and of the relation between substance and matter. For, as we shall see, Leibniz denies that substance is material. At this point, an element central to Leibniz's rejection of atomism is that its denial of an inner source of activity presents insurmountable problems in dynamics--problems whose solution Leibniz will seek in metaphysics, and in a metaphysical unit.

Summary

Leibniz rejected atomism because, for him, it was an inadequate account of the ultimate nature of matter--inadequate for reasons that were mathematical, physical, above all metaphysical. The particle theory that Locke accepted and used in

the Essay failed for reasons that were the same as for other such theories. Those reasons enter into Leibniz's comments throughout the New Essays from its opening Preface.

The principles violated by atomism include those central to the system Leibniz had been developing by the time the Essay was available to him in French: the principle of sufficient reason, fundamental to all aspects of his thinking; and the law of continuity, the identity of indiscernibles, and the principle of plenitude. And, there were other grounds for criticisms, based on specific properties of the particle, grounds that were at once physical (solidity and hardness, the problem of cohesion, inherent inertness, unalterability), and mathematical (finite divisibility in particular). And, in a sense, the problems with inertness, unalterability, and finite divisibility are also metaphysical, involving as they what is central to Leibniz's conceptions of reality.

It has been emphasized from the outset that, as Locke's Essay is not an exposition of atomism, so too the New Essays can never be approached as an extended argument against atomism. However, Leibniz would have been sensitive to the significance of the particle theory of matter for Locke's epistemology and his metaphysics. His criticisms of atomism, and especially the grounds for his rejection if it, are crucial for an understanding of the issues that separate the two.

Notes

1. Leibniz referred frequently, and into his late years, of his youthful acceptance and rapid rejection of atomism. The earliest of the references, in PPL, was written in 1669 (and this, of course, does not imply that there were not earlier comments); the last, in the correspondence with Clarke, in 1716 (the year of Leibniz's death). Correspondence with Thomas Burnett (1697), and with Nicholas Remond (1714)--published in LPS, vol.3 and mentioned by Loemker--refers to a walk through the woods when Leibniz was still in his teens during which he decided to reject substantial forms and to accept the "new" philosophy, atomism and mechanism. Then, by 1669, when he would have been 23, Leibniz would write of his early agreement with "those contemporary philosophers who have revived Democritus and Epicurus and whom Robert Boyle aptly calls corpuscular philosophers . . ."--continuing with reference to the primary qualities of magnitude, figure, and motion. Leibniz goes on to say that primary qualities are not intrinsic to body, that they cannot be explained independent of God. (The Confessions of Nature Against Atheists, PPL, p.110. The reference to "primary qualities" would not, of course, have been inspired by Locke; its source, undoubtedly, was Boyle's The Origin of Forms and Qualities, first published in 1666.) In a postscript to his fourth letter to Clarke, Leibniz is still referring to that early acceptance "of a vacuum and atoms, but reason brought me into the the right way." (Leibniz-Clarke Correspondence, p.43) He continues with his criticisms of atomism, arguments which will enter into the present ensuing discussion.

It must be added that Leibniz rejected particle theories including that of Descartes which at least did not commit the "sin" of finite divisibility and did not require a vacuum!

2. These are not the sole principles either formulated by Leibniz or taken over from others. Some of these have a significant role in Leibniz's idea of nature and will be discussed in chapter VIII, below, in particular.

3. Loemker (in his PPL Introduction) identifies 13 principles, which he organizes according to a "scale of universality." (P.45) Ortega y Gasset cites ten principles, only two of which he states were not original with Leibniz. (The Idea of Principle in Leibniz and the Evolution of Deductive Theory, Mildred Adams, tr., New York: W.W. Norton & Co., Inc., 1971. P.13) The Loemker 13 and the Ortega ten do not overlap completely, even considering the larger number which the former finds.

4. This point is made in somewhat different ways by both Loemker (PPL, pp.44-45) and Ortega (Idea of Principle, pp.12-13).

And, no doubt, by others who have considered the role of principles in Leibniz's thinking.

5. It is primary only in this limited sense; it is not primary in the sense of being original, underived. In First Truths (written, according to Loemker, between 1680 and 1684), it is described by Leibniz as derived from his notions of truth (necessary and contingent), and thus is given a logical basis in that work. (PPL, p.268) Loemker grounds sufficient reason in the principle of perfection--the perfection of the universe. (PPL, p.45)

6. Consider, however, Collingwood, in the Essay on Metaphysics: "The Leibnitian /sic/ Law of Sufficient Reason is not that everything has a cause, it is that everything has a ground." (R.G. Collingwood, An Essay on Metaphysics, Chicago: Henry Regnery Co./Gateway, 1972. P. 329. Reprint of original Oxford University Press edition) If Collingwood is correct--and I think he is--emphasis of the principle would be on reasons why, without necessarily asserting anything about cause. Loemker's grounding of the principle itself--in perfection--would be another way of expressing the same point.

7. In others of Leibniz's works there are fuller expressions. For example: ". . . there must always be some foundation for the connection between the terms of a proposition, and this must be found in their concepts. This is my great principle, with which I believe all philosophers should agree, and one of whose corollaries is the commonly held axiom that nothing happens without a reason, which can always be given, why the thing has happened as it did rather than in another way . . ." (Letter to Arnauld, July 14, 1686; PPL,p.337) Also: ". . . nothing takes place without a sufficient reason; in other words, . . . nothing occurs for which it would be impossible for someone who has enough knowledge of things to give a reason adequate to determine why the thing is as it is and not otherwise." (The Principles of Nature and Grace, sn.7; PPL, p.639)

8. This is a major and fundamental criticism--that Locke is expressing in the Essay an arbitrary universe.

9. NE, Preface, p.66. But, even miracles must comply with the principle of sufficient reason, and of the perfection of the Creator. Given that perfection, there can be nothing imperfect in His creation. Anything arbitrary--without grounds or reason--would be imperfect. (See also Discourse on Metaphysics, sns. 3-7.)

10. "It must not be thought that ideas such as those of colour and pain are arbitrary and that between them and their causes there is no relation or natural connection: it is not God's way to act in such an unruly and unreasoned fashion. I would say, rather, that there is a resemblance in which one thing expresses

another through some orderly relationship between them." (NE, 2.8.13;131. Also, *ibid.*, 15;131ff and 4.6.7;403)

Locke, however, would not deny any "relation or natural connection." He is not saying, in E,2.8. or in any other part of the Essay where he is concerned with distinguishing the secondary qualities and our ideas of them that there is no relationship between those powers and the resulting sense ideas; rather, that the relationship is outside the scope of human knowledge. For, we can have no ideas--no simple ideas--of that connection as a necessary connection. (Consider also: E, 2.23; 3.6; and 4.11.)

11. Locke, it must be recalled, would not deny something intrinsic to the nature of the one that would account for the other. However, he places it outside the scope of human knowledge--once more.

12. The passage in which Leibniz identifies these positions will be referred to in 6.1.b.

13. Loemker refers to this also as the principle of individual differentiation (PPL, p.45); Ortega, as the principle of differentiation (Idea of Principle, p.13).

14. Remnant and Bennett, in their discussion of "denomination," comment on the determination of the intrinsic and the extrinsic, with the latter relationally determined. (NE, pp. xxxvi-xxxvii. They are there referring to the New Essays and to others of Leibniz's works.)

15. "Things which are uniform, containing no variety, are always mere abstractions." (NE, 2.1.1;110) See below, 8.2.c, for discussion of the complete conception of an individual substance--the grounds of the monad as unique.

16. Locke's position on the finite or infinite divisibility of the particle is not clear. (See above, 3.2.a) Question has also been raised about whether Locke's analysis of substance leads him to the threshold of a conception of substance as activity (in 4.4, above).

17. In the Essay, 2.27 is entitled "Of Identity and Diversity." The chapter heading in the New Essays is "What Identity or Diversity Is." Locke's problem in the chapter is what determines the identity of the person. Leibniz responds in terms of what determines any identity.

18. NE, 2.27.1;229. Locke's statement in the Essay is not precisely as Leibniz gives it in the words of Philalèthe, his Locke spokesman. However, the meaning is not affected.

19. See above, 3.3.

20. In Lovejoy's classic statement: ". . . no genuine potentiality of being can remain unfulfilled . . . the extent and abundance of the creation must be as great as the possibility of existence and commensurate with the productive capacity of a 'perfect' and inexhaustible Source." (Arthur O. Lovejoy, The Great Chain of Being, New York: Harper Torchbooks, 1966. P.52. Reprint of Harvard University Press edition, 1936.)
21. PPL, pp.636-637.
22. Thus, the close connection with continuity. In some ways, each requires the other; they are interdependent--although continuity is more inclusive.
23. "Letter . . . on a general principle useful in explaining the laws of nature . . . as a reply to . . . Malbranche." Nouvelles de la republique des lettres, July 1687. (PPL, p.351)
24. There are other references to continuity in Specimum Dynamicum; e.g. ". . . this law of continuity, which excludes a leap from change . . ." (PPL, P.447); ". . . a general principle of order arising from the concept of the infinite and the continuous . . ." (Ibid.). Then, when writing to de Volder, in 1699: ". . . no transition is made through a leap; . . . a body can move from one place to another only through intervening positions. . . . the same thing applies not only in transitions from place to place but also in transitions from one form to another or from one state to another. For experience, as well, refutes all changes through a leap." (Ibid., pp.515-516) As these passages indicate, the principle is central to the rejection of any vacuum--of space, of form or kind, of condition.
25. We will return to the qualities of hardness and finite divisibility in 6.2, in the discussion of specific properties of the material atom which are criticized by Leibniz.
26. The brief article to which Leibniz refers (and it is cited by Remnant and Bennett in the text of their translation) is "Letter . . . on a General Principle Useful in Explaining the Laws of Nature . . ." (PPL, pp. 351-353) It appeared in July 1687, and was critical of Malebranche. The statement and context of the law shows a mathematical basis, but the article also discusses the law in relation to physics and mechanics. The article concludes: ". . . the general principles of physics and mechanics themselves depend upon the action of a sovereign intelligence and cannot be explained without taking it into consideration." (Ibid., p. 353) Thus, the grounds are at once theological and metaphysical.
27. It should be pointed out that Descartes' particle theory did not require a void for motion. His vortex theory of motion attempts to solve the problem of motion at a distance associated

with those particle theories which asserted the existence of a vacuum in space by eliminating the possibility of distance. (See E.J. Aiton, The Vortex Theory of Planetary Motions, New York: American Elsevier Inc., and London: Macdonald, 1972. Chapter III, "The Vortex Theory of Descartes," is devoted to this issue. See also p. 242, below.)

28. See below, 8.2.e.

29. These characteristics and the criticisms would be applicable to most particle theories, from that of Democritus on, but with the exception of Descartes' theory on a few of the issues.

30. See, for example, Meditations, IV; Principles of Philosophy, Part II, Principles i-viii.

31. Locke also takes up the issue of solidity in E, 2.13, "Simple Modes of Space."

32. It has been pointed out that Locke's position on motion on impact was modified after the Essay's first edition, in response to Newton's principle of gravity. However, there are discussions of motion in the Essay which continue unchanged through the Essay's various editions--unchanged, in the sense that they did not reflect that modification. (See above, 3.3 and n.35.)

33. Note the distinction Locke makes between the roles of the senses and of mind.

34. The discussion of cohesion which follows will consider the further.

35. "Protrusion," according to the Glossary in the Nidditch edition of the Essay, is "the action of thrusting or pushing out an attached part." (P. 851)

36. To give Locke his rightful scientific due: he, too, was clearly concerned with accounting for motion in his discussion of solidity. But, because of the nature of his scientific orientation--in medicine with a rudimentary knowledge of chemistry (at a time when it was in the early stages of development as a science, it must be remembered), but not in mechanics or in mathematics--he could never meet Leibniz on the latter's grounds. And, of course, his purpose in the Essay would preclude the level of Leibniz's discussion.

37. At times, Leibniz makes a stronger claim for fluidity as the fundamental condition of matter, with solidity the result of motion. (See below, 6.2.b and 8.3.)

38. We should be reminded that Locke cites sight and touch as sources for the idea of space. For solidity, touch alone is cited.
39. NE, 1.1;74: ". . . there are ideas and principles which do not reach us through the senses, and which we find in ourselves without having formed them, though the senses bring them to our awareness." It is in positions such as this that one seeks, and finds, Leibniz's kinship with Plato.
40. Leibniz completely rejects Locke's analysis and explanation of the source of ideas in sensation and of the empirical grounds of knowledge.
41. "Extension is an abstraction from the extended and the extended is a continuum whose parts are coexistent . . ." (NE, 2.13;149)
42. Epicurean atomism accounted for cohesion through a system of "hooks" which fit together, thereby holding the atoms together.
43. See above, 3.2.b and c, and 3.3.
44. E, 2.23.23-27.
45. The reach of this lack of explanation is expressed more than once in the Essay. Consider the passage which concludes Locke's speculation--presented, it must be emphasized, as speculation only--on the pressure of air as the explanation of cohesion. (E, 2.23.27) (Locke was, of course, familiar with Boyle's work on the pressure of air.)
46. Remnant and Bennett point out in their discussion of cohesion in their Glossary (xxxiv) that Leibniz rejected all theories of cohesion current at the time, offering instead his own theory grounded, as we shall see, in motion. What is, perhaps, Leibniz's most telling criticism of theories of cohesion is to be found in his comments on Articles 54 and 55 of Descartes' Principles of Philosophy, in which he (Leibniz) discusses the problem with greater detail than is found in the New Essays. (PPL, pp.403-407) Descartes' particle theory, as noted, differs fundamentally from that of Locke; the theory of the former allows for infinite divisibility and requires a material plenum.
47. There is a problem of terminology and translation here. The word translated as "rigid" in Leibniz's discussion of cohesion in his Preface and in 2.23, is raide--stiff, tight, inflexible (Larousse). Locke, in the Essay, refers always to "solid parts," and to "solidity." Raide, one assumes, conveyed Leibniz's meaning more precisely than would have rigide, solide, or even fermete (firmness), which he used in his dis-

cussion of solidity in NE,2.4. The key meaning of raide in this context is, possibly, "inflexible." (But, it must also be pointed out that raide could have been the word used by Coste in his translation of the Essay into French; and that Leibniz simply continued use of the word from the French edition.)

48. See above, 6.1.d.

49. See especially in the Essay, 2.13-17, where Locke considers the sources of our ideas of space, duration, number, and infinity; and also, E, 2.29, where he discusses distinct and obscure ideas (sn.16, in particular).

50. ". . . when we talk of infinite Divisibility of Body, or Extension, our distinct and clear Ideas are only of Numbers: but the clear, distinct Ideas of Extension, after some Progress of Division, is quite lost; and of such minute Parts, we have no distinct Ideas at all; but it returns, as all our Ideas of Infinite do, at last to that of Number always to be added; but thereby never amounts to any distinct Idea of actual, infinite Parts." (E, 2.29.16) Many of Locke's discussions of the infinite divisibility of matter would seem to be responses to Descartes' infinitely divisible particles and his identification of matter and extension.

51. See above, 3.3.

52. This, in opposition to Locke (whose position on this issue is closer to the Aristotelian), who distinguishes between the idea of infinite space and the idea of space infinite. (E, 2.27.7)

53. There are many references in others of Leibniz's works to his opposition to any particle theory which asserts the particle's finite divisibility. Note, for example, "Clarification of the Difficulties which Mr. Bayle has Found in the New System . . ." (PPL, p.496)

54. The comment is included in yet another statement by Leibniz in which he rejects atomism--elementary particles which are contained in corporeal nature. (NE, 2.23.11-12;219)

55. See the discussion of the kingdoms of nature and grace (8.1, below).

56. It has been pointed out that Leibniz also rejects Descartes' theory of infinitely divisible particles or elements.

57. The passage continues: "In fact . . . every body is changeable and indeed actually changing all the time, so that it differs in itself from every other." (NE, 2.27.13;231)

58. See above, 1.3 and n.48.

59. "What real alteration can the beating of the Pestle make in any Body, but an alteration of the Texture of it?" (E, 2.8. 19. Note also, *ibid.*, 9.)

60. See above, 3.3.

61. See above, 3.3, n.35.

62. ". . . the Laws of Nature . . . derive from principles higher than matter, although in the material realm everything does happen mechanically." (NE, 1.1;72)

Chapter VII

The Issue of Substance

Examination of Locke's position on material substance showed how the corpuscular philosophy provided the basis for the formulation of this position. The purpose now is to explore Leibniz's position on substance, from the perspective of his response to Locke. Our concern here is not to present Leibniz's own positive position; that must await discussion of the monad. It is, rather, to examine the issue he defines primarily through his criticisms of Locke's position.

To give proper due to Descartes' influence on both Locke and Leibniz, we will begin with a brief discussion of two of his (Descartes') positions: his identification of matter with extension, and the problem of mind/body interaction resulting from his dualism. Both are important in Locke's discussion of substance; they are central to an understanding of the problems Leibniz was facing as he worked out his own position.

We will then turn to our central concern: Leibniz's response to Locke, focusing attention on those chapters in the New Essays in which Leibniz's comments and criticisms are most revealing of his own position--albeit in negative terms. Where appropriate, we will refer to others of Leibniz's writ-

ings for clarification, or at least for a more fully developed position on the issue. We will conclude with a note about Leibniz's comments on real essence.

7.1: The Legacy of Descartes

Many issues central to Leibniz's thinking in physics and in metaphysics had their origins in problems he identified in Descartes' thinking. We will look briefly at two of these issues, for they permeated the thinking not only of Leibniz, but also, as we have already seen, of Locke; and of others both in philosophy and in science in the seventeenth century and beyond, into our own times.¹ Descartes is as important for the problems he provided for subsequent thought as he is a liberating intellectual force in his own time.² However, the present concern is not with Descartes alone, nor is it with a full examination of Leibniz's criticisms of Descartes. The sole purpose is to look at two of Descartes' positions as they affected the formulation of Leibniz's own thinking about substance, as his solutions are expressed in his writings, including his response to Locke.³

This discussion of Descartes' legacy is limited in scope and in depth to two points, both grounded in Descartes' dualism: first, his identification of matter with extension--with res extensa; and, second, one of the major problems resulting from that dualism--the problem of the interaction between res extensa and res cogitans, between body and mind, and the way in which Descartes attempted to resolve that issue.⁴

Descartes' identification of matter with extension was a neat solution to a complex of problems. It was part of the mathematization of the natural world, and thus central to his removal of the subjective and the teleological from nature. It was related to own own theory of matter: there were three categories of particles or elements, the finest equivalent to what we conceive of as space. It was his solution to the problem of motion without a vacuum: the vortex theory showed how motion was possible without the void of traditional atomism, and always on impact. And thus nature was conceived of as a realm of matter in perpetual, mechanical motion.

Locke, as has already been pointed out, argued that matter could not be identified with extension; that matter also required solidity or impenetrability to explain resistance, and therefore to account for motion on impact. Were we to continue to use the language of essence for Locke, that essence would be designated by the original primary qualities: extension, solidity, mobility. Further, there was a clear distinction to be made between the extension of matter and the extension (or, to use Locke's term, expansion) of space; these are two kinds of extension, and we have separate and distinct ideas of each.

Leibniz rejects Descartes' res extensa as completely as does Locke. His grounds for doing so are different. Where Locke is concerned with distinguishing matter from space (and within the context of identifying the different sources of different ideas) through solidity/impenetrability, Leibniz is con-

cerned (though not exclusively) with force--with what underlies and accounts for motion. Descartes' conception of matter as extended substance does not allow for an adequate explanation of the force necessary to produce motion. Res extensa is totally passive; billiard-ball motion on impact is inadequate to account not only for force, but for the conservation of force. Leibniz rejects Descartes' particle theory, although he does accept the denial of a vacuum; for Leibniz, too, there can be no action at a distance. In rejecting Descartes' theory, he offers a different analysis of matter.⁵ He rejects the Cartesian identification of matter as res extensa at least in part because it lacks a basis for a correct analysis and explanation of force, and thus of activity.

The second point, the dualism of mind and body, is related to Leibniz's position that extension as the essence of matter does not account for the power necessary for motion. The central problem, one that was to be a central problem from then on, is the interaction between the two irreducible substances, extension and thought, body and mind. Leibniz's solution to that problem will also take in the issue of force in matter. For Descartes, the immediate issue was how the individual mind, res cogitans, and the individual body, res extensa, could possibly affect one another. If the two substances, as they exist in the individual human being, have no possible connection one with the other, then how can there be any interaction? Descartes proposed one solution; many of his followers another. Descartes, in Passions of the Soul, offers the pineal gland, a

tiny gland at the base of the brain for which a function had not yet been discovered by the early seventeenth century, as the place of interaction between mind and body.⁶

The natural world itself functions purely mechanically. The human body, and all forms of life--including the non-human sentient--are part of that natural world of res extensa and therefore subject to the same mechanical laws that govern all of nature.⁷ Any knowledge that the mind is able to have of that world of nature is primarily through the agency of God, of Perfect Being, Who would not deceive us in the truth of our clear and distinct ideas. What comes to us from the natural world (including our own bodies) through individual sensations would hardly be worthy of being called knowledge, and can be relied upon because of a non-deceiving Deity Who has given us that faculty of sense perception for our protection and for the convenience of living.⁸

Descartes' solution to the problem of mind/body interaction was not accepted by those Cartesians who came to be known as Occasionalists. They proposed the constant intervention of God on every occasion of what appears to be mind/body interaction. This, as we will see, Leibniz rejects because it requires God's miraculous intervention in the regular order of nature.⁹

Leibniz criticized and rejected other attempts to explain the interaction between mind and body, or to do away with it, as Spinoza attempted to do through a single substance (or God, or nature) with infinite attributes, two of which are thought

and extension.¹⁰ For Leibniz, there is no way in which the two completely unrelated substances can ever interact. There must be a totally different way of explaining what his contemporaries considered interaction, the influence of mind and body on each other, even the process by which mind is able to know and to have ideas about body, about other minds and bodies, about the natural world, about what is not the mind and thinking of the thinker. Leibniz finds his solution in a radical redefinition of substance, one in which matter as substance is rejected. His redefinition of substance--his position that there is but one substance (though an infinite number of individual substances)--requires a changed conception of matter, and includes his solution to the issue of force required for motion.

Thus, the legacy of Descartes: a conception of material substance that cannot account for the source of matter's motion; a dualism of substance without an explanation acceptable even in seventeenth-century terms of the interaction between the two independent elements in that dualism.

7.2: Leibniz on Locke on Substance

In turning to Leibniz's response to Locke's position on substance, it is important to keep in mind that that response is as significant for what it reveals about Leibniz's thinking as it is a criticism of Locke. Leibniz is highly selective about what he chooses for comment--as he is, after all, throughout the New Essays. Still, Locke's discussions of substance in the Essay are among the most important in the entire work, ex-

pressing his own attempts to deal with Descartes' dualism, as well as the working out of a position on material substance. All, in addition to the relation between substance and what exists.¹¹

As we have seen, Locke deals with the dualism by acknowledging the existence of matter and spirit, and then by refusing to speculate about the process of interaction.¹² Perhaps the clearest message we get from Locke in most of his discussions of substance is through his disavowals: of ever arriving at knowledge about how mind and body interact, about how the particles of matter are held together to produce extended matter, about the communication of motion, about how a command of thought can produce a motion in the body, and so on. He is not usually concerned with those issues that concerned Leibniz so deeply. And, where he is concerned, he explicitly rejects what he would interpret as speculation.

Locke's major statement about substance is chapter 23 of Book II, "Of our Complex Ideas of Substances."¹³ We have already discussed many of the ideas in the chapter, in particular in terms of how Locke's position on material substance is dependent upon his corpuscularianism. His concern there is to present his position on the source of what he designates as "complex ideas of substances," and through this to make comment on what those ideas are ideas of. Thus, when Locke discusses substances, he is also presenting his position on what exists. In this sense, Locke's position on substance is crucial to his ontology.¹⁴

Locke's initial goal in considering how we arrive at the idea of substance (in his Book II discussion of substance) is to show how this origin clarifies the meaning of the idea and its objects. Simple ideas of sensation and of reflection

go constantly together; which being presumed to belong to one thing, and Words being suited to common apprehensions, and made use of for quick dispatch, are called so united in one subject, by one name; . . . (E,2.23.1)

We assume that union of several ideas in a common subject--the "substratum"--in which they subsist, and from which they result. This we call "substance." Thus, what we refer to as substance bears a causal relation to the object's properties. But now Locke is concerned with that "complex idea of substance" in its varying meanings, from the particular substance (this here apple), to particular kinds or sorts (apples), and on to material substance and spiritual substance, to the highest level of abstraction--pure substance in general. There is a hierarchy in the meaning of substance, from the individual and concrete to the most abstract. If we are to examine our "notion of pure substance in general," we find only a "supposition" of that which supports those qualities that produce in us simple ideas.¹⁵ What is the support without the qualities? Take them away, and what do we have?

Leibniz replies by denying Locke's assertion that we accustom ourselves to thinking of the substratum as support of our simple ideas; "for from the beginning we conceive several predicates in a single subject, and that is all there is to these metaphorical words 'support' and 'substratum'." (NE,

2.23.1;217)¹⁶ Furthermore, Leibniz asserts, Locke's simple ideas are all qualities, and thus abstractions, which become concrete through predication in a specific subject. Leibniz even questions whether, as accidents, they are "genuine entities"; he suggests that they may be relations only. (Ibid.) Leibniz's point is that Locke reverses the problem when he considers substance as the central issue. The more complicated and difficult problem is with the analysis of what Locke refers to as "simple ideas"; qualities, accidents, possibly relations--certainly not entities. Substances, as subjects, can be dealt with more clearly. As Leibniz goes on to state:

If you distinguish two things in a substance--the attributes or predicates, and their common subject--it is no wonder that you cannot conceive anything special in this subject. That is inevitable, because you have already set aside all attributes through which details could be conceived. Thus, to require of this 'pure subject in general' anything beyond what is needed for the conception of 'the same thing' is to demand the impossible . . . (Ibid., 2;218)

Substance, as "pure subject" and thus without its individualizing attributes, is as much an abstraction for Leibniz as for Locke. Both require those specific attributes (qualities, properties) for an individual--although their explanations differ, and even though Leibniz can still find significance in substance as an abstraction; for "consequences arise from it . . . [that] are of the greatest importance to philosophy" (Ibid.) (He does not specify those consequences at this point in his discussion.) Where Locke does battle with certain Scholastic and neo-Scholastic concepts as part of his reforming intellectual revolution, Leibniz does not have a similar pur-

pose. His ecumenical urge in philosophy is expressed more through a modification of a concept rather than outright rejection.¹⁷

Locke's second level down from the complete abstraction of pure substance in general is corporeal, or material, substance and spiritual substance--that which "supports" the qualities of mind or spirit. For Locke, we have as clear an idea of the one as of the other.¹⁸

For Leibniz, Locke is asking for a way of knowing not possible for the object in question; how we are to know anything is dependent upon the nature of what it is we seek to know. When Locke asks for clear ideas of spirit and body, he (Locke) cannot find a satisfactory answer because he asks for a way of knowing (through clear ideas) not possible for substance in general, nor, here specifically, for corporeal substance. Where there is a "clear and distinct notion" one would have "means for giving a priori proofs of many truths about it." (NE, 2.23.5;219) It would have to be both necessary and possible to analyze the subject so as to find what is predicated of it. But Locke, of course, by corporeal substance (or, for that matter, by spiritual substance or pure substance in general) has denied any essential and specifying predicates. He thus dismisses the possibility in the face of a failure to discover what cannot be found, because the very meaning denies that possibility.

There are three aspects to Leibniz's response to Locke's problems with material substance: inaccessibility of particles;

lack of knowledge of that cohesion which is necessary for the extension of mass matter; and lack of knowledge of how motion is communicated by impulse. We have already discussed how, for Locke, the second and third issues are derived ultimately from the first, and from his position that simple ideas are the basis for all ideas and ultimately for knowledge; because we can have no ideas of how particles cohere, we can have no knowledge of that cohesion.¹⁹ So, too, for Locke we can have no ideas of how motion is communicated from one body to another and of how and why that motion is conserved. (NE, 2.23.28;224)

There is no argument Locke can give that Leibniz can accept. Leibniz does agree that the conditions of our senses are suitable to our human condition--as Locke points out--but he denies that corporeal nature contains elementary particles. (Ibid., 12; 219) In fact, he states, if there were such particles, finitely divisible, then it would ultimately be possible to have knowledge of them. However, matter's infinite divisibility means that even if our eyes had the capacity to see things smaller than they now do, we could still never have access to matter; as matter's divisibility goes on to infinity, so the acuity of our vision would have to become greater infinitely. (Ibid.) Locke's possibly finitely divisible particle could lend itself to ultimate knowability; Leibniz's matter infinitely divisible could not.

Next, and with our attention continuing with matter, there is the issue of cohesion (discussed in another context).²⁰ Locke, we recall, required cohesion to account for "how . . .

the solid parts of body are joined together to make an extended whole." (NE, 2.23.23;222) Leibniz agrees about the difficulty of explaining cohesion; but rejects its necessity for making an extended whole. Although matter in the abstract (primary matter) is perfectly fluid, and therefore cannot be conceived of as having parts joined to one another, matter as it actually occurs (secondary matter) does require cohesion: ". . . there is some degree of bonding everywhere." This bonding is produced by motions all going in the same direction; division would then be the result of "turbulence and resistance"--set up by "crosscurrents" of motion. (Ibid., 222f)

Finally, Locke's inability to account for the communication of motion and its conservation as it passes from one body to another, and for the increase of motion on impact, is an expected inability; for, the passage of an accident from one subject to another is "inconceivable." Locke is unable to account for that communication of motion because it is, in fact, an "insurmountable problem"--an insurmountable problem, that is, on Locke's terms. (Ibid., 28;224)

Leibniz's solution brings him--and us--into the heart of his system: the pre-established harmony. It also bring us into the heart of his dynamics, and to the significant disagreement with the Cartesians about the conservation of motion. It is not motion that is conserved, but force (a point that has already been made, and will be raised again in the discussion of Leibniz's solution to what he found to be inadequacies and failings in Locke's position).²¹ Leibniz's criticism of Locke, here

especially, is grounded in the former's work in mathematics and dynamics. It is yet another instance of the two totally different approaches and purposes: Locke, unwilling to speculate about what is not accessible through simple ideas; Leibniz, not explicitly concerned with the sources of our ideas, and always concerned about methods or positions of others that might hold a germ of insight to be pursued. Locke is not concerned with formulating or expressing any laws of motion or of dynamics; that would be beyond his role as "under-labourer." He would, nonetheless, reject a position central to Leibniz's solution to those problems which he, Locke, would not touch and could not explain: "The fact is that the real laws of motion depend upon a cause which is higher than matter." (NE, 2.23.28;224) What that cause is will be considered shortly.²²

Thus, Locke's two requirements (cohesion and the transmission of motion) underlying the basic properties of material substance (extension, solidity, and mobility) are beyond the scope of human knowledge--in Locke's view. In Leibniz's criticisms of Locke's position, they are incomprehensible, or are incorrectly analyzed by Locke. But, Locke uses that analysis as evidence for his denial of the possibility of our ever knowing what material substance is. Whether or not this is a step in the denial of material substance is another issue--one that has already been considered.²³ For Locke, the question can be examined only in terms of the implications of the corpuscular basis of matter; and, of his position about the relationship between what is abstract--and thus existing only in thought--

and what actually exists as a particular thing. Any abstraction cannot be considered as actually existing apart from thought.

There is an additional issue to be mentioned here: Leibniz's response to Locke's comments on mind/body interaction, how it is that material and spiritual substance can affect one another. For Locke, "the passing of motion out of one body into another . . . is as obscure and unconceivable, as how our minds move or stop our bodies by thought . . ." (NE, 2.23.28; 224)²⁴ Leibniz denies the possibility of such interaction: ". . . souls can make no change in the force or in the direction of bodies . . . to explain the union of soul and body we must avail ourselves of the pre-established harmony." (Ibid.) The pre-established harmony explains that union by denying it, and then by offering a different theory: "concomittance" in place of mutual influence.²⁵

One of the few positions of Locke that elicit Leibniz's approval is that active power is specific to spirits (its "proper attribute"); and passive power to bodies. (Ibid.)²⁶ So too Leibniz: ". . . so long as the word 'spirit' is construed broadly enough to cover all souls or rather--to put it more generally still--all entelechies or substantial unities, which have some analogy to spirits." (Ibid., 225) For, substance is to be applied exclusively to that more broadly construed meaning of "spirit." Matter is not substance at all. And thus Leibniz resolves the dualism by abandoning it.

As, it must be added, Locke seems ready to abandon substance at the highest levels of abstraction. But, there are, at least, two other ways in which one can consider substance in Locke's analysis: particular sorts of substances (i.e., species or kinds--apple, humankind, oak tree), and particular substances--the individual objects of our experience, those objects which are most directly the complex ideas of substances as they exist and as they are the objects from which we analyze our simple ideas of sensation especially. For "particular sorts" we will look briefly at Leibniz's comments on essences. Particular substances--individual things--must await the presentation of Leibniz's positive position, most specifically through the concept of the monad--of substantial unities.

7.3: Leibniz on Locke on Essences

In the discussion of Locke's notion of real essence, we were concerned not only with the distinction he drew between real and nominal essences, but also--and primarily--with how that meaning is tied into his corpuscularianism and with its relationship to material substance. Because we are denied access to the "real internal constitutions" of things, we can never have knowledge of the real essences of substances--be they material or spiritual. To go further, we saw that the real essence and the real internal constitution are identified.²⁷ For Locke, the real essence of substance is of a particular substance. One might more appropriately refer to the real essence of a particular substance, specific to a partic-

ular substance; it is specific, and particular, and inaccessible to the mind.

But, we recall that Locke distinguished between real and nominal essences. The nominal essence is the abstract idea which the name of anything signifies; those ideas we have of any object or kind of object which enable us to properly call it by its name. With simple ideas, and with modes and relations, there is no distinction made between the real and the nominal essence. (The basis is different with simple ideas than it is with modes and relations.) It is only with substances that the real and the nominal essences differ. The nominal essence is the definition; it defines the sort or the species, although the observed properties covered by the definition will have their source in the common experiences of the observers. One could relate the nominal essence to Locke's particular sort of substance; the nominal essence is the particular sort.²⁸

Locke's distinction was part of his reforming zeal to which we have already referred.²⁹ Substance, substantial forms, essences: all are Scholastic notions to be examined for what they mean; to determine whether they help or hinder our attempts to discover what exists and how we are to know what exists. Locke sends substance pure, substantial forms, and essences unmodified the way of innate ideas, and for not dissimilar reasons.³⁰

In turning to Leibniz's response to Locke's views on essences, we will consider briefly just two points: first, Leib-

niz's response to Locke's distinction between nominal and real essences; and, second, the relation between real essences and material substances. Leibniz's comments are important; the delineation of the differences between the two are essential both for an understanding of their positions, and thus for the present purpose. For, those differences are fundamental to where each stands on the determination of reality. The heart of the disagreement is, ultimately, in two conceptions of what is real, and of how that reality is determined. For Locke, there is an empirical determination; for Leibniz, it is fundamentally rational.³¹ Although Leibniz shows that experience certainly is not irrelevant to the determination of what is real, reason can do so independent of experience.³² It is the surest way to the identification of reality.

First, Leibniz rejects Locke's analysis of essences into the real and nominal. He finds that Locke's "way of putting things constitutes a very novel mode of expression." The distinction "people" have spoken of is between "nominal definitions and 'causal' or 'real' ones"; when "people" speak of essences they mean "real ones," though it is possible that "'nominal essence' might refer to a false and impossible one." (NE, 3.3.15;293)³³ So far, Leibniz has referred to what "people" (unnamed, unidentified) mean when they speak of "essence." Locke, of course, is aware of what is usually meant by the term, what it usually refers to; the entire point of his distinction is to express his own position that the "real" that essences are understood to refer to (where that reference is to independent

existences; for Locke, substances)--that "real" is in fact nothing more than the agreed-upon properties that make up kinds or species or sorts.³⁴

Leibniz, of course, has his own conception of "essence": ". . . nothing but the possibility of the thing under consideration." (NE, 3.3.15;293) But now Leibniz goes on to state that

Something which is thought possible is expressed by a definition; but if this definition does not at the same time express this possibility then it is merely nominal, since in this case we can wonder whether the definition expresses anything real--that is, possible . . . (Ibid.)

Leibniz, in other words, is putting the burden on definition, but interwoven is what he means by "possibility" in his highly specific, technical, idiosyncratic sense. The reality of anything can be determined a priori through reason which can exhibit "its cause or the possibility of its being generated." (Ibid., 294) Experience can and does acquaint us "a posteriori with the reality (when the thing actually occurs in the world)." (Ibid., 293f)

Clarification of what Leibniz means by "possibility" especially must await examination of the elements of Leibniz's positive position, to follow in the discussion of the monad. For the moment: possibility is to be understood logically. Anything--any subject--whose predicates are without contradiction is possible. This is determined through reason only; and in this sense its determination is a priori. Something must be possible before it can be experienced a posteriori in its actual occurrence.³⁵ As we will see, not all possibles will exist, in

the sense that they will be chosen for creation by the Diety. Non-contradictory predicates may be sufficient to make something possible; but God brings into existence the best of the possibles only--the best of those compatible, or "compossible," to use Leibniz's term.³⁶

Leibniz's response to Locke on the distinction between nominal and real essences is, at times, a rejection based on his (Leibniz's) judgment of its inadequacy; at times, the opening for Leibniz to expound on his own ideas with their different presuppositions and purposes. This, after all, is the program of the New Essays. Thus, Leibniz's "correction" of nominal and real essences to nominal and real definition, and his distinction between the necessary and the possible just considered can be regarded as instances of criticism of Locke and as statements of his own positive position.³⁷

To turn now to the second point: the relation between real essences and material substances. It is here that differences central to the present purpose emerge most sharply. We will regard this brief discussion as prelude to the fuller presentation of Leibniz's own position.

Locke's point, we recall, is that we are denied access to the real essences of material substances--of particular material substances: individual apples, human beings, nuggets of gold, for example. As for particular sorts of substances, we can speak only of their nominal essence--those properties that make up our abstract idea of the sort, and to which the name refers. The most we can do is define the nominal essence; on Locke's terms,

it would be out of the question to refer to the real essence of a particular sort. Why? Because the real essence refers to the "real internal constitution"--including the specific particles which together make up the specific object with their powers to produce in us the specific simple ideas that them make up the complex idea of the object. Undoubtedly, there are in nature--in the individual objects that exist--certain similarities that indeed enable us to recognize and refer to particular sorts. But, individuals are what exist; and individuals only have real essences--that "real internal constitution" that must be specific to the individual.

Locke, in other words, is drawing connections--or the lack of them--between the inner and the outer, between what we perceive and what underlies or is the source of what we perceive.

And so, after all, is Leibniz. Yet, even with his more radical position on the absolute uniqueness of the individual, he asserts the reality of the kind. To begin with, he distinguishes between the mathematical and the physical significance of species. "Mathematical strictness" prohibits the "tiniest difference" between any two things, if they are to be of the same species. Physical species allow for greater flexibility; demand greater flexibility. Leibniz writes that

two physical individuals will never be perfectly the same species in this manner [the manner of mathematical species], because they will never be perfectly alike; and furthermore, a single individual will move from species to species, for it is never entirely similar to itself for more than a moment. (NE, 3.6.13;308)

Locke's demand is unrealistic; his demand, that is, that members of a species be identical if we are to speak of a real essence of anything beyond the individual.

But, Leibniz tells us, we do have a way of determining the species, at least where the organic (animals, plants) is concerned. And that is by generation: ". . . two similar individuals belong to the same species if they did or could have come from the same origin or seed." (Ibid., 309) And thus Leibniz does find a grounding of species in nature. It is not solely a matter of definition, even though definition itself is not arbitrary but is also grounded in nature--through generation.³⁹

There is, then, a basic disagreement here: between Locke's position on the unknowability of the basis for species, and for what makes the individual one of a kind; what we can say about the particular sorts is no more than human classification; and Leibniz's position that species do exist in nature, and that it is possible to have knowledge of them--even though it is necessary to modify our conception of what we can expect in a physical (as opposed to mathematical) species.

But, what of the particular--the particular material substance of Locke? For both Locke and Leibniz (although we have yet to look closely at Leibniz's position on this), what exists is the individual substance--even though each means something different by this designation; and, with Locke, there is real question about what any material substance is, apart from its qualities--primary, secondary, tertiary.⁴⁰ Is it possible to

attain knowledge of what anything really is--of what makes it what it is? The issues, ultimately, are metaphysical and scientific, with the epistemological problem caught in the middle.

Apart from taking issue with Locke's designation of "real essence," and its distinction from "nominal essence," Leibniz rejects the corpuscular basis of the distinction. Further, and strictly, there can be no material substance for Leibniz. But then, what exists in the world, in nature? How do we determine what is, and what is real--here thinking only of that category of real existence that might be at least roughly analogous to Locke's particular (material) substance? The only way we can begin to answer these questions is to turn to Leibniz's positive position which expresses his solution to questions we have been considering: questions about the ultimate nature of what does exist and is real, specifically in nature, and as a way of coming to grips with Leibniz's idea of nature. The answer is to be found in Leibniz's concept of the monad, and how it is related to matter and to the world of nature.

Summary

The focus in the discussion just completed has been the issue of substance, and its central place in Leibniz's thinking --but in light of the problems he identified first as they emerged out of Descartes' distinctions, and then in terms of Locke's position in the Essay. Descartes' conception of extension as the essence of matter was rejected because it could not account for force; although Leibniz agreed with Descartes' posi-

tion on the impossibility of a vacuum, he would have to reject Descartes' particle theory--his theory of the elements--with its vortex theory of motion. As much as Leibniz would struggle with an alternative theory of the nature of matter--and, as we shall see, he is never clear about that alternative--matter as extension could not be accepted. In addition, Leibniz would reject the notion of matter as substance, for that leads to the insoluble problem of how the interaction of substances material and spiritual is to be accounted for.

Thus, Leibniz agrees with Locke's rejection of matter as extension only, but he then rejects Locke's position that matter is extension and solidity. But, further, Leibniz rejects Locke's analysis of substance in its varying degrees of abstraction--from the "pure" down to the particular, with the further designations of material and spiritual, and of particular sorts of substances. Where Locke is headed in the direction of rejecting substance as the unidentifiable substratum of qualities and properties, Leibniz maintains the necessity of substance. And, in addition, where Locke rejects the possibility of our ever being able to know how the two substances--matter and spirit--could influence one another, Leibniz, again, denies the existence of two substances.

And, finally, Leibniz rejects Locke's distinction between nominal and real essences (here, specifically in relation to substance, the one category for which Locke affirms the distinction). He denies the distinction, ready to place any distinction that is to be made at the level of definition. However, because

Locke's position on real essence is intrinsic to his corpuscularianism, Leibniz's rejection would be predictable.

The ultimate questions and distinctions rest with different perceptions of reality and of the nature of existence, and the grounds for those differences. Each avers the existence of the individual--this is basic to their positions. But what identifies the individual? And, where is reality to be found? How are we to know and identify that reality? On these issues, they differ. How radically and profoundly they differ will now be explored.

Notes

1. Two obvious examples are Ryle, in The Concept of Mind; and Rorty, in The Mirror of Nature.
2. Among those liberating influences is the distinction between subjective perceptions and objective mathematically determined properties of matter; between those properties amenable to objective mathematical analysis as distinguished from the subjective sense qualities. The distinction, in Locke's terminology, is between the primary and the secondary qualities.
3. Leibniz's explicit commentaries on Descartes include his "Brief Demonstration of a Notable Error of Descartes and others Concerning a Natural Law," of 1686 (PPL, pp.296-301), in which Leibniz shows that it is force, and not motion that is conserved; and his "Critical Thoughts on the General Part of the Principles of Descartes," of 1692 (PPL, pp.383-410).
4. Locke rejected Descartes' position on the first (by distinguishing the extension of matter from the expansion of space, and by making solidity one of the original primary qualities of body; and through his analysis of material substance); and, typically, shrugging his intellectual shoulders at the second.
5. See below, 8.3.
6. Passions of the Soul, Articles xxxi and xxxii. Note also, NE, 2.23.21;221.
7. Both Locke and Leibniz reject Descartes' contention that the "brutes" are machines. (E, 2.9.11-12; 2.11.11. NE, 2.1.12;113f)
8. Consider Meditations III and IV especially; also Meditation VI in relation to sense perception.
9. Leibniz's most explicit criticisms of Occasionalism, as a theory of the relation (or non-relation) of mind and body is in A New System of the Nature and Communication of Substances, #'s 13 and 14. (PPL, pp.457-458) Leibniz there refers to the theory as a deus ex machina, an explanation that requires constant miracles, for it is an explanation that is outside secondary causation. Although Leibniz's own pre-established harmony has been regarded as an explanation that is, at most, a variation on the theory of occasional causes, Leibniz's own criticisms of the latter would indicate that he, at least, did not see any close connection. H.W.B. Joseph, in Lectures on the Philosophy of Leibniz (Westport, CT: Greenwood Press, 1973. Reprint of Clarendon Press edition, 1949), points to the differences between the two positions, referring to the pre-established harmony as parallelism, with "changes in the body taking place according

to physical laws, and changes in the soul according to psychical laws . . ." (P.161-162) Thus, each follows its laws and "develops regularly without any need of divine interference . . ." (P.162)

10. Ethics, Part One, definition vi and proposition xiv (including corollaries). Although, as we have seen, Locke does mention the issue of interaction, he explicitly rejects knowledge of and speculation about the process by which it takes place. (E.g. E, 2.8.22; and 1.1.2. Also, see above, 2.3 and ns. 32 and 33.)

11. These three points are singled out as germane to the specific concerns here, and not because they are the sole or most significant of the issues. Certainly, a central concern of Locke is to examine what the idea of substance could possibly be an idea of; he is concerned with unraveling the meaning of the idea of substance by tracing it back to its source. (See above, 4.4.)

12. Locke accepts the dualism of mind and body--of the material and the immaterial. There is an important discussion of the issues in the context of Locke's proof of the existence of God (E, 4.10), and in relation to the primacy of cogitative or of incogitative beings-- "better Terms," Locke writes, "than material and immaterial" for his purpose. (Ibid., sn.9) In considering whether there is something eternal, Locke opens up many knotty issues; e.g. whether an eternal being is cogitative or incogitative; and with it, whether matter could produce thought. (Locke also considers whether God might produce thought in matter; thus, thinking matter.) In the discussion, he argues for the separateness of matter and thought by showing that those properties that identify matter--the primary qualities, including the passive power of motion--could never produce or create thought. (See also p.21, n.9, above.)

13. E, 3.6, "Of the Names of Substances," is also significant.

14. As Locke finally reveals at the Essay's conclusions, exploration of substances and the degree to which we can have knowledge of them would come under the heading of physike, whose concern is with what exists. (E, 4.21.2)

15. E, 2.23.2-4.

16. Yet, the passage begins with Leibniz responding that Locke's "way of thinking is correct" when he (Locke) states that what we call substance results from the inability to imagine simple ideas subsisting by themselves--that substance is the "substratum wherein simple ideas exist"!

17. The contrast between the positions on substance of Locke and

Leibniz is both significant and revealing. It has been mentioned in the General Introduction, above, and will again be considered in the conclusions. Leibniz's position on the basis for the individuality of substance--on the complete concept of the individual substance--will be considered more fully in 8.2.b-d, below.

18. E, 2.23.5. NE, 2.23.5;219. And, it should be added, Locke means we have a clear idea of neither.

19. Though Locke does present, speculatively, a hypothesis. See E, 2.23.23-27; and NE, 2.23.23;222f. Also, 6.2.b, above.

20. Refer, again, to 6.2.b, above.

21. See 6.2.c, above; and 8.2.f, below.

22. See 8.1, below.

23. See 4.4., above.

24. Nonetheless, it exists. And, Locke's entire causal theory of perception--of the origin of our ideas, "the materials of our knowledge," in sensation--is evidence for how much Locke constructs on the basis of this interaction. (See 2.3, above.) It should be noted that the statement Leibniz gives to Philalethes, which is quoted here as expressing Locke's position, is a fair summary of that position in E, 2.23.28--although many other points are made there, not all of which Leibniz takes up.

25. Leibniz used "concomitance" before he described his principle as "pre-established harmony." See, for example, his letter to Arnauld, 28 Nov./8 Dec. 1686 (Leibniz-Arnauld Correspondence, p.269). Note also 8.4, below.

26. Locke, in the Essay, uses "matter."

27. See 4.3, above.

28. See 4.2, above.

29. See introductory comments to chapter 4, above.

30. E, 3.6.9-11; NE, 3.6.9-12;306. Leibniz, perhaps not incidentally, has Philalethes refer to the Scholastics as perpetrators of substantial forms (at the place noted). Locke does not name names--at least in this place in the Essay.

31. The sense in which each category is used will be clarified.

32. There are several passages in the New Essays in which Leibniz emphasizes the significance of experience--of the senses--in

"bring/ing/ abstract thought to mind" (1.1.4;77f. These include: "Experience is necessary . . . if the soul is to be given such and such thoughts, and if it is to take heed of the ideas that are within us." (2.1.2;110) The passage continues: "But how could experience and the senses provide the ideas? Does the soul have windows? Is it similar to writing-tablets, or like wax? Clearly, those who take this view of the soul are treating it as fundamentally corporeal." (Ibid., 110f) And thus Leibniz raises the specter of the mind as material which he--and others--saw the inevitable result of Locke's analysis of the genesis of thought.

Later in the work, Leibniz writes: ". . . our certainty regarding universal and eternal truths is grounded in the ideas themselves, independently of the senses, just as pure ideas, ideas of the intellect--e.g. those of being, one, same etc.--are also independent of the senses." (4.4.1-5;392)

33. Leibniz had made the distinction between real and nominal definitions by the time of the Discourse on Metaphysics, of 1686. (PPL, p.319)

34. Locke writes also of "sortal names," which stand for abstract ideas. (E, 3.3.15)

35. "The real existence of beings which are not necessary is a matter of fact or of history, while the knowledge of possibilities and necessities (the necessary being that whose opposite is not possible) is what makes up the demonstrative sciences." (NE, 3.5.2-3;301) Thus, the "necessary" is that whose opposite is contradictory (and therefore is not possible); the "possible" is that whose opposite is not contradictory (and therefore is possible). These are determined logically (a priori). Whether the possible is actual (really exists) is determined a posteriori. and is a matter of fact--a truth of fact as opposed to a truth of reason (a necessary truth).

36. See 8.4, below, for "compossibles."

37. There are, also, differing positions on such issues as the nature and process of abstraction, and about the connections among individual, species, and genera, in which are revealed their positions on the individual as the sole real existent and on the extent to which we can know the individual. Consider NE, 3.36;289f. Both agreement and disagreement emerge dramatically in this passage: Locke and Leibniz agree that only individuals exist; they disagree on why this is so. They agree that knowledge of an individual is limited; they disagree about why. (See General Introduction, above, for discussion of issues on which there are similarities and differences of doctrine and purpose.)

38. See especially 4.3, above, for discussion of real essences in the Essay.

39. ". . . no matter what rules men make to govern how things are to be named and what entitlements go with names, provided that the system of rules is orderly (i.e. interconnected and intelligible) it will be founded in reality, and men will be able to imagine only such species as have already been made or distinguished by nature . . ." (NE, 3.6.13;309)

40. See 4.4, above.

Chapter VIII

Leibniz's Solution

The Monad in the Kingdom of Nature

The task now is to present Leibniz's positive position, a position that must satisfy the demands, metaphysical and physical, underlying his criticisms of atomism and of substance.

It has been pointed out that those criticisms did not find their first expression in the New Essays. Leibniz uses in that work arguments and ideas that had been developing over the years, expressed in correspondence and in articles that go back to 1668-1670 (when Leibniz was approaching his mid-20s);¹ gradually modified and sharpened by the time he composed his extended commentary on Locke's Essay; repeated until the last (if not final) expressions in The Principles of Nature and Grace and the Monadology, both of 1714.²

Leibniz's answer to the inadequacies of atomism and the problems of substance is to be found in a concept he had been working on, and working out, for decades: the monad.

The monad: the "true atom of nature"; Leibniz's solution to the problems resulting from the dualism of substance, from matter as extension; the meeting ground of physics and metaphysics; symbol of the macrocosm in the microcosm, the expression of the universe in the individual.

In this consideration of the monad, all aspects of the concept will not be explored. We will not be concerned with the monad as rational, as spirit. Nor will we bring into the discussion all aspects of the monad below the rational; for, that would involve us in the extraordinary complexity of Leibniz's physics and mathematics. Our focus, then, will be the monad in Leibniz's "kingdom of nature." The "kingdom of grace will be referred to only where it is necessary to clarify a point or an issue through contrast with the monad in nature.

The discussion will open by considering this precise issue: Leibniz's kingdom of nature, in contrast to the kingdom of grace.³ We will then turn to the monad to explore what it is, concentrating our attention on its non-rational significance. Next, we will look at what Leibniz has to say about matter, independent of the monad. The problem then will be to examine Leibniz's position on the relationship between monad and matter--on the pre-established harmony as it functions in nature.

8.1: Nature and Grace: the Kingdoms and their Laws Distinguished

Leibniz divided God's creation into two realms or kingdoms: that of nature and that of grace.⁴ It is a significant distinction. For, it expresses not only different aspects of the creation, but also different kinds of action in different arenas of activity, different governing principles or laws, different kinds of causation, different ways of knowing. Not

all of these differences are germane to the present issue, but as a preliminary to the examination of the monad--to identify and establish the context of that examination--let us briefly consider those differences that are relevant.

The kingdom of grace expresses the community, or society, of rational monads (minds, spirits) whose self-awareness and memory make them accountable for their actions and thus morally responsible. The rational monad, therefore, as subject to the divine moral law, is a member (at least potentially) of the kingdom of grace.⁵

Still, the monad as rational is nonetheless a monad, created by God to "inhabit" the kingdom of nature as well as grace. Its rationality and its self-awareness qualify it for grace; its link to body--in that, like all monads, it requires body--requires its membership in the other kingdom, that of nature.⁶ It is a membership it shares with all other, non-rational monads.

The kingdom of nature is, thus, a contrast to the moral realm. It is ruled--at least in part--by the laws of nature, in contrast to the moral law. For Leibniz, this does not mean that it is ruled by mechanical principles exclusively; nor is it the realm of efficient causation exclusively. In nature there must be metaphysical principles and final causes hierarchically superior to the mechanical and the efficient. To deny the primacy of the former--to regard nature as an arena of purely mechanical activity--would be impossible for Leibniz, because of the fundamental impulse in his thinking of finding a

way to overcome the inadequacies of those position that did that precisely.⁷ While not denying the mechanical and the efficient, he makes them subservient to the metaphysical and the final.⁸

Even though Leibniz does not once in the New Essays refer to either kingdom; even though nowhere in that work does he explicitly make those distinctions so central to his thinking; nonetheless, the distinction, and the issues that underlie it, are central to his criticisms of Locke (as we have seen in the discussions of atomism and substance). Further, as we now prepare to discuss the monad, these distinction must be kept in mind. For, the concern here is not with the kingdom of grace; nor is it with the monad as rational; nor is it with the moral law. It is solely to explore that idea of nature which emerges out of the monad as non-rational, and thus as limited to the kingdom of nature. With this in mind, let us now turn to the monad.

8.2: The Monad⁹

The monad is Leibniz's elusive, startling, even mystifying solution to problems in metaphysics and in physics that concerned him for most of his life. The words, the metaphors and similes he used to describe it--it is without windows, it is a metaphysical point, it represents the universe from its own perspective--all lead one to wonder how seriously, how literally, the concept is to be taken.¹⁰ **But then the** terms Leibniz used to identify what he was driving at before he began to use

"monad" and even after he had settled on the word--simple substance, substantial unity, soul or, for the rational monad, mind or spirit--all these terms help to bring the issue back into focus.¹¹

The present approach has been to use Leibniz's criticisms of Locke in the New Essays as a source for the identification of the problems, and then to examine what he says about the monad as the solution to those problems. We have already considered Leibniz's criticisms of Locke's atomism and of his notion of substance. The questions to which we must now address ourselves are how the monad is the solution and, ultimately, what is the idea of nature that then is suggested. In the discussion that follows, it must always be kept in mind that our concern is with those metaphysical and physical issues that Leibniz has identified.

8.2.a: What is a monad? A note on Leibniz's terminology

How is it possible to define and describe the monad? Before examining the specific properties that Leibniz names in his many discussions, it is instructive to consider the possible significance of Leibniz's use of "monad" to identify his concept of substance--his replacement of "substance" by "monad."¹² Leibniz is never explicit about why he adopted a new term, but one can assume that he eventually had to express the sharp distinction between the traditional concept and the positions of his contemporaries (e.g. Descartes, Spinoza, Locke), and what he was doing. To continue to refer to such terms and

expressions as simple substance, substantial unity, soul, would have risked even greater misunderstanding than his own concept was bound to generate on its own. For, the properties Leibniz assigns to his monad are different from those usually identified with substance: the monad can never be material, though as we shall see, its existence is never separate from matter.

(With Descartes, substance can be either spirit or matter; with Spinoze, substance is one, and matter and soul are two of its infinite attributes.) The monad is never an abstraction; its existence is always individual; one might even say that it is Leibniz's unit of existence.¹³

Substance--to go back to Aristotle's ten categories--had both an individual and a general sense, through Aristotle's distinction between primary and secondary substance.¹⁴ As time passed, and philosophers responded to issues raised initially by Aristotle's analysis of substance, that general sense took on especial significance, as the most inclusive of abstractions. For, its existence was required for the existence of everything else.

We are, by now, witness to Locke's struggles with "pure substance in general" in the Essay. Again, by the seventeenth century, substance--material substance especially--was not necessarily associated with or identified by activity; for Leibniz, inactive substance is a contradiction in terms. The Leibnizian universe is a universe of activity, with rest a condition that cannot exist. And, finally, as Leibniz denies substance as material, so the identification of soul as exclusively human--

or, as possessed only by those with reason--was denied. Yet, there is a distinction between that activity which is fully rational, to the point of self-awareness, of consciousness of self--the apperception of the rational monad--and that perception which is present in all substances.¹⁵ There is a sense in which the monad as soul and substance as activity have their intellectual ancestors in the Greek conception of psyche¹⁶--even though Leibniz's conception is specific to the problems and the ideas of seventeenth-century physics, mathematics, and above all, metaphysics.¹⁷

With these points in mind--all bearing on the need for a change of terminology--let us now consider those properties that define the monad. Many have already been mentioned in the preceding discussion; their identification must be gleaned primarily from those of Leibniz's papers in which he was working out the concept of the monad, rather than from the New Essays itself.¹⁸ The properties to be considered (and some under more than a single heading) are: individuality, uniqueness, pre-determined activity.

8.2.b: The monad is an individual

The monad exists as an individual, and only as an individual. This property of individuality is crucial to its meaning and its significance.¹⁹ However, Leibniz's metaphysical unit cannot be combined with other such units to make up a whole, in the way that material atoms are combined. This requires further comment. For Leibniz does write of monads as "dominant"--at the

least in every organic or organized whole, as distinguished from an aggregate. This is certainly clear for humans. The rational monad--spirit, mind--is the dominant monad. It is the organizing and unifying principle over all the other monads that are "part" (in a metaphysical sense) of the human being. And, presumably, this would have to be true of any organic whole: all kinds of animal life below the human, all kinds of vegetative life. Every material unit must have its monadic unit; but if any organism is to function--to act--as a whole, there must be a dominating, a directing, center of that activity.²⁰

8.2.c: The monad is a unique individual

The monad as individual would not be sufficient in itself to mark a crucial distinction between Locke and Leibniz--after all, the particle, too, is individual--and thus would not overcome many of the principles and specific characteristics underlying Leibniz's critical objections to the material atom.²¹ But, there is a second property central to the monad, one that for Leibniz would bring the monad into conformity with those principles and would satisfy other objects: each monad is unique. The individuality of the monad is complete; every monad is different from every other monad, and thus each monad's individuality is unique. This uniqueness is expressed by Leibniz's description of each monad as a unique perspective on the universe; every monad perceives and expresses the universe from its individual and unique point of view.²²

The problem is to find and clarify the source of the monad's uniqueness; the further problem, to justify that position. We will proceed with the former, as we continue to consider how the monad is described; the former must remain open.

8.2.d: The monad's uniqueness is pre-determined
(the "complete concept")

The monad's uniqueness, its complete individuality, is determined for each monad at the creation.²³ This is not a characteristic touched on directly in the New Essays--it does appear indirectly through the pre-established harmony--and so we must turn to others of Leibniz's works for its meaning. Thus in the Discourse on Metaphysics, the statement of the ninth point is:

That each singular substance expresses the whole universe in its own way, and that in its concept are included all the experiences belonging to it together with all of their circumstances and the entire sequence of exterior events.
(PPL, p.308. In the original, the text is italicized) 24

Each monad is created with its "history"; were we to speak in grammatical terms, each monad would be a subject, and everything that happens or that it does would be the totality of predicates.

This property of the monad was one that created for Leibniz more philosophical and theological trouble than possibly any other. For, it had profound implications for issues of necessity and contingency, for freedom of the will as opposed to the original determination of the will. The issues and objections surfaced long before Leibniz used the term "monad"--specifically with the Discourse on Metaphysics, and the ensuing correspond-

ence with Arnauld.²⁵ There was a fundamental problem underlying this property of the monad; for, it is here, in this "complete concept," that Leibniz finds the solution to the problem of the dualism of substances that plagued his contemporaries--the solution he referred to as the "pre-established harmony."²⁶ Each monad is "complete" in the sense that everything that will happen to it from its creation to divine annihilation (the only way the monad can be destroyed) is determined by God.²⁷ Aside from the issue of the "best of possible worlds"--that what is brought into existence must be the best of the compossibles (the best of all those possibilities that can co-exist)--the creation with unique completeness (as well as will complete uniqueness) is Leibniz's way of explaining and expressing the "relation" between the dualism of soul or mind, and matter or body; between thinking and material substances. For, there is no relation; there is no dualism. And, with the elimination of the dualism, with the assertion of a monism of substance, there is a further elimination of any interaction between substances--between soul and soul, spirit and spirit. The monad is not only a complete concept; it is, in a sense, complete unto itself. No monad can affect--can interact with--any other monad. What seems like interaction, be it between monads or between monad and matter--is in fact the result of the concomitance established at the creation. And thus did Leibniz choose to identify himself on the title page of the New Essays: "the author of the pre-established harmony."

8.2.e: The monad is active

The property central to the monad, and one of the problems Leibniz seeks to resolve through the monad, is activity. Within this context, the focus is on activity in nature, and thus a consideration of the activity of the activity of the monad--what the monad does, what is the nature of its action--must bring with it a concern with the power necessary to produce that activity.²⁸ For, the monad is at once Leibniz's unit of activity and the inherent source of force in nature.²⁹ As we will see, the monad as the unit of activity is of even greater significance than are those properties already discussed, in Leibniz's struggle to overcome the inadequacies of atomism and the dualism of substance: it brings us to the very heart of Leibniz's conception of nature.

The two activities Leibniz identifies in the monad--in every monad--are perception and appetite.³⁰ If Leibniz had identified the monad as the center of rational activity exclusively, there might not be so many problems involved in attempting to get at his meaning. But, he explicitly does not so limit his conception. And, as we have seen, many of his most pressing problems relate to the natural world, specifically to the issue of force.³¹ Nonetheless, in attempting to get at his meaning, it is instructive to consider the significance of precisely these two activities. Is there anthropomorphism at work here? Or, is something much more fundamental involved--with or without that anthropomorphism?

Recall that Locke, in the second book of the Essay, first

in chapter 6 and then in chapter 21, identifies perception or thinking, and volition or willing, as "the two great and principle Actions of the Mind"; understanding is identified as the power of thinking, and the power of volition is the will.³² These are the two active powers of spiritual substance. Leibniz's designation of perception and appetite as the two activities of the monad is close to Locke's identification of the activities of spirit.³³ The real point is that both are expressing a position about the nature of soul--of that which is alive--that goes back into Greek philosophy. Witness Plato's analysis of the soul in Republic IV, with "spirit" as the recognition that something more than thought is necessary for reason to be carried into action. And, again, with more direct significance, Aristotle's analysis of the soul as the principle of life in De Anima especially; what has soul, what is alive, is that with an inner source of motion--of change, of activity. Thus, plants have life, have soul at this basic level. And, thus, Leibniz, now using "monad" as the term for what he had earlier called soul, is expressing the Aristotelian position and the Greek insight: to have life is to have the source of activity within--to be self-moved, in other words.

Leibniz, in rejecting the Cartesian and Lockean conception of nature as purely mechanical, with all activity the result of impact and thus of an external source of all motion, sought his explanation through a conception that would place force--and thus the activating power--within what moves.³⁴ The clue to what he was doing is to be found in his initial use of "soul"--

as synonymous with "simple substance" and "substantial unity" --for what he would ultimately term "monad."³⁵ If the source of force is inherent in that which acts, then that source must have life, and thus soul.

Now, neither Descartes' res extensa nor Locke's addition of impenetrability to extension is adequate for explaining motion and its laws. Both place the force essential to account for motion external to that which moves. To place force within, to present a theory about the force to produce activity as having a source within that which moves, is to assert the basic aliveness of that source. The two forms of activity that Leibniz could turn to would have to be perception and appetite. Both, in the monad in nature (as opposed to the rational monad) need to be understood in a way that is analogous to such activities in humans. Perhaps a fairer way of putting it, for Leibniz, is that the human activities of perception and appetite carry these fundamental activities of all that is alive to a more complex level because perception is carried into the level of thought and reason--because perception becomes apperception in the rational monad.

The monad as a unit of activity is a unit of life in the most basic sense of having its force, the source of activity, within. Of the two activities identified by Leibniz, it is appetite that is most closely identified with motion. For, it is appetite that provides a motive for motion--the motive and the force essential to produce that motion. The grounds for this are to be found in the relation between appetite (or "appetition")

and endeavor which Leibniz works out in his response to Locke's discussion of power.³⁶ If it is in this context that elements basic to his position on force are brought together; we will look at that response in greater detail in the discussion of force to follow.

The second of the activities is perception. This is central to the monad's uniqueness and individuality. The perceptions of each monad are that monad's unique perspective of the universe; each monad expresses the universe from its unique perspective; the sequence of the monad's perceptions constitute the unique individuality of the monad; each monad mirrors the universe from its unique point of view. (And thus Leibniz's metaphors for describing the monad express its activity of perception.) In a sense, the history and the totality of the universe (and, therefore, time and space) from the creation, must be "located" in these perspectives; the monad is the locus of each perspective. Creation is total and complete. Everything that is to happen or unfold in time--including time itself--exists at the creation. If we can conceive of that completeness and then add to it the following: the conservation of force in nature; the interrelationship of perception and perspective; the identification of each monad with each perspective; the monad's perceptions as the unfolding of the perspective--if we can begin to think in terms of these interconnections, then perhaps we can begin to grasp the ultimate thrust of Leibniz's thinking.

When Leibniz identifies perception and appetite as the two activities of the monad which is the "unit" of such activities,

he provides us with the instruments for bringing together elements of his system.

8.2.f: The monad is a unit of force

It has been pointed out that a central issue in Leibniz's thinking is the issue of force.³⁷ We have already touched on elements of the problem in the preceding consideration of the monad as a unit of activity; in particular, in the notion of appetite as one of the two activities of the monad. We need now to probe a bit more deeply into the issue of force, keeping in mind that our concern is not with the physics involved, but with the metaphysical issues that, for Leibniz, were primary and fundamental.³⁸

Where there is activity, there must be the force or energy sufficient to carry out that activity. But, where does that force come from? Leibniz rejected those theories that made force extrinsic to that which acts--extrinsic to matter, specifically. This underlies his criticisms of Descartes, and also of Locke, both of whom took the position that there is no force inherent in matter, in material substance. Motion, as matter's activity, is the result of impulse or impact, although the details of that impulse differ in the accounts of Descartes and of Locke. For Leibniz, the force that makes possible motion in nature is not to be found entirely in a mechanical explanation; it is not to be found in the view that in nature there is efficient causation exclusively. This, in spite of Leibniz's assertion, noted previously, that "in the material realm everything does

happen mechanically.³⁹ For his full explanation of force, Leibniz had to turn away from efficient causation, and to that kind of causation associated with purposeful activity: to final causation. Force, thus, has a mechanical (or dynamical) and a teleological basis, with the teleological required, ultimately, to fully explain the mechanical. Monads act, and the force that makes their activities possible is inherent in each monad. The monad is not only the active principle in nature, but it is also the unit of force. Yet, how is this force to be explained? What is its source? In the New Essays, the answers are developed most fully in Leibniz's comments on force in response to Locke's discussion of power. (E and NE, 2.21)

Locke distinguished between active and passive powers, the former possible for mind only.⁴⁰ Leibniz responds to Locke's initial distinction between active and passive powers with a discussion in which he uses many of the elements in the analysis of force he had presented in his works on dynamics-- including the important Specimen Dynamicum of 1695.⁴¹ Although at times Leibniz seems to equate force and power, he here draws a distinction in which power is the more inclusive term, and in which the passive-active distinction is preserved (though presented with a complexity one would expect from Leibniz).⁴²

Leibniz begins by referring to some of the distinctions Aristotle makes in his Physics: power is potentia⁴³ and is to be distinguished from act and change; it is the "possibility of change." It is both active and passive, because change is "action in one subject and passion in another." Passive power

Leibniz calls--or, more appropriately, describes--as "capacity" or "receptivity." Active power, in what he calls the "fuller sense," is "faculty" and "endeavor"; this is force. (NE, 2.21. 1;169)⁴⁴ There is, also, a "special kind of passive power /which matter has/ which carries more reality with it: resistance; this includes impenetrability and inertia." (Ibid.; 170)

Thus, Leibniz probes and reformulates the active-passive power distinction which Locke simply presents, but does not explore, in the Essay.⁴⁵ But now Leibniz brings in further distinctions: between what he calls primary active forces--"entelechy"; and derivative active forces--"effort." (Ibid.; 169f) We need here to note the more specific and restricted use of "entelechy," previously cited as yet another term that "monad" replaced. For, here entelechy is identified with "endeavor"; combined with perception, it is a soul: "When an entelechy-- i.e. a primary or substantial endeavour--is accompanied by perception, it is a soul." (Ibid.;170) We have already identified perception and appetite as the two activities of the monad --of soul, of substance in Leibniz's sense of the term. The problem now is to explore the relationship between the terms --these concepts--that enter into Leibniz's analysis of force as activity (and therefore into the concept of the monad): entelechy, endeavor, appetite. What, in particular, is the relation between appetite and endeavor--and therefore between appetite and primary acting force?

The passage in which Leibniz draws the connection between appetite and endeavor is the following:⁴⁶

. . . volition is the effort or endeavour (conatus) to move towards what one finds good and away from what one finds bad, the endeavor arising immediately out of one's awareness of those things. This definition has as a corollary the famous axiom that from will and power together, action follows; since any endeavour results in action unless it is prevented. So it is not only the voluntary inner acts of our minds which follow from this conatus, but outer ones as well, i.e. voluntary movements of our bodies, thanks to the union of body and soul. . . . There are other efforts arising from insensible perceptions, which we are not aware of; I prefer to call these 'appetitions' rather than volitions, for one describes as 'voluntary' only actions one can be aware of and can reflect upon when they arise from some consideration of good and bad; though there are also appetitions of which one can be aware. (Ibid.,5;172f) 47

Before considering Leibniz's text, it is instructive, even necessary, to comment on Hobbes' use of "endeavor" in relation to appetite in Leviathan. Endeavors, we recall, are "These small beginnings of Motion, within the body of Man, before they appear in . . . visible actions . . ." Hobbes continues, identifying the endeavor "toward something which causes it" as appetite; that "fromward something" as aversion. Both appetite and aversion "signifie" motion.⁴⁸ Hobbes, further, draws a connection between imagination (his "decaying sense") and the beginning of all voluntary motions; a connection between perception (of a sort), endeavor as the (imperceptible) beginning of motion towards something which is the cause of the motion (appetite), and voluntary motion in humankind.

This is not the place to explore any influence which Hobbes might have had on the formulation of Leibniz's analysis of active force in relation to the monad.⁴⁹ The purpose of mentioning Hobbes' ideas here is for the light they shed on which Leibniz could possibly be getting at through the designation of appetite as an activity of the monad. We need especially to exclude from

the present consideration the connection Leibniz makes between volition and voluntary motions, apperception as distinguished from insensible perceptions, and "considerations of good and bad."⁵⁰ These would be appropriate in a discussion of the monad as rational, and as a potential member of the kingdom of God. Leibniz, however, in this aspect of his discussion of force, of active power in his sense of the term, is clearly concerned with force in the kingdom of nature. And yet, he uses "appetitions" --contrasting it explicitly with "volitions," and with situations with moral implications. We have here a distinction that parallels the one between the perceptions--the insensible perceptions --that are activities of all monads, and the apperceptions of the rational monads.

Leibniz's use of "appetite" even in relation to active force in matter may seem anthropomorphic. More likely, it ought to be interpreted as an analogy that reflects his attempt to articulate his position that force is inherent in all matter. That position expressed also through the assertions that the monad (or soul, or substance) acts through matter--even though the "harmony" between the two is pre-established; that matter as existing and acting--secondary matter--always is in motion (as differentiated from materia prima, matter in the abstract).⁵¹ Appetite--appetition--can be identified with endeavor (conatus) as that which provides the force which makes motion possible. For anything to act, there must be force; in human terms, perhaps motive. Appetition expresses that "motivation" analogously. Whatever provides the reason why action takes place--

and motivation can be understood as reason why--must be present if there is to be that action. So force in nature is analogous to motivation in human terms, in the rational monad.

With this, the role of perception as the other activity of the monad is also clarified, and again can be understood through analogy--an analogy that one begins to grasp by examining the connections Leibniz makes in the passage quoted above, and also through the relationships Hobbes draws among endeavor (motion outwards), sensation/imagination, and appetite. There can be no motion without an object to move towards (or away from, in Hobbes' identification of aversion), and that requires perception or awareness of the object. Further, as we know, Hobbes first speaks of endeavor at the beginning of the Leviathan (in chapter one), in relation to the motions outward that continue the motions inward that are his explanation of sensation and the genesis of what will become, eventually, thought.

Thus, Leibniz's terminology describing the monad in nature--describing activity and force in nature. It is anthropomorphic, in that it needs to be understood as analogous to human activity. It is appropriate for his concept of the monad as "soul"--as that which is a center or unit of activity with its "motivation" to act and an "awareness" that is necessary to establish direction. But, of course, the monad as the unit of force, and as "soul" in nature, has no voluntary motion or motivation; nor is its perception "apperception."

8.2.g: The dominant monad

We come now to one of the many properties of the monad that almost defy description: the monad as the instrument for unity in any living whole. The property is dominance.

We can begin by stating the problem. Given the properties of individuality, of uniqueness, with the uniqueness the predetermined element making for the individuality of the monad, of activity, of force--all properties of every monad--how is Leibniz to account for the unity of monads come together as one organism--be that organism tree or cow or garden weed (without considering the human being, though the problem and the principles Leibniz calls upon to deal with humans are the same)? How, in other words, are these individual monads beyond number to act together to fulfill the ends of the whose being? To deal with this issue, Leibniz has a theory of dominance among monads.⁵²

To begin with, it must again be pointed out that monads do not exist independent of matter. The monad is the force inherent in matter, and thus requires matter if that force is to be exerted.⁵³ Each monad is a soul--the force of "life" inherent in each particle or "bit" of matter.⁵⁴ But then how are we to account for the unity that is an organic whole, a whole whose activities are purposeful (though not in the sense of being directed by reason)?⁵⁵ How can this be possible when, in Leibniz's theory, each living being is the totality of monads beyond number? How is it possible to give unity to a body composed of matter divisible to infinity? It is to solve this problem that

Leibniz makes use of a notion of dominance.

The notion is clearest in human beings, with spirit or the rational soul or monad as dominant in the entire being. But even within the human--when we consider the various organ systems of the body, each of which would have to have its dominant (albeit not rational) monad--there would have to be a hierarchy of dominance. This brings us to the very issues out of which the concept of the monad emerged: all matter acting requires force. Efficient causation and laws of mechanics may express and explain action as motion. But, aggregates of matter can never account for the actions of organic wholes. For that, we need to go outside efficient causation and mechanical laws to final causation and metaphysical laws. Organic unities--living bodies--act as wholes, striving always towards that end or purpose which defines what that whole is and is all about. The concept of the dominant monad is thus an expression of the presence of final cause even in nature. Although the two kingdoms are separate--nature is not grace--to the extent that final causes do operate in nature, nature can never be totally independent of grace.

And, for Leibniz, it could not be otherwise: the creation must express the ends and purposes of its creator. These purposes must find their expression in nature, even though rationality is required for entrance into the kingdom of grace. It is in this sense that all life reflects purpose, and that there must be dominance among monads if the purpose of the organism is to be achieved through its history.

8.2.h: The monad is the microcosm

Long before Leibniz referred to the monad specifically as "mirror" of the universe, he had conceived of his unit as the microcosm. What is the basis for this? On what grounds does Leibniz justify it? And, what is its significance?

The monad as microcosm has its roots in at least three of Leibniz's principles. First, there is the position that God brings into existence the greatest number of compossibles. of the (close to) infinity of possible existences, God chooses to bring into actual existence all of the possibilities that can coexist. This is the principle of plenitude in action. Second, and through the principle of sufficient reason and the identity of indiscernibles, God will choose one, and only one, of each of the possibilities. Why would God bring into existence more than one of the same? Third, each of the possibilities is itself a perspective--a unique perspective. Herein lies the grounds of Leibniz's position on the uniqueness of each individual existing: each point of view or perspective must be singular and individual; there could never be two instances of the identical perspective. Carrying this one step further: to each perspective there answers a monad. This means that the totality of monads is equal to the totality of perspectives which equals the totality of the creation in time and in space: the universe and its history.

There is another direction from which to approach what Leibniz is saying about the monad as microcosm. That is by way of perception as one of the two activities of the monad. Every

perception is in itself a perspective on something, and always from the point of view of the perceiver. Each point of view, each perception, must be unique; no two people, as an example, ever perceive the apple in precisely the same way. Every perception is what it is because of the "history" of the perceiver, in the sense that that "history" has brought the perceiver to the moment of the perception. But, then, no two monads as units of force impel matter in the identical direction, into the identical place at the identical moment. Thus, the monad as perceiving and perceiver, without ever ceasing that activity, is a ceaseless sequence or series of perceptions of the totality of what exists.⁵⁶ It is in this sense that each monad is a "mirror" or an expressions of the universe.

If we consider the universe as the totality of existence --both infinite and eternal--then each monad can be considered as a "unit" of existence, a part of that totality.

So much for the basis of Leibniz's position, and the principles one might call upon to ground its formulation. But, there is the second question to consider: what is its necessity, and thus its significance? The major part of its significance must rest with Leibniz's ontology, and with it, his conception of nature. Leibniz is making a statement not only about existence, but also about the relation between individual, or unit, and the whole. In addition, he is formulating yet another part of the whole that is his system. For the moment, we will put aside the issue of the necessity and significance of the microcosm, to return to it when we consider Leibniz's idea of nature.

The defining properties of the monad have now been considered: the monad is a unique individual, with its uniqueness determined in its creation; in perpetual activity--with appetite (to use the term we have already referred to in the discussion of force) and perception; the activity of appetite is linked to force; the activity of perception underlies the monad's very existence and the nature of that existence--as an aspect of the totality which is the universe, a unique perspective of and on that totality, a microcosm. Further, the monad is not independent of matter, in the sense that it is the force that accounts for what matter does. (This, in spite of the pre-established harmony, still to be discussed.) If a body is to be a unity of its units, an organic body--a living body--and therefore a dominant monad, is required.

8.3: The Issue of Matter

Leibniz's conception of matter is among the most perplexing of the problems he bequeathed to philosophical posterity. What matter is, its relation to the monad, its reality independent of the monad, the connection between matter and motion, and matter and force--these remain among the issues that seem incapable of satisfactory explanation. Within the context of this discussion, the serious and difficult issues involved in Leibniz's conception of matter will continue unresolved. Yet, it is essential that some aspects of what he says about matter be considered--in particular in those passages in the New Essays in which he deals with the central characteristics of matter in

response to Locke's positions on solidity and cohesion.

There is a sense in which the significance of Leibniz's ideas about matter lies less with his positive ideas and more with his recognition of the problems in the positions of others. From this perspective, what would then be important is Leibniz's recognition that Locke's conception of matter and his explanation of motion (matter's passive power of motion) would not adequately account for force, for solidity, for cohesion.

It needs also to be kept in mind that Leibniz's concerns are different from those of Locke. Leibniz's concerns center on force and activity in nature. Although he does not do much to clarify the problems noted above, he does say a number of things in the New Essays--as well as in others of his works written before 1705--that can be examined. Some of these need to be mentioned as links between the preceding discussion of the monad and the examination of the pre-established harmony which will follow.

The initial point is that matter is as fundamental to Leibniz's thinking as is the physical world. In some ways, the issues that provided the basic problems and the initial impulse to his thinking revolve around matter.⁵⁷ Witness, for example, his early rejection of atomism, his recognition of the insurmountable problems inherent in Cartesian dualism, the insight into the inadequacies of Descartes' position on the conservation of motion. There are many aspects of his thinking that trace back to one or another issue related to matter and to the physical world.⁵⁸ What Leibniz has to say about matter runs through

his writings: in correspondence, in articles, even in the New Essays--although there, in his comments on matter, he seems more concerned with pointing to the problems with atomism than he is with developing his own ideas about matter. However, the latter are present.

This leads to the second point. Through the long years in which Leibniz had something to say about matter, his thinking changed and developed, revealing inconsistencies in his position, so that it is close to impossible to provide a clear exposition of what that position is. Certainly, by the time of the correspondence with Des Bosses (specifically, the correspondence that begins in 1709 and continues until close to the end of Leibniz's life), the reader is ready to give up the battle.⁵⁹ Without attempting to document this, I would suggest that the nature of matter is an issue Leibniz never worked out to his satisfaction, that his concern with metaphysical and theological issues--including his convictions about the necessity for establishing metaphysical grounds for physical theory--possibly prevented him from dealing with many of the problems which he expressed in his criticisms of the Cartesians and the atomists.

But this leads to a third point. The clue to the problem of working out a position on matter is to be sought in the relation between matter and force, keeping in mind that the monad is force in its metaphysical guise, as force is the monad operating in nature. This leads into the physical aspect of the problem and would require exploration of Leibniz's physics (his dynamics, specifically), as well as his metaphysics. Nonetheless, and

without discussion of Leibniz's dynamics, there is a point that demands mention: the suggestion that Leibniz's position is that force is inherent in matter; and that his is an insight with implications that could never have been developed in Leibniz's own time--by Leibniz, or by anyone else. For, there are implications that point to a radical change in the conception of matter: matter as force, matter as energy. It is tempting to say that Leibniz is on the edge of collapsing matter into energy; it is activity that is the central fact of existence, and thus the central problem is to account for the force that makes that activity possible.

None of the foregoing is to suggest that Leibniz abandons matter. With all the questions and uncertainties, Leibniz's concern with matter persists. In the Preface to the New Essays, he refers to matter as "the jumble of effects of the surrounding infinity . . ." (NE, Preface;57)⁶⁰ The comment is made in a brief discussion about abstraction; matter in the abstract is not matter existing, and certainly not matter organized in a living, an organic, a unified, body. This brings us in the point that there are three ways in which one can speak about what we might refer to as matter: primary matter, secondary matter, and body.

The distinction between primary matter (materia prima) and secondary matter is one that Leibniz makes in several of his works. In the New Essays, he defines primary matter as "matter in the abstract, considered as an original quality, like motionlessness." (NE, 2.23.23;222) It is matter as purely passive, the capacity to be receptive to motion. (NE.2.21.1;170) Pri-

mary matter is to be distinguished from secondary matter, "matter as it actually occurs, invested with its derivative qualities . . ." (NE, 2.23.23;222) These derivative qualities are impenetrability and inertia, which together make up resistance. (NE, 2.21.1;170. Also 2.4.1;123-124) Matter so conceived is thus the passive element.⁶¹

The initial contrast is between matter in the abstract--matter as capacity for movement; and matter existing--as resistance. Now, matter as capacity only would have to be abstract; for, in nature there is no rest, in the same way that matter is infinitely divisible--and both for the same mathematical reason.

As all matter existing has its inherent force, so all force requires matter through which it is exerted.⁶² But, physical reality is not made up of discrete units of force acting through discrete units of matter. How are we to account for those larger units in which quantities of matter adhere, or cohere, to the extent of body? And, cohesion is in itself a problem, though somewhat less for Leibniz than for Locke. Locke, we recall, considers the pressure of air as a possible cause of the cohesion of matter. He also considers some of the problems it poses as a theory of cohesion, and concludes, typically, with the equivalent of "Who knows?"⁶³ Further, for Locke the issue of cohesion is central to any account of extension: what, indeed, holds the particles together? Leibniz, while allowing for the difficulty of explaining cohesion, does not agree that it is necessary for extension. He states: ". . . the notion of extension appears to me to be totally different from that of cohesion."

(NE. 2.23.23 and 27;222-223)⁶⁴ Without entering into the complexity of Leibniz's explanation, that explanation lies within the distinction between primary and secondary matter: the former (matter as abstract) is "perfect fluidity"; there, rest (motionlessness) is possible. The latter (matter existing) is matter always in motion. This motion produces "bonding"--the firmness discussed earlier: ". . . bonding . . . is produced by motions, when they all run the same way . . ." (Ibid., 23;222)⁶⁵ If we consider what Leibniz says in response to Locke's discussion of solidity, extension and motion (the original primary qualities) we find that firmness, bonding, and cohesion all are identified; that although primary matter is fluid, the ceaseless motion (in the same direction) brings matter as fluid into a condition of rigidity.⁶⁶ What Leibniz does is use motion to account for the varying states of matter, from the "fluid" to the "rigid"--the solid, the firm. Thus, it is through cohesion, but ultimately through motion and therefore through force, that Leibniz attempts to give an account of matter that would be different from the "hard" indivisible atoms of Epicurus--the position which he associates with Locke.⁶⁷

The concept of matter as fluid, with motion as the cause ultimately of solidity and cohesion is, indeed, a bold concept, even though it was not a wave of the future analysis of matter. However, within Leibniz's own system, it allows for the central role of force in relation to matter. Force is necessary for motion, which in turn accounts for solidity and cohesion.

Nonetheless, how are we to account for the existence of

body, as distinct from matter? For now we need not only the explanation for the cohesion of matter, but also for combined activities of force, of soul, of those monads associated with the individual units of matter. We need some sort of unity for that purpose which is to describe the motions of body as a whole. This requirement of unity leads into some of the basic issues underlying Leibniz's conception of the monad. For, a theory of physical cohesion is not sufficient to account for the unity of matter. Physical cohesion gives us an aggregate; we can combine matter ad infinitum as we can divide matter ad infinitum. Thus, there must be that which unites, but also that which provides direction or purpose to the unity. And so there must be some order in the unity which is body, some hierarchy monads which makes the body a unified whole rather than an aggregate.

This brings us to what we have discussed in another context: the dominant monad in any organic body; the hierarchy of dominant monads; the suggestion that if matter is infinitely divisible then there must be an infinite hierarchy in any organic body. It also brings us back to Leibniz's need for final causes in nature: even though the laws of nature are mechanical laws, and causation in nature is efficient causation, this is not sufficient to account for order in nature.

There is an additional issue to raise, and that is whether all bodies are organic--whether all matter must, ultimately, be viewed as organic. What are we to say about a rock? Does Leibniz, in other words, admit the existence of the inorganic? Are

all bodies "ensouled"? Is all matter "ensouled"? It is an extremely difficult question to answer. In the New Essays, it is not discussed. In "A New System of the Nature and the Communication of Substances" (1695), Leibniz writes that "true unity" could never occur in "artificial machines, or in a simple mass of matter . . . for such a mass can be compared only to an army or a herd, or to a pond full of fish, or a watch made of springs and wheels."⁶⁸ This is the "aggregate"--matter which does not have an inner source for unity, and thus which does not have a purpose as a whole; matter united, but without unity. All matter must have its inherent source of motion. Not all matter is unified through a dominant monad. Each fish in the pond is an organic unity (with a dominant monad). The aggregate of fish in the pond does not have a dominant monad. And so matter that is not organic: its "operation" is mechanical, in the sense that it is not part of a whole with an inherent purpose unifying the parts.

As with so many of Leibniz's ideas, we reach an impasse when we attempt to get at his meaning. And, perhaps we err in expecting to work out that meaning. With the New Essays as evidence, Leibniz seems to have reached a resolution of some of the issues, at least for that moment: matter existing and organized into bodies is always organic, always alive, always "ensouled," always with its inherent force, its monad.

And this leads into the next and concluding concept--the concept Leibniz regarded as a major triumph: the pre-established harmony.

8.4: The Pre-established Harmony of Monad and Matter

Leibniz regarded the pre-established harmony as one of his major accomplishments, his solution to the vexing problem of dualism: how mind and body, soul and matter, can interact.⁶⁹ We have already considered the problem as it related to the issue of substance, focusing our attention on Leibniz's criticisms of the positions of Descartes and of Locke specifically. The concern now is with how Leibniz overcomes--or claims to overcome--the dualism which that conception of substance entails, through his pre-established harmony. As the final step in this exploration of the monad, the task is to consider what the pre-established harmony is, how Leibniz conceives of it as the solution to dualism, how it fits into his system in terms of its connections with other elements in his thinking, and what are some of its implications and problems.

The problem for which the pre-established harmony was proposed as the solution is the one of how mind or spirit or soul can act on body or matter; and, how matter can affect soul. Leibniz began to express his criticisms of the two positions current at his time long before his own solution appeared in "A New System of the Nature and Communication of Substance," in 1695. These two positions were the interactionism which he attributed to the Scholastics (and which is also the position, albeit modified, of Locke), and occasionalism, the position of the Cartesians--if not of Descartes himself.⁷⁰ Leibniz began, apparently, to formulate his solution by the 1680s: in "First Truths" (1680-1684)⁷¹ and in the Discourse on Metaphysics (1686).

That position was finally stated explicitly, with its characteristic terminology, in "A New System." In this major formulation, the pre-established harmony refers specifically to the relation between mind and body.⁷² But, in fact, the issue and Leibniz's resolution of it through the pre-established harmony is so broad as to extend to all existences: in addition to the question of how the individual mind as rational monad and its body can interact, how all rational monads can be interrelated, how all monads can be interrelated, and how matter can interact with monads and with other matter. The issue is expressed in terms of influence and interaction, but there are underlying implications for epistemology (are perceptions of an "external" world or of inner states?); for causation, in nature specifically (in what sense are natural occurrences "mechanical"? what can cause anything to happen, and in an orderly, predictable way, if all change is inner change?); and the major issue, the relation between the pre-established harmony and Leibniz's analysis of force (Leibniz's correction of the conservation of motion to the conservation of force). The epistemological issues are especially significant in the New Essays; the concern here is, of course, with what the pre-established harmony reveals about events in nature.

Leibniz's initial step in formulating his solution to interaction is his denial that there are two substances.⁷³ There is one and only one substance, defined by the dual activities of appetite and perception; and identified by Leibniz as the monad. But, by identifying a single substance, Leibniz

has placed the problem on another level: between substance (now the monad) and matter--rather than between spiritual substance and material substance. Then, because of how Leibniz defines the monad (a world unto itself), the larger questions of connections with all other existences must be dealt with. We need to question where the solution is to be found, where is the improvement over a dualism of substance, for doesn't Leibniz face the same problem, but in different terms? Or, perhaps, is Leibniz offering a radical redefinition of substance--a redefinition to rival that of Locke?⁷⁴ But first, it is necessary to consider what is the pre-established harmony, what it asserts.

The passage in the New Essays in which Leibniz gives his fullest statement of the pre-established harmony (and without exclusive reference to rational monads, at least until its conclusion) is to be found in Book IV, chapter 10, "Of Our Knowledge of the Existence of God."⁷⁵ It is Leibniz's response to Locke's reasoning about the existence and nature of God; whether eternal being is matter or mind; whether matter ("incogitative Being") could produce mind or soul ("cogitative Being").⁷⁶ Locke had stated in his argument that "Matter is not one individual thing," and were matter the "eternal first cogitative Being" there would not be one such being, but an infinite number of "eternal finite cogitative Beings, independent one of another, of limited force and distinct thoughts, which could never produce that order, harmony, and beauty which is to be found in Nature." (E, 4.10.10)⁷⁷ Leibniz replies (using as his point of departure Locke's statement that matter is "not one individual

thing"; this shows, he says, that Locke is "one step away from my system"): 78

. . . what I do is to attribute perception to all this infinity of beings: each of them is like an animal, endowed with a soul (or some comparable active principle which makes it a true unity), along with whatever the being needs in order to be passive and endowed with an organic body. Now, these beings have received their nature which is active as well as passive (i.e. have received both their immaterial and their material features) from a universal and supreme cause; for otherwise, as our author has so well said, their mutual independence would have made it impossible for them ever to have produced this order, this harmony, this beauty that we find in nature.

To interrupt the passage for a comment: Locke could not have meant what Leibniz here attributes to him. Rather, the particles, with their passive power of motion, could never produce that order (etc.). It is not their "mutual independence" but their limitation to passive power that makes it impossible for them to produce the order, harmony, beauty of the universe.

Leibniz continues, now coming to the main point:

But this argument, which appears to have only moral certainty, is brought to a state of absolute metaphysical necessity by the new kind of harmony which I have introduced, namely the pre-established harmony. Here is how: each of these souls expresses in its own manner what occurs outside itself and it cannot do so through any influence of other particular beings (or, to put it a better way, it has to draw up this expression from the depths of its own nature); and so necessarily each soul must have received this nature--this inner source of the expressions of what lies without--from a universal cause upon which all of these beings depend and which brings it about that each of them perfectly agrees with and corresponds to the others. That could not occur without infinite knowledge and powers. And great ingenuity would be needed, especially, to bring about the spontaneous agreement of the machine with the actions of the rational soul . . . (NE, 4.10.10;440)

There are many issues that might be examined closely: the significance of the distinction between moral certainty and meta-

physical necessity, for example; or, the statement that each "being" is "like an animal," with each being a unity of soul/monad as the active principle and matter as the passive principle; the significance of the context of the passage as an argument for the existence of God.⁷⁹ However, we will persist in limiting our attention to the pre-established harmony, and to its significance in nature. There is, in fact, a sense in which the pre-established harmony connects with the monad as a unit of force, and thus with Leibniz's dynamics, in a way that is more comprehensible (more interesting and enlightening, perhaps) than it does with the monad as rational.

First, there is the denial of any external influence (from any source), combined with the "expression" of what occurs externally. The monad "perceives" what is external (as Leibniz states at the outset), but that perception does not have an outer source; if it did, then Leibniz would be admitting to external influence. The monad does not respond; it expresses. Were it the former, external influence would be allowed; "response" conveys the sense of reaction to that which is other. The monad "expresses" in that what it does--its activity-- is "wrung out" from within.⁸⁰ Further, each monad expresses what occurs outside "in its own matter": the expression is unique, as each monad is unique. And, it draws this expression "from the depths of its own nature." But, what is that "nature"? It is the complete concept which is the complete history of the individual monad, the "law" which is its nature and which is intrinsic to it from its creation.⁸¹ Let us now

consider some of these points at somewhat greater length.

Each monad and the matter through which it acts (the active and the passive principles) are so created that they will seem to be interacting and influencing each other. But, on the contrary, each will be acting according to its own law. Matter qua matter will answer to the mechanical laws which are the laws of nature. However, each monad is a complete concept, with its entire history--from creation to eternity or to annihilation by its creator--established at that creation. Thus, its law is its history; it obeys its law in the unfolding of its history, its complete concept. And nothing can interfere with that law: not from the outside--for the pre-established harmony denies that possibility; nor from within--for its individual history is pre-established. The pre-established harmony and the pre-established history require each other. Because the laws unique to each monad--and expressing that uniqueness--are created with it, it is essential that the laws of every monad be so established. As long as Leibniz denies mutual influence, the complete concept is a necessary accompaniment of the pre-established harmony.

There is another of Leibniz's ideas that now can be placed within the framework of the pre-established harmony: the existence of the best of the compossibles. Leibniz states that there is an infinity of possible monads, but that God selects from these for creation the best of those that can co-exist, and thus that are "compossible." Each possibility is a different possible perspective of the creator; existence is granted only to

those perspectives that can exist together. Thus, the com-possible and the pre-established harmony also are interdependent. Divine perfection and the perfection of the creation are best served and expressed through the original establishment of the universal order. That order is, for Leibniz, highly specific, including, as we have seen, the complete history of every monad, and, therefore, of every unit of force and of all matter brought into existence as the best of the compossibles.

Another point to be mentioned involves perception. We recall that perception was one of the two activities of the monad--of all monads. But, if we consider perception as directed to what is external to the perceiver, then we realize immediately that the pre-established harmony must deny that possibility. As there can be no interaction between monad and matter, between mind and body, so there cannot be any perception of what is external to the monad, for that would require the influence which Leibniz denies. Instead, the pre-established harmony allows for perception to be directed within; perception is of the monad's inner states, and in fact the sequence of those inner states is the history of the monad.

But now isn't Leibniz painting himself into a corner in which he is likely to meet Berkeley, or Malebranche? Does the position on perception that the pre-established harmony requires lead Leibniz into an idealism at the level of the monad as the individual unit of existence? That is a difficult question to answer on Leibniz's own terms--with an answer that would

be fair to his conception of the monad as not limited to the rational or even to the level of life that is exemplified by the "beasts." The level of perception below this is in no way comparable to the self-conscious perception of the rational mind or even of the (presumably) conscious level of the animal (animal understood in the usual sense, and not in Leibniz's extended meaning).⁸² But, as all monads are active perpetually, as there is no absolute rest, so there must be some degree of perception always present--along with appetite. Further, the very notion that each monad is, by definition, a unique perspective on the entire universe carries with it the need for perpetual perception.

None of these points gets to the issue of idealism just raised: that perception at all monadic levels is inner and not of an independently existing world. The pre-established harmony accounts for the agreement between inner perception and external world. But what evidence is there that there is a world (and other minds) answering to the inner perceptions? Leibniz does, in several papers, give criteria for establishing that reality --criteria that would be applicable to rational minds only. However, keeping in mind that the present concern is with the monad in nature, we need to frame the issue somewhat differently. We need to consider for a moment the issue of force in the context of the pre-established harmony.

How are we to reconcile the notion of force as inherent in matter with the pre-established harmony?⁸³ What is the purpose of asserting that force is inherent in matter if that force

can have no direct influence on matter? Did Leibniz find a solution to the problem of force in matter and then proceed to ignore it? For, to say that force is inherent in matter is to say that the monad acts through matter; for the monad is identified with that force. (What is the monad, in addition to the force that accounts for its activities?) And yet the pre-established harmony denies the possibility of influence, of a causal relation between the monad and the matter through which it acts. What seems to be influence is the result of the "agreement" established at the creation, in which monad and matter each is set off into existence to follow its own laws. It seems, then, that Leibniz is denying both external influence--the influence of other monads, of other matter; and internal influence --in the sense of the monad as internal to matter. Nothing can be affected by anything else; everything must follow that history which is its law, unfolding through eternity.

Perhaps this is precisely what Leibniz is asserting, if we do not take his terminology literally. It can be considered the metaphysical expression of the conservation of force: force cannot be lost, and it cannot be transferred.

Thus, there is no need for reconciliation: the pre-established harmony in the kingdom of nature is the metaphysical principle that underlies Leibniz's theory of force.⁸⁴

Summary

The task has been to examine Leibniz's monad, approaching it as the instrument through which he seeks to resolve the problems he identifies in atomism as a position on the nature of matter; and the problem of substance inherited, at least in part, from Descartes and with which Locke had sought to deal.⁸⁵ The extent to which he achieved this purpose will be examined first in the conclusions to Part Two and then in the overall conclusions, when the ideas of nature of Locke and of Leibniz are compared, and the implications of their differing positions on science and metaphysics in relation to each other are considered. For the present, we need to summarize the major points made in this discussion of the monad as it relates specifically to Leibniz's kingdom of nature.

Leibniz divides existences into two realms or kingdoms--that of nature and that of grace. Each follows its own laws, but those of nature must ultimately fall under the higher principles of grace. In other words, the laws of nature are not sufficient unto themselves to account for and to explain the natural world. Leibniz seeks--and finds, or at least formulates--the underlying explanatory principles of nature in those moral laws and metaphysical principles that are intrinsic to the final causes of the realm of grace. Thus, the laws of nature which are mechanical laws and which follow efficient causation, are explicable only in the light of the metaphysical principles which have their source in that realm which is closest to the divine. The monad is ruled by those metaphysical principles

(and the rational monad, by the moral law); matter follows the physical and mechanical laws of nature--even though those natural laws are inexplicable with the higher metaphysical principles. The laws of nature require metaphysics.

The monad is that metaphysical instrument--the source of activity in nature (as well as in the moral kingdom of grace). Each monad is individual and unique--a "complete concept" carrying with it its history through all of its existence, from creation. It is ceaselessly active, its interrelated activities of appetite and perception identifying it with soul, and enabling Leibniz to use it as the source of all activities in existence, the force inherent in all that exists.

Every monad has its associated matter, through which it acts. Putting it another way, there is no matter existent that does not have its inherent force. (Even though all matter is divisible to infinity, it can never lose its inherent force.) It is at this level of individual monad-and-matter that mechanical laws are operative. This is what answers to Leibniz's analogy of the pond of fish: the aggregate without unifying purpose. But reality does not consist of monads as discrete units of force and the matter through which force acts. Everywhere in nature there is activity directed to a goal, a purpose. The achievement of purpose requires a unity of activity, and this requires a principle of order or organization among monads. Leibniz finds his solution in the dominant monad, and then in a hierarchy of dominance. Without that dominance and the hierarchy, nature would indeed be analogous to a pond of fish.⁸⁶

Thus, matter organized is matter organic, matter alive in the sense of having organized and purposeful activity: matter ensouled.

There are, then three ways of considering matter: matter in the abstract (primary matter); matter as mass, as it exists with its inherent force, its monad (secondary matter); and matter organized and unified for a purpose through a hierarchy of dominant monads.

Leibniz faces the issue of interrelation, now of monad and matter, of mind and body, by denying it. He proposes in its place a theory identified initially as "concomitance"; and, by 1695, as the pre-established harmony. That doctrine serves Leibniz as the means by which he is to account for the interrelationships among all existences: between monads, as between monad and matter, between body and soul.⁸⁷ All existences are created so that they are in harmony throughout their eternity. The units of existence are created without the necessity for mutual influence and for causal interaction. Thus, Leibniz's monad is not only a unique individual; it is also a completely independent individual. The pre-established harmony accounts for the semblance of interaction.

The monad as it exists in nature is a unit of force, separable in thought from the material unit which it requires for the working out of that force in activity. Nature may obey the laws of mechanics; those laws describe nature's activities and thereby enable us to predict those activities. But the laws of mechanics, and the laws of nature, alone lack the full explana-

tory power essential for how and why things are as they are--
which means how and why their activities are purposeful (and
purposeful, ultimately, in terms of the kingdom of grace).
For that, the monad--the unit of force, the metaphysical unit--
is Leibniz's answer.

Notes

1. For example, in "Confessions of Nature Against Atheists" (1669): "At the beginning I readily admitted that we must agree with those contemporary philosophers who have revived Democritus and Epicurus and whom Robert Boyle aptly calls corpuscular philosophers . . . that in explaining corporeal phenomena, we must not necessarily resort to God or to any other incorporeal thing, form, or quality . . . but that so far as can be done, everything should be derived from the nature of body and its primary qualities--magnitude, figure, and motion. But what if I should demonstrate that the origin of these very primary qualities themselves cannot be found in the essence of body? Then indeed, I hope, these naturalists will admit that body is not self-sufficient and cannot subsist without an incorporeal principle." (PPL, p.110. Many papers gathered in PPL under the heading, Theological Writings Related to the Catholic Demonstrations, and dated 1668-1670, express the germ of many of Leibniz's later and basic ideas and positions, on the way to being worked out.)

It should be emphasized that reference to Leibniz's writings as expressing ideas characteristic of a particular period will be limited to those already published and, usually, accessible in English. It is always possible that something will turn up (as the complete papers are published) that might modify a point.

2. Last, only because Leibniz's death in 1716 brought an end to further refinement of the ideas. (The two works just cited are not the last of Leibniz's writings. Witness the extensive correspondence of the final two years of his life, including the correspondence with Clarke, in 1715-1716.)

3. Leibniz does not discuss either kingdom explicitly in the New Essays.

4. As early as 1676, Leibniz was writing of the "community" between God and men, of the "city" they compose. (PPL, p.218). One is reminded immediately of Augustine's "City of God." The distinction is implicit by 1686, in the Discourse on Metaphysics (PPL, pp.326-327), and is explicit at least by 1692, in "Critical Thought on the General Part of the Principles of Descartes," when he speaks of a "double kingdom." (PPL, p.409) It persisted through Leibniz's writings; the very title, Principles of Nature and Grace bears witness to that persistence.

5. See, for example, A New System (PPL, p.458); Discourse on Metaphysics (PPL, p.326); and, the discussion of moral, as distinct from physical, identity in the New Essays (2.27.9;236f).

6. ". . . every Spirit, every Soul, every created simple substance, is always united with a body and . . . no Soul is ever entirely without one." (NE, Preface;58)

7. Consider, for example, his criticisms of all particle theories, from that of Democritus and Epicurus on into his own time (see n.1, above); his discussions and criticisms of Descartes' Principles (PPL, pp.383-410); and note that he included Descartes in the tradition of atomism, along with Galileo, Gassendi, and Bacon (PPL, p.110).

8. Refer yet again to those passages in the New Essays in which Leibniz states that "the laws of nature . . . derive from principles higher than matter." (NE, 1.1;72) Also, 2.23.28;224, in which Leibniz states that the laws of motion derive from "a cause which is higher than matter." It must be emphasized that in these, and other, passages, Leibniz refers to the material realm as one in which "everything does happen mechanically." (NE, 1.1;72) (Note also in On Nature Itself: ". . . final causes are useful not only for virtue and piety, in ethics and natural theology, but also for discovering and detecting hidden truths in physics itself." /PPL, p.500/)

9. Loemker writes of the "widely held" view that Leibniz did not begin to use the term until the late 1690s--in correspondence, specifically. The word was not Leibniz's own; it was used a century earlier by Giordano Bruno; and, closer to Leibniz's time, by F.M. Van Helmont (an acquaintance of both Leibniz and Locke). The first public use, according to Loemker, was in On Nature Itself, of 1699. (PPL, p.508, n.11)

In the New Essays, when Leibniz refers to the monad, he does so in conjunction with other more usual terms; e.g. with "simple substances" (Preface,55; 2.11.17;145), and "substantial unities" (2.23.23;223). However, he asks, "Does the soul have windows?" (2.1.2;110); and refers to the soul as "a little world." (2.1.1; 109)

10. The mirror imagery especially is to be found in two works of 1714: The Principles of Nature and Grace and Monadology. Both works are summary statements of what--for lack of another term--could be called Leibniz's system. (Because of the brevity of each, it seems inaccurate to refer to them as presentations of a system; and yet they cover most of the central metaphysical ideas.) The terminology is applied to "each singular substance" as early as the Discourse on Metaphysics (PPL, p.308).

The concept of a metaphysical point is present in A New System. (But, in a letter to Des Bosses of 30 April 1709, Leibniz retracted the "point" terminology, stating that the unity which he monad confers is derived "not from points but from the primitive force of action." /PPL, p.599/)

11. A case might be made for adding "entelechy" to the list. Note especially the correspondence with John Bernoulli, 18 Nov. 1698, in which Leibniz writes: "Life, or the first entelechy . . . includes also perception and appetite . . ." (PPL, p.512)

12. The word "monad" had a long history predating Bruno's use of it (see n.9, above). It comes from the Greek monas, which means "unit," or "the one." F.E. Peters writes, in Greek Philosophical Terms (New York: New York University Press, 1967): "According to Aristotle, all philosophers agree in making the monas the arche of number (arithmos) . . . (Metaph. 1080b, 2a) Aristotle's own definition of the monas is 'substance without position,' clearly distinct from the 'point' (stigma) that is 'substance with position' (Anal. post. 1, 87a)." (P.120)
13. For Locke, as well as for Leibniz, existence is individual.
14. Cat. 5, 2a11-3b17 especially, for the distinction between primary and secondary substance. (All of chapter 5 is concerned with substance.)
15. Leibniz develops the notion of apperception, as specific to the monad with reason, in the New Essays. See e.g. 2.9.4;134.
16. In the New Essays, Leibniz refers to the monad as "an enduring principle of life." (2.27.4;231) This same identification of the monad with life and soul and the simple substance persists into Leibniz's later works--e.g. Principles of Nature and Grace (PPL, p.636).
17. Mathematics is included here because the infinite is crucial to so many of the properties of the monad; consider for a central example, Leibniz's denial of rest in the monad--his very definition of the monad as simple substance, as that which is always active. (Principles of Nature and Grace, PPL, p. 636) And, in the New Essays: ". . . action is no more inseparable from the soul than from the body. . . . /A/ thoughtless state of the soul and absolute rest in a body are equally contrary to nature and never occur in the world. A substance which is in action at some time will be so forever after . . ." (NE, 2.1.9-10; 111)
18. The guide in this discussion of the monad will be similar to the one employed to this point: to refer to those of Leibniz's positions expressed in **writings through** the time of the New Essays; and to refer to later works (i.e., those written after 1705) where there is not significant change or where change is especially revealing.
19. In the New Essays, Leibniz's criticisms of atomism as violating a principle of individuation expresses most directly his position that what exists must be individual, uniquely individual. (See 6.1.b, above. Also, NE, 2.27;230ff; and 3.3.1-5;289f.)
20. The issue of dominance, and its significance, will be considered in 8.2.g, below. For this moment, it is noted that Leibniz does seem to distinguish between the animate and the inanimate; e.g. NE, 3.6.41-42;328. It should be kept in mind,

for consideration later, that all matter as existing must have its inherent force (and thus its monad), as no monad exists independent of that matter through which it acts. But, that animate matter (matter that has an organic principle) will have a dominant monad.

21. E.g. the identity of indiscernibles, and the principle of sufficient reason. (See 6.1.a and b, above.)

22. Thus, as early as the pre-monadic Discourse on Metaphysics: ". . . it is not true that two substances can resemble each other completely, and differ only in number . . ." (PPL, p.308) So also in the New Essays, in the Preface for one example: ". . . two souls of the same species, human or otherwise, never leave the hands of the Creator perfectly alike . . ." (p.58) And, in On Nature Itself (PPL, p.506); in A New System (PPL, p.457); in the Monadology (PPL, p.643).

23. One is tempted to describe this predeterminism in contemporary terms by saying that each monad's history is programmed into it. (And, in fact, Nicholas Rescher does precisely this in The Philosophy of Leibniz (Englewood Cliffs, New Jersey: Prentice-Hall, 1967): ". . . every possible substance . . . is represented in the mind of God by what Leibniz calls its complete individual notion . . . in which every detail of the substance at every stage of its . . . career is fixed. For simplicity and convenience we shall call the complete individual notion of the . . . substance its program." (P.14)

However, the temptation should be restrained; for it would imply a purely mechanical unfolding of all monadic activity. The monad's activities are ultimately purposeful, either directly, for the rational monad as capable of acting for a purpose,, or indirectly, through the subservience of efficient to final causation. As Leibniz states in the New Essays: ". . . the laws of nature . . . derive from principles higher than matter, although in the material realm everything does happen mechanically." (Preface, 72)

24. Note also, sn.13: ". . . the individual concept of each person includes once and for all everything which can happen to him . . ." (PPL, p.310) Two further points: terminology in the discussion is pre-monadic, and thus "substance" is still used; also, the reference to "person" in sn.13 follows the reference in the preceding section (sn.12) to intelligent souls.

25. See especially sn.13, in which Leibniz distinguishes between "future contingents" that are certain (i.e., God foresees them), and necessary (i.e., the contrary implies contradiction). (PPL, p.310) The analysis is logical, and grammatical; something certain may still be "free."

26. The pre-established harmony was so named in a postscript to Basnage de Beauval, 3/13 Jan. 1696 (identified by Loemker as

"Second Explanation of the New System"; PPL, p.460). Leibniz's important discussion is in A New System of the Nature and Communication of Substances (already referred to), which was published in the Journal des savants, 27 June 1695. (PPL, pp.453-459) However, the central idea of "concomitance" appears at least in the correspondence with Arnauld--if not earlier. Leibniz is there evaluating the problems of what he refers to as "the hypothesis of impressions or that of occasional causes" (ital. in original); and offers instead "the hypothesis of the concomitance or harmony between substances." (ital. in original) (4/14 July 1686, Leibniz-Arnauld Correspondence, p.65)

27. How Leibniz attempts to reconcile this with the theological demand for freedom of the will is another matter.

28. ". . . there can be no action without a force of acting, and conversely, a power which can never be exercised is meaningless. . . . action and power are different things, the former a matter of succession, the latter permanent . . ." (On Nature Itself, PPL, p.501)

29. Thus, in Specimen Dynamicum (1695), Leibniz refers to "activity, or the force of created substances." (PPL, p.445)

30. In the New Essays, Leibniz does not explicitly state that perception and appetite are the two activities of all monads or simple substances--as he does in other works; in, for example, On Nature Itself (PPL, p.504); Letter to John Bernoulli, 18 Nov. 1698 (PPL, p.512); and many years later, in The Principles of Nature and Grace (PPL, p.636). However, the position is implicit especially in NE, 2.21.5;172f, and in ibid., 36;189. In both these discussions of "endeavor" Leibniz interrelates perception and appetite in the monad or substance, without limitation to the rational monad.

31. The monad as "spirit," as rational, is not really central to the problems that led Leibniz to his unique conception. Further, we ought to keep in mind, again, that the work in which the term is first used in a published work is On Nature Itself.

32. E, 2.6.2.

33. Descartes, in Meditation IV, identifies the two faculties of understanding and will. Both Locke and Leibniz follow Descartes in this--Locke exactly (E, 2.7), Leibniz with modification. (The influence of Hobbes on Leibniz is discussed in 8.2.f, below.)

34. There are, at the least, two problems that Leibniz is struggling to work through: his insight into the conservation of force, rather than motion; and his position that matter, as an aggregate moving on impulse only, does not account for the order and organization of events in nature. He holds to these, as he holds to the position expressed in the passage quoted at the conclusion of

n.23, above--that "in the material realm everything does happen mechanically."

35. "Entelechy" might also be included, except as it has been pointed out above, Leibniz does seem to shift ground in his use of this term; e.g. ME, 2.21.1;169f. (Leibniz took the term from Aristotle; it is significant especially in De Anima, II, 412a, in the definition of "soul" as "the first grade of actuality /the first entelechy/ of a natural body having life potentially in it." /Basic Works of Aristotle, Richard McKeon, ed., New York: Random House, 1941. P.555./ The translator, T.A. Smith, uses "actuality" in the text, and not "entelechy.")

36, E and NE, 2.21; especially NE, 1-5;169-173; and 36;188-190. There is an issue which will more appropriately be raised in the discussion of force, to follow: the translation of tendance as "endeavor," and the possible source of appetite as the motive for motion. (See 8.2.f, below.)

37. Indications of a position to be developed are to be found by the early 1670s, in e.g. "The Theory of Abstract Motion: Fundamental Principles," #1 in Studies in Physics and the Nature of Motion, (1671; PPL, pp.139-142). Certainly, Leibniz makes major statements by the time he deals with the distinction between the conservation of motion and of force, in the mid-1680s. (Loemker remarks that Leibniz's distinction between motion and force does not appear until his criticisms of Descartes' position on the conservation of motion, first presented in 1686 in "A Brief Demonstration of a Notable Error of Descartes and Others Concerning a Natural Law" (PPL, pp.296-301).)

38. Leibniz refers to metaphysics as "this primary and architectonic discipline" in "On the Correction of Metaphysics and the Concept of Substance" (1694; PPL, p.432). (This brief paper published in Acta Eruditorum discusses issues which would be presented in greater depth in Specimen Dynamicum and in A New System in 1695. Leibniz here persists in referring to "corporeal" as well as "spiritual" substance.)

39. NE, 1.1;72. See also ns. 23 and 31, above. (Note also one of several pertinent passages in Specimen Dynamicum: ". . . there is something prior to extension /in corporeal things/, namely, a natural force everywhere implanted by the Author of nature--a force . . . which is provided . . . with a striving or effort /conatus seu nisus / . . ." PPL, p.435)

40. See 6.1, above. (In the present discussion--as in the earlier discussion of power in the Essay--we will not be concerned with the issue of freedom of the will. Leibniz does comment extensively on Locke's discussion of the will; but this is a different issue.)

41. This is the work to which Locke had referred so disparagingly in his correspondence with William Molyneux. (See chap.5, n.16, above.)

42. As, for example in "On the Correction of Metaphysics . . .": ". . . the concept of forces or powers /'notionem virium sue virtutis'--GPS,4,p.469/ which the Germans call Kraft and the French la force, and for whose explanation I have set up a distinct science of dynamics . . ." (PPL, p.433)

43. Leibniz uses the Latin in his text (NE, 2.21.1;169). The Greek term for "power" is dynamis.

44. The complete passage is: "The active power can be called 'faculty' and perhaps the passive one might be called 'capacity' or 'receptivity'. It is true that active power is sometimes understood in a fuller sense in which it comprises not just a mere faculty but also an endeavor." (NE, 2.21.1;169. It might be instructive to consider what would be less than a full sense of force. Leibniz does not clarify this here.) Leibniz refers to the Specimen Dynamicum for discussion of this analysis of force. The distinctions in that work are, however, somewhat different, although a part of the difference may rest with differences in translation. Remnant and Bennett render primitives as "primary"; Loemker, as "primitive." It is clear from both contexts that Leibniz means what is underived, an originating source. (See discussion of "primary" in Remnant and Bennett, Notes, lxxv.)

45. One could not expect more of Locke. His is not concerned with the physics of power, nor can we expect the kind of metaphysical concerns that so absorbed Leibniz. And Locke's central concern in E, 2.21 is with active powers of spiritual substances --especially with the will and freedom. (Leibniz, incidentally, entitles NE, 2.21 "Of Power and Freedom.")

46. Leibniz is here responding to Locke's distinctions among: will, volition, voluntary, involuntary.

47. It is essential to point to an issue of translation. The French word in the NE which Remnant and Bennett translate as "endeavor" is tendance. The translators justify this rendering for several reasons, most notably because "Leibniz equates it with effort' and with 'conatus', the latter being the Latin for 'endeavor' . . ." (Notes, xxxix) Loemker, in his translations in PPL in which force is discussed, uses "tendency"--a rendering, no doubt, of tendance. It is because of the rendering of tendance as "endeavor" that attention is drawn to Hobbes' relating of endeavor and appetite.

48. Leviathan, Book I, chap. vi (Harmondsworth, England: Penguin Books and Pelican Books, 1968, p.119). It must be noted that it would seem, in Hobbes' view, that the actual cause of the motion is external to what is moving; that appetite is the

endeavor towards something which is its object and, thus, its cause. However, there is a continuity between that motion that originates in what is "external" to mind and that is the sensation when it affects the matter which makes up the human sensory system; and the motions outwards in pursuit (or avoidance) of what is perceived. (Ibid., chaps. i.ii.iii, and vi, especially.)

49. There is a highly suggestive discussion of the possibilities of that influence by J.S. Watkins, in Hobbes' System of Ideas (London: Hutchinson University Library, 1965), in chap. VII. The key notion for Watkins is Hobbes' concept of endeavor, through which, in Watkins' view, he "overcame the body/mind problem." (p. 123) Watkins even states that Leibniz's idea that "the world is a concourse of monads, was derived from Hobbes." (p. 125) The key connection is through Hobbes' notion of endeavor, and Watkins attempts to demonstrate the relation between endeavors and monads through early writings of Leibniz, long before the concept of the monad appeared in full bloom in the late 1690s. The key issue, for Watkins, is the problem of mind/body dualism. Hobbes and Leibniz were seeking a similar solution, but from opposite perspectives--with Hobbes providing Leibniz with the central idea.

It should be added that Watkins does not discuss perception and apperception in relation to endeavor--an issue that is taken up here (and a discussion that was written before reading the Watkins' discussion). Watkins touches on many other issues that are of present concern, including the significance of the calculus, criticisms of atomism, and the conservation of force rather than motion. Dualism remains the core issue, and Watkins states: "In Leibniz's concept of force, the physical and the psychical merge." (p. 317)

R.S. Westfall, in Force in Newton's Physics (London: Macdonald, and New York: American Elsevier, 1971), also considers briefly the possible influence of Hobbes on Leibniz, in relation to endeavor. (p. 317) Another influence that ought to be considered (one suggested to me by H.S. Thayer) is that of Spinoza. See especially Ethics, IV, Prop. 18.

50. Note that s'apercevoir (in its various tenses) is in the French text of the Essay and the New Essays; that Remnant and Bennett translate it as "awareness." (NE, Notes, xxvii)

51. For the distinction between primary and secondary matter, see especially NE, 2.23.23;222f. The issue of how, or whether, the monad might act through matter is exceedingly complex. The pre-established harmony seems to deny the possibility. Yet, Leibniz states more than once that monad and matter exist as a unit, and that the activities and the force that identify the monad cannot be separated from matter. (On Nature Itself, PPL, pp.504-505; A New System, PPL, esp. pp.456-458, for examples.)

52. There is no discussion of the dominant monad in the New Es-

says. Dominance is discussed explicitly in, for example, the correspondence with De Volder (20 June 1703; PPL, p.531); "Reply to the Thoughts on the System of Preestablished Harmony . . ." (1702; PPL, p.580); in the correspondence with Des Bosses (16 June 1712; PPL, p.604). It is certainly possible--perhaps even probable--that Leibniz began to formulate the concept of dominance before 1702; wouth the availability of the Leibniz papers, one is dependent upon those of the papers that have been published. However, if this was a concept that began to develop in the early 1700s, then it is interesting to note that that development began at the time when Leibniz would have been concerned with his commentary on the Essay. (One might then ask why there is no discussion in the New Essays. A possible response is that there would have been no reason or place to develop the position and its implications within the context of the commentary on Locke's Essay; it lies outside the scope of that commentary.)

53. For discussion of matter and of the relation between monad and matter through the pre-established harmony, see 8.3 and 8.4 below.

54. Reference by Leibniz to a particle is, indeed, surprising. Yet, he does use this terminology, though not in the New Essays.

55. This is opposed to the whole that is an aggregate; more of this in 8.3.

56. Recall that for Leibniz there can never be a state of complete rest. Thus, the monad's perceptions never cease. And thus, Leibniz's conception of the "minute perception."

57. These, in addition, of course, to his early concern with logic, the development of the art of combination, jurisprudence, and such theological issues as transubstantiation.

58. Loemker remarks on "the fading of the logical interest from first place in /Leibniz's/ thought, after the publication of Newton's Principia and Locke's Essay, and its replacement by the physical studies of the 1690s . . ." (PPL, p.13)

59. Reference is made to the correspondence in PPL, which covers the period 1709-1715.

60. The phrase in the French text is: ". . . le mélange des effets de l'infini environnant . . ." (GPS, p.50) Question might be raised about the rendering of mélange as "jumble," a word that conveys a sense of chaos or disorder not conveyed by mélange. It is possible, however, that chaos or disorder would be precisely what Leibniz intends by matter.

61. In the Specimen Dynamicum, Leibniz's terminology differs somewhat. There he write of two kinds of passive force: primi-

tive passive force, equivalent to the Scholastic materia prima; and derivative passive force, which is secondary matter. (PPL, pp.436-437) This is consistent with the view of matter as itself passive.

62. This is an admittedly controversial point. Would it push Leibniz into positions not far from those he seeks to avoid--into dualism, for example? In demanding that substance be active, is Leibniz only redefining terms without solving problems?

63. E, 2.23.23-27. See 6.2.b, above.

64. Leibniz also distinguishes extension from matter, although he rejects Locke's distinction between the extension of matter and the extension of space--a distinction Locke emphasizes in making solidity one of the original primary qualities of matter. (E. 2.4; also, 3.2.a, above.

65. See 6.2.b, above.

66. ". . . space is full of matter which is inherently fluid, capable of every sort of division and indeed actually divided and subdivided to infinity; but with this difference, that how it is divisible and divided varies from place to place, because of variations in the extent to which the movements in it run the same way. That is what brings it about that matter has everywhere some degree of rigidity as well as of fluidity, and that no body is either hard or fluid in the ultimate degree . . ." (NE, Preface;59f)

67. Leibniz refers more than once to the "hard" or "rigid" atom of Epicurus; e.g. NE, Preface;60; 2.4.4;125.

68. PPL, p.456. (Mass is usually associated with secondary matter.) Leibniz uses these analogies in other works; in, e.g. Monadology, sns. 67 and 68.

69. Leibniz thought so highly of his solution that he chose more than once to identify himself as its discoverer--including the title page of the New Essays, which announces that the work is by "the author of the Pre-established Harmony." (Or, so it appears in the Gerhardt edition.) One might question whether this was Leibniz's own designation, or was added by later editors, perhaps by Raspe in the first published edition of 1765. But Leibniz also identifies himself this way in his "Considerations on Vital Principles and Plastic Natures," published in 1705 in the Histoire des ouvrages des savants (PPL, pp.586-590. The doctrine itself was announced in A New System. The basic idea which the pre-established harmony expresses goes back many years before it was formulated by name; consider "concomitance" already mentioned.

70. Leibniz does criticize Descartes' own solution of the

pineal gland as the site of mind/body interchange. But, a distinction must be drawn between Descartes' position and that of the occasionalists. (See 7.1, and ns. 7 and 10 in chap. 7, above.)

71. Loemker dates "First Truths" in the period 1680-1684. The Discourse on Metaphysics is dated 1686. (The former reads like a preliminary study for the latter.)

72. Loemker points this out in his notes to the "Second Explanation of the New System," of 1696. (PPL, p.461, n.21)

73. See above, chap. 7, especially 7.1.

74. Locke specifically, in this context. The underlying issue is how seventeenth-century philosophers, caught in the scientific revolution, struggled to redefine substance, with Locke and Leibniz as two examples.

75. Locke's chapter heading is: "Of Our Knowledge of the Existence of a God."

76. Locke concludes that "incogitative Matter and motion, /as the sole activity of matter/ whatever changes it might produce of Figure or Bulk, could never produce thought: . . ." (E, 4.10.10)

77. Leibniz changed "finite" to "infinite." (NE;439)

78. It is noted that this decision to begin this passage several sentences before Leibniz gets into the pre-established harmony is deliberate, and for two reasons: first, because it contains a clear statement of the monad as the active principle, matter as the passive principle; and, second, to give an example of Leibniz misinterpreting Locke.

79. See Conclusions to Part Two, below.

80. The French words translated as "express" and "expression" are expression (subject) and exprimant (verb; infinitive-exprimer). Both convey the meaning of squeezing and wringing out (Larousse). We must continue to be mindful that Leibniz's use of such terms as "perceive" and "express" is to be taken analogously, and not literally.

81. In a different context, one might say that that history is constituted by everything which might be predicated of the monad--considering the monad as subject.

82. Leibniz rejects Descartes' position that animals are "machines"--extended substances, in the latter's sense.

83. It is, again, necessary to be reminded that we approach the

issue from the viewpoint of metaphysics--where Leibniz sought the solution to the ultimate source of force in matter--and not in terms of physics.

84. This discussion has not considered another harmony pre-established--the harmony between the two kingdoms of nature and grace.

85. These do not exhaust the purposes and possibilities of the monad; there are many problems--physical and metaphysical --for which the concept was to be the solution. The two explored here are specific to the present concern.

86. In reality, even a pond of fish is a highly organized "universe" of purposeful activity.

87. And, it must be added, between the two realms of nature and grace.

Part Two

Summary and Conclusions

The preceding discussion has had a two fold purpose: first, to consider what are Leibniz's criticisms of atomism --of any theory that holds to a material particle and a vacuum--and to consider the grounds on which he rejected such a theory; and, second, to delineate his own positive position--that of a metaphysical unit, the monad, as his alternative to the material unit. The immediate goal has been to find a basis for drawing implications for Leibniz's idea of nature, implications that would follow from his conception of the monad, and that then could be compared with that idea of nature suggested by Locke's position on a material particle. The underlying goal has been to show how Leibniz's rejection of atomism and his concept of the monad are grounded in the position that metaphysical principles are primary, and that physical laws must conform to metaphysical laws.

We will limit ourselves here to Leibniz--to a summary of the major points in the preceding discussion, and then to a few conclusions which we can draw from that discussion. The task of comparison, begun in the general introduction, will be continued in the general conclusions, to follow.

Leibniz's rejection of atomism did not find its initial expression in the New Essays, with his criticisms of and commentary on the ideas in Locke's Essay. That rejection can be traced back through his own written comments to his youth. His early acceptance of atomism as signifying the new in philosophy, natural and metaphysical, was followed almost immediately by a rejection of atomism. The full development of the reasons for that rejection was to take at least a quarter to a third of a century--until the final decade of the seventeenth century--but the germ of those reasons was already present at the beginning. Thus, when Leibniz came to the writing of his commentary on Locke's Essay at the beginning of the eighteenth century, his own position was fully developed, or at least close to completion. Certainly, it would be wrong to suggest that Locke's atomism was a major factor in Leibniz's interest in engaging him in dialogue. The emphases in the text suggest an epistemological interest. This would still remain subordinate to Leibniz's overall commitment to metaphysical principles. Nonetheless, it was inevitable that Leibniz would respond to Locke's particle theory, because that theory was so crucial for Locke's epistemology. And, further, the reasoning Leibniz brought to bear on his responses to Locke's particle theory were not reasons newly made for the occasion; they bring together ideas metaphysical, physical, mathematical, which Leibniz had been developing in the years preceding this major (in length) of his written efforts.

We have sought the reasons why Leibniz rejected a parti-

cle theory of matter both in his metaphysical principles and in specific inadequacies more closely related to problems in physics and metaphysics. Thus, it was shown that the material particle combined with a vacuum must be rejected on at least four basic theoretical grounds: its violation of the principles of sufficient reason, identity of indiscernibles, plenitude, and continuity. There is no reason why there should be undifferentiated particles of matter moving in an equally undifferentiated vacuum and thereby denying the law of continuity, as well as the principle of plenitude. It must now be pointed out that there is a further principle to be kept in mind, one central to the conception of God: a principle of perfection which would underlie the other principles, particularly the principle of sufficient reason.¹

And there are other grounds for rejecting atomism, problems emerging from the very nature of the material atom: how to account for solidity or hardness; how to explain the cohesion of the particles; the necessity in most particle theories of what is, for Leibniz, an unmathematical and illogical finite divisibility; the lack of differentiation among particles; and above all, the absence of any inherent force. The last is a central reason related to Leibniz's own work in dynamics, and especially his correction of the conservation of motion to the conservation of force.

This brings us into another of the issues related to Locke's particle theory: the issue of substance. Substance is significant in this context, not only because of how it is

related to Locke's particle theory and to his discussion of real essences, but because Leibniz's own unit, the monad enters so completely into his struggle to resolve some of the central problems of substance. Leibniz rejects a dualism of substance --the Cartesian dualism which Locke accepts though with modification. There is, for Leibniz, one and only one substance, renamed eventually "monad."

Leibniz's single substance acts unceasingly. Rest is intellectually conceivable, as an abstraction; in reality, in nature, there can be no rest. For, as anything is divisible to infinity, so the passage from motion to motionlessness is infinite. Leibniz's single substance is not itself material. Yet, its actions are through matter; the monad "expresses" itself through matter. If we cut through Leibniz's anthropomorphic terminology, we can interpret him as working toward a position that the monad is the force inherent in matter. It is that power within matter which accounts for matter's actions. Leibniz, thus, would resolve the dualism of substance through a single substance which is the force inherent in all matter. As force is exerted through matter, so matter requires force. Matter, divisible to infinity as it is, does not exist without force, without the monad.

But, where is the improvement, the solution to the problem of dual substances? How can monad affect matter? Does this question now replace the problem of how spiritual substance can affect material substance? Leibniz's answer--at least on the metaphysical level--is that there is no true inter-

action or mutual influence, for monad and matter have been synchronized from the creation. The harmony between monad and matter is pre-established. This, it turns out, is the metaphysical expression of a physical conservation of force, Leibniz's correction of Descartes' conservation of motion. What remains constant is not the quantity of motion, the activity, but the energy or force necessary for that activity.

What are the implications of all this for existence and for change and causation in nature? Does this enable Leibniz to provide the alternative to what he regards as the arbitrary universe of Locke?

Existence for Leibniz, as for Locke, is individual. But, for Leibniz that individuality is extreme: everything that exists is uniquely individual. Every monad--in nature, every unit of force--is different from every other monad. That difference is established at the creation, for every monad is complete, as a subject of whose predicates are "known" by God. But, further, if there is no true interaction between monad and matter--if there is synchronization or harmony, rather than interaction--and yet monad and matter require each other for force to be exerted through matter, then what can be said about change in nature, and causation which would account for change? Do the complete concept of the individual and the pre-established harmony, interrelated as they are, serve to remove causation from nature, leaving only the illusion of causation as pre-determined changes are played out? For, the pre-established harmony would seem to assert that as monad and matter cannot

interact, so neither can matter and matter, and monad and monad.

Matter qua matter most certainly cannot interact with matter; for matter as separate from monad is an abstraction only, devoid of its inherent force and thus without activity. Matter without substance, without the monad, cannot act. So, too, monad qua monad, separate from that through which it acts --matter--is equally an abstraction. Monad could not act directly on monad. Thus, there can be no interaction between monads, and between matter, considering each without the other.

The problem we are faced with is how Leibniz would account for change in nature, what could be the meaning of causation in his universe. Change clearly does occur, for motion--activity--is unceasing. The kingdom of nature is a mechanical realm, obeying the laws of motion. Those laws of motion are central to a natural world that, as existing, is never without motion, and therefore never without change. But, again, what is the source of motion, what is its cause, even its reason why? The monad, clearly, is that source. And yet Leibniz denies direct interaction.

Perhaps the solution is to be sought in the relation between the two kingdoms of nature and of grace. The laws of nature, including the laws of motion, are subservient to those of grace--the moral and metaphysical realm which provides the natural realm with purpose. Causation, then, is teleological, the working out of purpose. In this sense, cause must be sought outside the mechanical order of nature. Change itself

in nature may be mechanical, explicable through laws of motion; causation, as reason why, can never be mechanical in Leibniz's universe.

This brings us to Leibniz's view that Locke's universe is an arbitrary one, without sufficient reason why anything happens as it does except for a mechanical working out of matter in motion. Leibniz's own universe would remedy that defect, first through the subservience of the kingdom of nature to the kingdom of grace, the realm of ends; and, second, through the conception of a God who exemplifies the principle of perfection and whose actions all accord with the principle of sufficient reason. Everything happens for the best in a universe created by God who, as perfect, created a universe in which there is sufficient reason for everything that happens and that exists. Thus, underlying the working out of causation in the universe is Leibniz's conception of God, that supreme and master monad who is the totality of perspectives on the universe, the monad as the macrocosm.² And so Leibniz's idea of nature: nature ceaselessly in motion, nature as a mechanical realm in which mechanics serves a teleology predetermined by the thought of an omniscient logician--God. It is, ultimately, an idea of nature accessible to that rational monad that is the human mind, through the unique perspective that characterizes each monad, rational or not.

Notes

1. In his discussion of Leibniz's principles, Loemker finds a hierarchy. The principles of identity and perfection alone have logical necessity, and therefore universality. He goes on to show how perfection is the foundation of almost all the others. (PPL, p.45) Ortega, however, finds no order. He write: ". . . Leibnitz plays with principles . . . he never set himself seriously to put the tangle of his principles in order, never arranged them in a proper hierarchy, never established subordinate relationships, never coordinated them." (Idea of Principle, pp.13-14)

2. There is no evidence that Leibniz ever referred to God as a monad. Further, to refer to God as the totality of perspectives on the universe almost brings him over to the side of Spinoza--a connection he would certainly reject. Nonetheless, a case can be made for such a designation--if we remember also to expand the universe to encompass the possible as well as the actual world.

General Conclusions

The dissertation took for its thesis the view that Locke and Leibniz, in their positions on atomism, were responding to the profound intellectual changes of the seventeenth century that led to the transformation of natural philosophy into science and, with it, the separation of science from philosophy. It considered Locke's Essay a major statement of the position that discoveries and principles established by the new science must determine the way in which epistemological and metaphysical issues are to be resolved. It found that Leibniz's pursuit of dialogue with Locke, culminating in the New Essays, was the result of Leibniz's recognition of the significance of the new science as the foundation of Locke's thinking; and, further, that the motive underlying the New Essays was Leibniz's conviction that metaphysics is primary.

The atomism that Locke accepts and uses in the Essay and the concept of the monad that is Leibniz's metaphysical atom are instruments that express the fundamental opposition arising from the separation of natural philosophy--of science--from philosophy. And, atom and monad are symbolic of that separation.

There is a second aspect of the thesis: the opposition is one that has persisted in philosophy, underlying problems,

disputes, and challenges for succeeding generations of philosophers. There is an additional legacy: the question of what is the major task of philosophy, as the sciences gradually took over from natural philosophy the exploration of the physical universe--the exploration of nature.

The thesis, then, is one that touches on several issues, each with its own demands for demonstration and comment, and all of them interconnected so that each one has implications for the others.

The central problem in developing the thesis was to find ways in which atomism and the concept of the monad express the fundamental issue: the differing responses of philosophy to the new science. The way chosen was to establish, first, how Locke's scientific background in general, and his commitment to the corpuscular philosophy in particular, are the factors that determine his analysis of the origin of ideas as the "materials" of knowledge; and, through this, determine his analysis of qualities and powers in nature and his conception of material substances and their real essences. Qualities and powers and material substances are incomprehensible without recognition of their corpuscular grounds. Locke's epistemology and his metaphysics--his positions on what exists in nature, and on creation and causation especially--are truly empirical. Our ideas are dependent on experience for their genesis, and that experience is continuous with processes at work in nature--processes that are discovered and studied by the sciences then emerging out of natural philosophy. Locke's empirical stance

resulted from his determination to work out an epistemology based on the discoveries of natural philosophy--and let the metaphysics fall where it may.

A different approach was necessary to demonstrate Leibniz's position. For, the concept of the monad is the outgrowth of his explicit criticisms of atomism--of all particle theories of matter--combined with metaphysical and physical problems involving substance and force. It was possible, therefore, to explore the reasons why Leibniz finds atomism inadequate, before going on to discuss the monad as his positive position, his solution to those problems. Both Leibniz's criticisms of atomism and his positive position express the central place of metaphysics in his thinking. Metaphysical principles are crucial to his rejection of atomism. The monad is a metaphysical and not a physical unit, consonant with those metaphysical principles that are central to his thinking, principles that cannot be violated in the kingdom of nature any more than they can be violated in the kingdom of grace.

There are two fundamental contrasts in the ideas of nature that are suggested by the contrast between atom and monad. First, there is the contrast between the atom as a unit of matter and the monad--the monad in nature--as a unit of force. Locke, as under-laborer, committed to the historical plain method, need not explain the nature and source of the force required for matter's activity. Not so Leibniz, for whom force is a central issue; recall his correction of Descartes, crucial in dynamics, in demonstrating that it is force and not matter that is

conserved. Locke's focus on matter leaves unaccounted the phenomenon of force; Leibniz's focus on force presents him (and all subsequent commentators bent on understanding his concept of the monad) with problems about the nature of matter and about the relation between matter and monad.

The second contrast is related to the first. For both Locke and Leibniz, nature is a fundamentally mechanical realm, in that motion is central to all immediate causation. However, both look past immediate causation to primary causation--beyond motion to God as first cause. For Locke, the ways and reasons of God are inexplicable to the finite human mind denied access to the divine mind. In Locke's example, so trouble-making to his contemporaries, God could have created matter with the capacity to think even though matter was not so created. In a position not unlike that of Descartes, God's infinite will guided by His infinite knowledge and wisdom are the grounds of all ultimate causation.

For Leibniz, Locke's world is an arbitrary one, the result of an arbitrary deity. The mechanical natural world is subservient to the moral kingdom of grace in which purpose is central. Purpose guides the machine; final causation lies behind efficient causation. Leibniz embraces teleology; the principles of perfection and of sufficient reason require a universe of purpose. Here, too, the metaphysical (with a nod to the theological and the moral) is primary.

Although the conceptions of nature of Locke and Leibniz approach each other--for both, nature is a mechanical realm in

which motion is the immediate cause of change--they differ profoundly.

The thesis's second aspect is one which seeks to extend the opposing responses of Locke and Leibniz to the new science. This second aspect offers a perspective on the history of philosophy in modern times by suggesting that the early opposition had profound significance for the future direction of philosophy. The dissertation makes no attempt to demonstrate this element of the thesis, and these conclusions can only suggest implications that call for further study and thought. The implications are significant for the interpretation they offer about the genesis of issues that have been and continue to be major concerns for philosophy and philosophers.

There are three issues to consider: first, the working out of the relationship between metaphysics and the new science as central to the immediate direction of philosophy in the generation after Locke and Leibniz, into the eighteenth century to Kant; second, the problem of finding the major task of philosophy that philosophers faced when the sciences gradually took over from natural philosophy the exploration of nature; and, third, the degree to which the separation of science from philosophy has determined the long-term direction of philosophy.

The first two issues are not especially problematic, and could be developed without too much difficulty. The third is considerably more complex, but it is the fundamental concern of the thesis and this study. For, that concern is not with the seventeenth century exclusively. It is, rather, with philos-

ophy's present--with how consideration of philosophy's past sheds light on issues which are central to philosophy's present.

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