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The Foundations of Pragmatism: Reclaiming the Pragmatic A Priori

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Abstract

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By Matthew Traut

In the wake of the Scientific Revolution, the legitimacy of knowledge derived from experience could hardly be doubted. Subsequent history has only reinforced the importance of empirical knowledge. However, there are certain domains of knowledge, particularly formal knowledge, that are not obviously based on experience. Traditionally, these domains of knowledge were understood as *a priori*. Developments in symbolic logic seemed to indicate the possibility of reducing all *a priori* knowledge to tautology. By the middle of the Twentieth Century, it became clear that this reduction would fail. Subsequently, the focus of the philosophical community has largely shifted away from considerations of the *a priori*.

This dissertation considers one possible rehabilitation of *a priori* knowledge. The tradition that culminates in the Incompleteness Theorem begins in Kant's categorization of *a priori* knowledge as analytic or synthetic. As the tradition developed, the synthetic *a priori* was largely rejected in favor of the analytic *a priori*. The pragmatic epistemology of John Dewey offers an alternative to the tradition, without completely rejecting the Kantian structure.

Dewey's version of the *a priori* involves a radical reorientation of the Kantian understanding of *a priori* knowledge. The most dramatic aspect of this reorientation is the prominent place assigned to possibility in Dewey's view. In the traditional view, the *a priori* was most naturally associated with necessity. Additionally, his account is not foundational, in the traditional sense. Although *a priori* knowledge has a unique status in his system, it does not provide material to justify empirical propositions.

This demonstration has several critical components. First, some understanding of the Kantian *a priori* must be presented. This presentation will establish a critical background; against which Dewey's conception can be evaluated. Second, a general account of Dewey's epistemological position must be provided. Specifically, an account of Dewey's epistemology must include an account of the functional role of *a priori* knowledge. Finally, Dewey's writings on the traditionally *a priori* domains of logic and mathematics must be examined. The outcome is account of the *a priori* that illustrates both its continuity with and difference from the original Kantian conception.

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Introduction

"There is no doubt whatever that all our cognition begins with experience…." "It is […] at least a question requiring closer investigation, and one not to be dismissed at first glance, whether there is any such cognition independent of all experience and even of all impressions of the senses."[1] These somewhat paradoxical statements appear in Kant's Introduction to the B-Edition of *The Critique of Pure Reason*. In the wake of the Scientific Revolution, the legitimacy of knowledge derived from experience could hardly be doubted. Subsequent history has only provided more reason to accept knowledge based on experience. However, even though it has not been dismissed, the question of knowledge independent of experience has not faired so well. In a contemporary context, there is good reason to wonder why we do not simply answer Kant's question in the negative.

The locus of the inquiry, particularly in the Twentieth Century, is the status of formal knowledge; logic and mathematics. Given the ever increasing success of empirical science, the relative importance of the *a priori* has diminished. In the *Critique*, Kant identifies the defining characteristics of the *a priori* as universality and necessity.[2] The combination of these two features, understood in a general way, can be taken to indicate an inviolability. Those pieces of knowledge which are genuinely *a priori* will never be violated by any experience. The candidates for this status have been shown to have exceptions. A famous example of this process is the demonstration that, in some empirical cases, triangles may have interior angles whose sum is greater than 180°. The legitimacy of the universality criterion itself has also been subject to doubt. As our

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[1] Immanuel Kant, *The Critique of Pure Reason*, trans. and ed. Paul Guyer and Allen W. Wood (New York: Cambridge University Press, 1998), 136.
[2] Kant, *The Critique of Pure Reason*, 137.

ability to travel has increased, we have encountered groups with few, if any, obvious common concepts. Such experience must cast doubt on whether there is any truly universal knowledge. These considerations, among others, have led many contemporary thinkers to reject all *a priori* knowledge.

One motivation for retaining an interest in knowledge independent of experience is its potential use as a common standard for human knowledge. If knowledge has no source other than experience, it is doomed to be idiosyncratic. We accept that each individual's experience differs from every other's. If there is no source of knowledge outside of that experience, then those individuals' knowledge will be similarly idiosyncratic. At a more practical level, the identification of knowledge that transcends cultural or political background provides a substantial basis for the interaction of individuals across those backgrounds. These considerations, positive and negative, seem to articulate the current stakes in the Kantian question. Although I do not propose to respond to all of these issues in this dissertation, they do form its motivational background.

I. The Nature of the *A Priori*

At the most basic level the distinction between the *a priori*, knowledge independent of experience, and the *a posteriori*, knowledge that depends on particular experiences, captures a feature of the knowledge experience itself. When we consider the things we suppose we know, we identify, at least, two broad categories. There is an apparent difference between the claim "The statue in Trafalgar Square is Admiral Nelson," and the claim "2 + 2 = 4". The first claim requires an experience, of London and the identity of Admiral Nelson for example, that might not be possessed by all individuals. The second claim seems substantially different. Even if we encounter individuals who do not immediately recognize the legitimacy of the claim, it could be demonstrated to them without having to travel anywhere or produce any specific objects. In this sense, it seems that individuals who share few experiences might come to recognize the latter claim. It seems to be a basic criterion of any epistemology that it explain, even if it explains away, this distinction we encounter in assessing our own knowledge.

Although the interest in the *a priori* can be found, in some form, in Plato and Aristotle, Kant's articulation is especially prominent. Kant's articulation of the distinction between the *a priori* and *a posteriori* cannot be considered without also considering the coordinate categories of the analytic and the synthetic. Although, it is generally accepted that the category of the analytic *a posteriori* is empty, there is some room for debate. The synthetic *a posteriori* includes all knowledge derived from experience of the world; the identity of the Trafalgar statue is a clear example of the *a posteriori*. In the case of *a priori* knowledge, this distinction between the analytic and synthetic seems intended to capture, among other things, the difference between the claims "All bachelors are unmarried men," and "The sum of the interior angles of a triangle is 180°." The distinction between the two is based on the sense that the first is true by stipulation, and the second is discovered, in some way. The history of philosophy since Kant has not been kind to his quaternary distinction. I would go so far as to say, that though he identifies significant differences among knowledge claims, his association of these terms muddies the water.

II. The *A Priori* Since Kant

The specific difficulties of the *a priori* first appear in the treatment of the category defined as synthetic *a priori*. This category can be construed to include all mathematical knowledge; or, if not all, at least the most primitive propositions. The distinguishing feature of the synthetic *a priori* is a sense of discovery. In order to explain the particular kind of discovery that defines synthetic knowledge, Kant relies on a conception of intuition. We discover synthetic *a priori* truths by intuitively observing them. Kant describes the process of recognizing that "7 + 5 = 12." It involves the consideration of some supplementary object, like dots or fingers, that exemplifies the equality.[3] This distinguishes the synthetic *a priori* from analytic *a priori* knowledge, which is stipulated through the definition of concepts, and *a posteriori* knowledge, which is synthesized from particular sensory information. However, there seem to be significant doubts concerning this faculty of intuition in the production of *a priori* knowledge. If some sort of observation is necessary, then it is unclear how the knowledge produced remains independent of those experiences. This question, however, is one that seems answerable through an examination of Kant's more detailed explanation.

In addition, views concerning the nature of mathematical knowledge, which constitutes the core of the synthetic *a priori*, changed significantly. The most significant of these changes is due to the development of formal techniques in logic. Around the turn of the Twentieth Century, techniques in the symbolization of inference seemed to indicate the possibility of reducing mathematical knowledge to logic. The philosopher Rudolph Carnap makes this understanding explicit, "…this [the deductive component of science] includes calculation, which is a special form of deduction applied to numerical

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[3] Kant, *The Critique of Pure Reason*, 144.

expressions."[4] Ultimately, the claim is that "2+2=4" is merely an instance of *modus ponens*, in the same way that "If there's smoke, then there's fire. There is smoke. Therefore, there is fire," is. For a period of time, many were extremely optimistic that these techniques could explain all mathematical knowledge. Since they were based on forms identified by the principle of substitution *salva veritate*, they seemed admirable examples of the analytic *a priori*. Thus, it seemed that Kant was partly right; the distinction between *a priori* and *a posteriori* was simply reduced to the distinction between analytic and synthetic.

From this point, things only get worse for the Kantian taxonomy. In order to understand this difficulty, it is necessary to consider the development of the project to reduce mathematical knowledge to logic. Bertrand Russell, A.N. Whitehead, and Gottlob Frege developed new techniques to represent logical inferences in symbolic form. This allowed them to develop an understanding of logical structure that was independent of the meaning of the terms involved. Although their work includes a semantic component, it is very different from the ordinary sense of semantics we have been discussing. Based on these advances David Hilbert, in 1899, publishes a formal axiom system for geometry. In the same year Giuseppe Peano published a formal axiom system for arithmetic (including basic number theory). These developments lead to a renewed enthusiasm for the possibility of explaining mathematics as an application of logic. The most developed version of these ideas is the "Hilbert Program."

One obvious source to begin to understand Hilbert's program is the address he gave, on August 8, 1900, in Paris. This address is one of the primary sources of the

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[4] Rudolph Carnap, *Foundations of Logic and Mathematics* (Chicago: University of Chicago Press, 1939), 1.

famous "Hilbert Problems". It is also the source of one of Hilbert's most characteristic assessments of mathematical knowledge, the "*non ignorabimus*." Hilbert says, "This conviction of the solvability of every mathematical problem is a powerful incentive to the worker. We hear within us the perpetual call: There is the problem. Seek its solution. You can find it by pure reason, for in mathematics there is no *ignorabimus*."[5] It is worth pausing for a moment and appreciating the power of this promise. In mathematics, uniquely among human endeavors, we need not be satisfied with inaccuracy. We can aspire to perfection. If we had sufficient resources we could know the entirety of mathematics. The optimism of Hilbert's program is the acme of the Kantian ideal. Mathematical knowledge, as *a priori*, is universal and necessary. As such, given sufficient time and resources it should be possible to exhaust its scope.

The period of Hilbertian optimism, then, represents the highest point in the history of the *a priori*. It provides a relatively clear sense of the full presentation of its domain. Mathematical knowledge will be reduced to logical knowledge, and logical knowledge rests, ultimately, on tautology. Although different from Kant's conception, notably in the lack of any innovation or discovery, the program has the advantage of vindicating the basic aspects of *a priori* knowledge. Both its necessity and universality are clearly explained. However, the golden age was short. Hilbert proposed his program in 1900, and by 1931 it was substantially destroyed. Although various reformed versions exist today, the wholehearted optimism of the "*non ignorabimus*" is completely gone.

The collapse of Hilbert's optimism is the result of a single paper, published by Kurt Gödel in 1931; "On Formally Undecidable Propositions of Principia Mathematica

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[5] David Hilbert, "Mathematical Problems: Lecture Delivered before the International Congress of Mathematicians at Paris in 1900," trans. Mary Winston Newson, *Bulletin of the American Mathematical Society* 8 (1902): 437.

and Related Systems." In that paper, Gödel demonstrated that the supposed reduction of mathematical knowledge to analytic knowledge was doomed to failure. The Incompleteness Theorem shows that, not only does the reduction fail, but it must fail. There is no sufficient axiomatization of mathematical knowledge. The *a priori*, then, could not be vindicated through a reduction of the category to the analytic. Further, the apparent promise of the program of Hilbert in mathematics and Russell and Frege in philosophy had largely convinced the community that such a reduction represented the way forward. This result was the end of most of the investigations into the foundations of mathematics.

After Gödel's paper, the hope of a unified domain of the *a priori* was lost, at least in traditional terms. By the middle of the Twentieth Century, the focus of the philosophical community had largely shifted away from considerations of the *a priori*. Philosophers like Sellars, Quine, and Davidson continued to discuss logic, but they did so in an idiom that did not include the *a priori*. The general philosophical position on the *a priori* seems well captured by Scott Soames, in his history of analytic philosophy. He says, "…the distinction between analytic and synthetic truths should coincide exactly with the necessary/contingent distinction, and the apriori/aposteriori distinction. …[such that,], all necessary and apriori truths are analytic, and it is only because they are analytic that they are necessary and apriori."[6] The publication of Quine's "Two Dogmas of Empiricism" totally undermines that constellation of concepts.[7] The result of that article was that contemporary philosophers have largely abandoned the question of knowledge independent of experience.

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[6] Scott Soames, *The Dawn of Analysis,* Vol. 1 of *Philosophical Analysis in the Twentieth Century* (Princeton: Princeton University Press, 2003), 353.
[7] Soames, *The Dawn of Analysis,* 354-355.

Contemporary philosophy, particularly in America, is still largely defined by Quine. That statement should not be taken to minimize the plurality of perspectives among academic philosophers. However, I believe it does capture the current state of the native philosophical tradition. It would seem, at this point, that the *a priori* is no longer a live philosophical topic. It may retain interest for historians, but it does not have a place in the current conversation.

III. The Future of the *A Priori*

I wish to argue that the consignment of the *a priori* to antiquity is a mistake. I believe that the retention and reformation of a distinction between *a priori* and *a posteriori* knowledge remains possible in a contemporary context. Before rehabilitating the *a priori*, however, we should remind ourselves what we have lost. One of the first aspects of the *a priori* to be identified is its universality. For Kant, universality was understood in a strong sense. For him, things that are known *a priori* will never find exception. While such universality would be valuable, the history suggests that, in the strongest sense, universality is unattainable. That being said, there is still reason to desire a weaker sort of universality. In particular, there is reason to desire knowledge that does not depend on an individual's particular experiences. It is ultimately this sense of a knowledge that is the common possession of humanity, as a whole, that is lost when the *a priori* is abandoned completely.

Although an analytic conception of the *a priori* may provide justification for some substantial part of the domain of the traditional *a priori*, the collapse of the Hilbert Program demonstrates that such a justification will remain, necessarily, incomplete. In some sense, the lack of complete justification is an esoteric concern. However, such a lack seems to undermine the character of the *a priori*, as a whole. There is a clear sense in which the *a priori*, as a universal and necessary structure, stands or falls as a whole. If there were no other alternative, the piecemeal justification provided by the analytic tradition would have to suffice. However, such recourse does not seem sufficiently motivated. If an alternative could be found, which more adequately supported a complete justification of the *a priori*, it would be obviously preferable.

The notion of a common core of human knowledge, if it could be defended, would have far reaching consequences. It would, at the very least, offer hope that the most pernicious human disagreements could find resolution. Even if those disagreements were intractable for practical reasons, the acknowledgement of knowledge that unites us as human would change our perception of ourselves as a species. Biology has largely succeeded in demonstrating that there is no material basis for the divisions we find among people. I believe that a rehabilitation of the *a priori* might serve a similar function in philosophy, and the humanities at large.

If the *a priori* is to be rehabilitated, what criteria must be met? The most obvious criterion seems to be an account that does not rely on intuition. We cannot simply retrace Kant's missteps. I believe that the satisfaction of this criterion requires attention to the synthetic *a priori*. The consideration of *a priori* knowledge as analytic seems to me to have been exhausted in the development and collapse of the Hilbert Program and traditional analytic philosophy. The second likely criterion seems to be an ontological austerity. If a category as contentious and battered as the *a priori* is to be brought back, it cannot bring any more contentious entities along with it. Finally, our account must explain everything that the other accounts do; and, if possible, more. One of the reasons for moving on without the *a priori* has been the ability of later theories to explain a great deal. To revive the *a priori* we must show that its cost, in terms of epistemic explanation, is not too high.

If we are to meet these criteria, what resources are available? I think the answer to this question is, "Surprisingly many." The tradition that abandoned the *a priori* was not the only tradition, though it was dominant. In the following chapters, I will argue that the American Pragmatist tradition, exemplified in the work of John Dewey, possesses the resources to meet these criteria, and rehabilitate the *a priori*. It is important to note, however, that the conception of the *a priori* that can be reclaimed is not the Kantian one. The failure of the concept will not be simply reversed. It is perhaps best to say that the concept will be *reconstructed* rather than reclaimed. At the conclusion of this reconstruction, I believe that we will arrive at a concept that is recognizably *a priori*, but that avoids the most obvious shortcomings of the traditional conceptions.

IV. Dewey

The first major obstacle to the claim that there is a role for *a priori* knowledge in a pragmatic theory of knowledge is the claim that the Pragmatists, and Dewey in particular, are committed to *a priori* knowledge at all. If the only legitimate sense of the *a priori* is the orthodox Kantian sense, Dewey is not committed to the *a priori*. His criticism of Kant's view is based on the fact that Kant takes the *a priori* to impose norms on experience from an external position. He argues that there is no preexisting form imposed on experience. However, he is committed to the existence of a general standard for knowledge. He argues that any theory of knowledge based on the claim that knowledge is 'relative' already implies the existence of some absolute. This absolute is an analogue of the *a priori*. It provides the stable grounding that makes general knowledge claims possible. Even if it is admitted that this aspect of Dewey's critical philosophy commits him to a structural analogue of the *a priori*, it does little to explain what might fill this role.

In his early work, most of Dewey's considerations of logic are critical. He argues against the understanding of logic common among his contemporaries. He also presents arguments against the traditional understanding of necessity; suggesting that it will not be a feature of his conception of the *a priori*. His discussion of mathematical reasoning, in *The Psychology of Mathematics*, provides an account based on the experience of equating means to ends in practical activities. At this stage of his development, Dewey does not provide sufficient resources to argue that this knowledge is *a priori*; its connection with practical activities might seem, under some conceptions, to argue against such a designation.

It is only in his later work that Dewey presents a fully articulate epistemological view. His first statement of the position, in *The Quest for Certainty*, identifies scientific inquiry as the primary object of epistemic explanation. The ideal of certainty, as the object of that inquiry, arises from anxiety concerning the future. Since the world of activity is subject to change and the hazards of circumstance, philosophers have tried to establish domains free from those perils. However, the greatest hope for security and stability comes from the control over the natural world provided by science

This view is developed in *Logic: The Theory of Inquiry*, which presents Dewey's account of the development of logic, as a function of the structure of inquiry. One of the most important distinctions in this work is the distinction between empirical and experimental experience. Empirical experience is merely the sensory observation of the world, with no attempt, other than the most basic directing of attention, to control the information. Experimental experience is directed by some goal. The nature of the teleology of experiment is identical to the teleology imposed by the disequilibrium of organism and environment. In this sense, Dewey seems to provide a naturalistic account of teleology. Logic, as it is understood in this work, is based on this inherent structure of inquiry.

The claim that Dewey maintains any commitment to a conception of *a priori* knowledge must, first, demonstrate continuities between elements of his view with the traditional views that allow its identification as *a priori*. In demonstrating these continuities, it is vitally important to acknowledge Dewey's strong criticism of the Kantian view of the *a priori*. Those criticisms not withstanding, there are several important aspects of Dewey's position that indicate his acceptance of some version of *a priori* knowledge. Most importantly, Dewey develops a view of specific domains of knowledge, mathematics in particular, which are not dependent upon experience. The independence, although complicated, seems to be the most obvious identifier of a conception of the *a priori* In addition to independence, however, Dewey also accounts for the traditional features of universality and necessity: although those concepts are substantially reinterpreted.

If it is accepted that Dewey maintains a commitment to the *a priori*, it must also be accepted that his version of this concept is drastically different than the traditional view. In the first place, Dewey is able to provide an account of the genesis of *a priori* knowledge out of ordinary epistemic activities. There is no appeal, as in Kant, to a special faculty that allows the *a priori* character of certain propositions to be appreciated. In the second place, Dewey radically reorients the structure of the concepts constituting the *a priori*. The most dramatic aspect of this reorientation is the prominent place assigned to possibility in Dewey's view. In the traditional view, the *a priori* was most naturally associated with necessity. Although Dewey accounts for the necessary character of *a priori* knowledge, it is a consequence of the relationship between the *a priori* and possibility. Finally, his account is not foundational, in the traditional sense. Although *a priori* knowledge has a unique status in his system, it is not justificatory. In fact, the independence of the *a priori* precludes its use in justifying any proposition with existential reference.

The selection of Dewey's work as an example of a reformed concept of *a priori* knowledge requires one additional explanation. It may be objected that focus on Dewey is anachronistic. Although Dewey is a contemporary of Gödel, there is no evidence he was aware of Gödel's work. Further, his most productive period predates Quine's most significant work by decades. Historically, then, it is impossible for Dewey to have been aware of the implications of their work. I do not wish to suggest that Dewey anticipates their work. Rather, Dewey seems to develop a position that avoids these difficulties, not through prescience, but heterodoxy. Dewey's position is a largely unexplored alternative to the tradition. Given that we are in a position to identify deficiencies in the tradition, the value of alternatives is emphasized.

By the end of this dissertation, then, I hope to demonstrate that Dewey's work can include a meaningful conception of the *a priori*. This demonstration has several critical components. First, some understanding of the Kantian *a priori* must be presented. This presentation will establish a critical background; against which Dewey's conception can be evaluated. Second, a general account of Dewey's epistemological position must be provided. Specifically, an account of Dewey's epistemology must include an account of the functional role of *a priori* knowledge. Finally, Dewey's writings on the traditionally *a priori* domains of logic and mathematics must be examined. These analyses provide the most complete presentation of the nature of *a priori* knowledge in Dewey's work. The outcome of this investigation, then, will be an account of Dewey's *a priori* that illustrates both its continuity with and difference from the original Kantian conception.

V. Plan of the Chapters

Chapter 1: Kant and the Synthetic *A Priori* – The purpose of the investigation of Kant is to provide a basis for my claim that Dewey retains a version of *a priori* knowledge. In order to make the claim that he accepts such a concept, it is necessary to identify its distinguishing features. Unfortunately, in the case of the synthetic *a priori*, this identification is not simple. Among Kant's conceptual legacies, the synthetic *a priori* is arguably the most problematic. In order to provide the most detailed expression of the full range of complex issues involved, I have chosen to rely on the interpretive work of contemporary scholars. Their presentations have the advantage of including not only the details of Kant's view, but also the contemporary criticisms of it. The insufficiency of the Kantian synthetic *a priori* is particularly important if we are to effect a reconstruction. Any conception of the *a priori* advanced by Dewey, if it is to be accepted, will have to avoid the difficulties of the Kantian position. Thus, the discussion of Kant must provide a sense of the identifying features of the synthetic *a priori* along with a general set of criteria that any improvement must meet.

Chapter 2: Dewey's Early Work; Psychology, Meaning, and Organic Unity – Dewey's early writings identify a set of problems that occupy him throughout his career. These writings are particularly important as they include Dewey's consideration of Empiricism, Rationalism, and Idealism. It is important that Dewey's introduction of the 'psychological method' is largely motivated by the failure of these earlier traditions. His attempt to provide an account of absolute or universal consciousness represents his earliest attempt to rectify those failures. Dewey's conception of experience as a unified whole is important because it seems to provide an alternative to the Kantian conception of intuition. Many of these writings contain Dewey's explicit commitment to a version of the *a priori*, though they do not include a complete account. These early writings also introduce the connection between experience, taken as a whole, and the phenomenon of meaning. Meaning, as later chapters will make clear, is the genesis of the *a priori* in Dewey.

Chapter 3: Radical Empiricism – Dewey's writings around the turn of the Twentieth Century develop the epistemological position that he calls "Radical Empiricism." It is important to connect the discussions of experience, in these works, with the discussions of the universal conditions of knowledge. There, the focus was on providing a response to relativism. Here, the focus and terminology shifts to a criticism of subjectivism in psychology. However, it is important that Dewey maintains a commitment to a conception of experience that is not wholly subjective. The commitment to the 'absolute' and 'universal' character of experience is weakened, but its generality is not abandoned. It is also important that experience is continuous, in a non-formal sense. The continuity of experience will be extremely important to the discussion of mathematical knowledge in the next chapter. Finally, this chapter will establish the connection between meaning and *a priori* knowledge. As forward-looking, knowledge requires a regulative component. When this component is made explicit, its consequences are known *a priori*.

Chapter 4: *The Psychology of Number* – This chapter will consider Dewey's only book length treatment of mathematics, albeit only as a co-author. *The Psychology of Number* provides a detailed description of the origin of numerical concepts and arithmetic operations. I will present these descriptions with particular attention to the connections between them and Dewey's discussion of more general epistemic issues. The outcome of this examination offers some general features of the revised conception of the *a priori*.

Chapter 5: Knowledge and Experiment – This chapter will provide a detailed examination of two important presentations of Dewey's mature epistemology; *The Quest for Certainty*, and *Logic: The Theory of Inquiry*. The former provides a general presentation of Dewey's epistemology. The most significant aspect of his mature orientation is his insistence on the paradigmatic character of experimental science. The focus on science is a development of his revision of Empiricism. Although his interest in that development remains, his project in his mature works is more general. *The Quest for Certainty* provides an overview of the development of scientific knowledge out of ordinary problem-solving. The *Logic* considers the implications of this connection for the methods of scientific inquiry. The hope of the work, he says, is to reform logic, broadly construed, such that it adequately represents the methods of science.

Chapter 1: Kant and the Synthetic *A Priori*

I. Introduction

If we want to investigate the possibility of rehabilitating the *a priori*, we must investigate Kant's views. I believe that the rehabilitation of the *a priori* will depend on emphasizing the synthetic aspects of *a priori* knowledge. Twentieth century analytic philosophy focused on the analytic *a priori*. That focus was extended to the point that *a priori* knowledge was reducible to analytic knowledge. Given the failure of the analytic project, the hope for the reconstruction of the *a priori* seems to lie in the synthetic *a priori*. In order to evaluate whether Dewey does posses any concept that is recognizable as such, and to determine how his conception differs from Kant's, it is necessary to establish a point of comparison.

Unfortunately, Kant's intellectual legacy is less helpful than it might be. Thinkers after Kant have not been as interested in explicating the synthetic *a priori* as other areas of his thought. Interest in his philosophy of mathematics has been sporadic, at best. This is particularly clear in the Twentieth Century. Mathematical developments in the Twentieth Century have led even sympathetic commentators to deride or ignore Kant's views on mathematics. The most conventional attack focuses on the apparent difficulty posed by the advent of non-Euclidean geometries. However, additional difficulties arise out of Kant's view on the nature of algebraic reasoning, and the relationship between arithmetic and geometry.

Luckily the Kantian tradition is not devoid of serious investigations of his philosophy of mathematics. Thinkers as significant as Frege and Russell have found Kant's views worthy of investigation. Sustained scholarly activity, in more recent history, begins with Charles Parsons and Jaakko Hintikka. The debate between Parsons and Hintikka sets the stage for the even more recent work of scholars like Michael Friedman and Lisa Shabel. The work of these scholars will be the basis for my consideration of the relevant Kantian themes.

I have chosen to use secondary sources, rather than consider the Kantian text itself, for two reasons. The first reason is methodological. I am not interested in the Kantian project as an historical artifact. I am interested in the way that Kant's views function in a modern context. Therefore, it seems reasonable to consider the expositions of Kant's work during this period. The second reason is practical. Kant's work is so influential that it has been the subject of critical attention since its writing. I am no Kant scholar, so my own reading of the text is likely to be superficial. In order to provide the most through and persuasive interpretation of Kant's position, I have, therefore, chosen to rely on the work of several eminent scholars.

Before considering various interpretations of Kant, it will be helpful to present the general structure of Kant's epistemology. In the first place, it is necessary to say something about Kant's distinction between analytic and synthetic judgments, and how that distinction is related to the distinction between *a priori* and *a posteriori* knowledge. Secondly, it is necessary to give a brief characterization of the distinction between concepts and intuitions, and their place in the Kantian system. By providing a very schematic account of these features, the significance of the various interpretations will be clarified.

Sebastian Gardner provides an explanation of the basic structure of Kant's epistemology in his commentary on the *Critique of Pure Reason*. The context of Kant's epistemology is the dominant position of his time, derived from both Leibniz and Hume, that all knowledge can be divided into two classes, which might be called *a priori* and *a posteriori*. *A priori* knowledge is necessary, and includes both metaphysics and mathematics. *A posteriori* knowledge is contingent, based on experience, and includes the natural sciences. Kant accepts the traditional understanding of these two types of knowledge. However, he complicates the taxonomy by introducing a new element; the distinction between the analytic and the synthetic.[8]

In the simplest terms, analytic judgment is tautology. It is, as Kant says, "thought through identity." An analytic judgment, like 'All triangles have three sides,' recapitulates content in the predicate that is contained, at least implicitly, in the subject. A triangle simply is a figure with three sides, so the judgment connecting the two is merely a covert identity claim. Synthetic judgments, on the other hand, extend knowledge beyond what can be determined by identity. The claim that the sum of the interior angles of a triangle equals one hundred and eighty degrees is not identical with 'triangle'. When the claim is asserted, some property, beyond what is already meant in the subject, is identified.[9]

It is not the nature of these terms that constitutes Kant's innovation, rather it is his claim about their relation to the original *a priori*—*a posteriori* pair. Rationalists and Empiricists will recognize the existence of analytic and synthetic judgments, however they are coordinate with the *a priori – a posteriori* pair. All *a priori* knowledge is analytic, because, as *a priori* it does not depend on any external facts. All synthetic knowledge is *a posteriori*, because as synthetic it must derive its warrant from some

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[8] Sebastian Gardner, *Routledge Philosophy Guidebook to Kant and the "Critique of Pure Reason"* (New York: Routledge, 1999), 52.
[9] Gardner, *Routledge Philosophy Guidebook to Kant and the "Critique of Pure Reason,"* 54-55.

external source, which could only come through experience. Kant's great innovation is to suggest that there is some knowledge that is both synthetic and *a priori*. The realization of this claim is the context for Kant's discussion of mathematics; because mathematics constitutes the most significant example of synthetic *a priori* knowledge.[10]

Having largely abandoned the structures of Rationalism and Empiricism, Kant is forced to present his own conception of cognition. Kant's conception of cognition rests on the interaction of concepts and intuitions. Concepts, in the most basic sense, are objects of thought. They are based on an understanding of objects through some feature that all the objects share. Intuitions are the way in which objects are presented to the mind. In the simplest terms, intuitions involve some process similar to sensation. Knowledge involves the interaction of these two. Intuitions provide the objects to which concepts apply, and concepts provide the relationships among objects that make them thinkable.[11] The exact natures of intuitions and concepts are the subject of much of this chapter. The details of concepts and intuitions, and their relation to the *a priori* – *a posteriori* distinction will have to await those investigations.

II. Intuition

There can be no dispute that intuition is an essential part of Kant's epistemology. Intuitions, along with their conceptual counterpart, are the substance of knowledge. It is not surprising, then, that intuition plays an important role in Kant's understanding of mathematical knowledge. Such knowledge, as synthetic *a priori*, is determined by its relation to intuition. So, keeping in mind the more general concerns about mathematical knowledge, we may turn to a discussion of intuition.

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[10] Gardner, *Routledge Philosophy Guidebook to Kant and the "Critique of Pure Reason,"* 55-57.
[11] Gardner, *Routledge Philosophy Guidebook to Kant and the "Critique of Pure Reason,"* 66-67.

Serious scholarly interest in Kant's philosophy of mathematics begins with a dispute concerning the nature of intuition. There had been some interest in Kant's mathematical thought before the work of Hintikka and Parsons; most notably the work of Gottfried Martin[12]. However, by the early Twentieth Century most thinkers had come to view Kantian theories of mathematics as seriously flawed, at best. Both Russell and Frege combined this view with a deep respect for Kant. It was their misgivings, along with the power of new developments in logic, that combined to dissuade serious attention to Kant's views.

Interest in Kant's views was cultivated, beginning in the late 1960's, by two prominent philosophers, Charles Parsons and Jaakko Hintikka. The dispute between these two, concerning Kant's view of intuition and its consequences, is the beginning of the contemporary interpretive tradition. The dispute turns on the apparently minor point of whether intuitions must be characterized as immediate individual representations, or whether they may be characterized simply as individual representations. The implications of this distinction quickly become more significant, affecting our understanding of the relationship between intuition and sense perception. In order to provide a basic characterization of Kantian intuition and its relation to mathematics, I will provide a sketch of the dispute between Parsons and Hintikka.

A. Charles Parsons

In 1964, Charles Parsons published a paper on Kant's theory of space. The argument of the paper involves the demonstration that, when taken together with his views on possible experience, Kant's belief in synthetic *a priori* knowledge of space,

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[12] Gottfried Martin, *Arithmetic and Combinatorics: Kant and His Contemporaries*, trans. and ed. Judy Wubnig (Carbondale, Illinois: Southern Illinois University Press, 1985).

leads to insuperable difficulties. Parsons argues that Kant's view that we know space to be both infinite and infinitely divisible is at odds with his claim that synthetic knowledge is knowledge of 'possible experience'. He argues that the infinitary features of space could never be the object of possible experience, given humans' thorough finitude. In arguing for this claim, Parsons presents a characterization of intuitions, which becomes the subject of the subsequent debate.[13]

Parsons provides his first definition of intuitions early in the paper. He says that "…intuitions, like anything 'in the mind,' are representations."[14] As representations, intuitions refer to objects. Their reference consists in, at least a potential, connection to an object and their content is represented as belonging to the object of their reference. Intuition is additionally defined as "…being in immediate relation to objects, and by being in relation to, purporting to refer to, individual objects."[15] It is this definition, and its consequences, which forms the subject of the debate with Hintikka. Parsons also claims that Kant supposes a close relationship between intuition and sensibility. We have intuitions as a result of the effect of objects on our senses. This point, too, will be important in the debate.[16]

There are several other features of intuitions, which become extremely important to any discussion of mathematics. Kant believes that there are some common characteristics of all intuitions. The commonality of these features distinguishes them as features of intuition, *per se*, rather than features of any particular intuition. These are the 'forms of intuition,' and the representation of objects in space and time is the most

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[13] Charles Parsons, "Infinity and Kant's Conception of the 'Possibility of Experience,'" *Mathematics in Philosophy: Selected Essays* (Ithaca, New York: Cornell University Press, 1983), 95-109.
[14] Parsons, "Infinity and Kant's Conception of the 'Possibility of Experience,'" 96.
[15] Parsons, "Infinity and Kant's Conception of the 'Possibility of Experience,'" 96
[16] Parsons, "Infinity and Kant's Conception of the 'Possibility of Experience,'" 96-97.

significant. The contribution of the forms of intuition is knowledge about the mathematical properties of space. Since these features pertain to the form of intuition, rather than any particular intuition, they are knowable *a priori*.[17]

In broad strokes, these remarks characterize Parsons' views about Kantian intuition. He develops this characterization, already in response to Hintikka's criticisms, in a paper from 1969. As we have seen, intuitions are in the first place singular; they refer to only one object. In this feature, they are contrasted with concepts, which characterize several objects by means of a common feature. The immediacy of intuitions is not simply a consequence of their singularity, according to Parsons. It is possible to imagine a singular, mediate representation; namely a definite description. Thus, Parsons insists on immediacy as an independent criterion of intuition.[18]

The insistence on immediacy leads Parsons to connect intuition with sensibility. He says, "A thesis about intuition which is of great importance for Kant is that our mind can acquire intuitions of actual objects only by being *affected* by them."[19] This insistence on objects impinging on the mind leads to an association with sensibility. The only way the mind is affected by objects is through the senses. Objects, or their physical effects, impinge on the sensory organs creating a mental representation. The significant feature of this process is that the ability to be affected in this way determines certain features of the *mental* representation. As we have already seen, paramount among these features is spatiotemporality. The constitution of the knower requires that all objects that affect her are represented in space and time. Since our mathematical knowledge is based on an

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[17] Parsons, "Infinity and Kant's Conception of the 'Possibility of Experience,'" 97.
[18] Charles Parsons. "Kant's Philosophy of Arithmetic," in *Mathematics in Philosophy: Selected Essays* (Ithaca, New York: Cornell University Press, 1983), 112-113.
[19] Parsons, "Kant's Philosophy of Arithmetic," 114.

intuitive access to this feature of our intuitions, Parsons concludes, it "…is in that sense still an intuition of sensibility."[20] Thus, those features of intuitions, which will be directly connected with mathematics, are connected, here, to sensibility.

The connection of intuition with sensation makes Kant's views on mathematics psychologistic. In essence it connects mathematical knowledge with 'possible experience', where 'possible experience' means sensory experience. Thus, mathematics is not about external objects at all; rather, it concerns features of our representations of those objects. This connection is the source of the problems Parsons diagnoses in Kant's view. In particular, Parsons believes that even the basic features of our geometrical knowledge exceed even the ideal limits of sensory experience.[21] If this is true, then it is hard to see how 'possible experience' could form the foundation of such knowledge. The particular difficulties diagnosed by Parsons concern Kant's philosophy of geometry, more than his view of intuition, and so will be considered later in this chapter.

At this point, it seems important to anticipate some of the issues that will be raised in the consideration of Dewey. The view expressed in *Psychology of Number* is, in many respects, similar to the view Parsons ascribed to Kant. In particular, mathematical knowledge, it will be argued, arises out of an assessment of the possibilities of experience. On the one hand, this connection is significant in defending the proposition that Dewey's view is sufficiently continuous with Kant's to be correctly called *a priori*. On the other hand, this connection raises the possibility that Dewey's views are susceptible to the same criticisms that Parsons raises about Kant's. However, Dewey's views, as developed in his mature works, differ from Kant's in a critical respect. Dewey

[20] Parsons, "Kant's Philosophy of Arithmetic," 115.
[21] Parsons, "Infinity and Kant's Conception of the 'Possibility of Experience,'" 96.

abandons any view of intuition as affect. Sensibility is not a paradigm for Dewey in the way it is for Kant. The divergence allows Dewey to provide a radically different understanding of 'possible experience' than Kant's.

B. Jaakko Hintikka

In 1964, the same year Parsons published his paper on infinity in Kant, Hintikka presented a radio lecture on the BBC. Hintikka's view differs from Parsons' in one important respect. Hintikka believes that intuitions may be understood as simply singular representations; representations of individual objects. The other features of intuition that Kant discusses are merely consequences of their singularity. This difference is apparently minor, but it has significant consequences for the interpretation of the related areas of Kant's philosophy. In particular, it will allow Hintikka to interpret Kant's philosophy of mathematics in a way that neutralizes the pejorative sense of psychologism, without renouncing the connection between mathematics and experience.

Hintikka's understanding of Kantian intuitions begins with his view that Kant belongs to an epistemological tradition that placed great value on 'maker's knowledge'. The 'Copernican Revolution' Kant claimed he had fomented involved a renewed attention to the activity of the knower. Kant believes, according to this view, that we can only have full knowledge of things we have produced. For Kant, synthetic *a priori* knowledge is the most important example of produced knowledge. He quotes Kant in support of this view[22],

> For he [the geometrical innovator] found that what he had to do was not to trace what he saw in the figure, or even trace its mere concept, and read off, as it were, from the properties of the figure; but rather he had to produce the latter from what he himself thought into the object and

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[22] Jaakko Hintikka, "Kant's 'New Method of Thought' and his Theory of Mathematics," in *Knowledge and the Known* (Dordrecht, Holland: D. Reidel Publishing Co., 1974), 126-128.

> presented (through construction) according to *a priori* concepts, and that in order to know something securely *a priori* he had to ascribe to the thing nothing except what followed necessarily from what he himself had put into it in accordance with its concept.[23]

This quotation illustrates Kant's view that synthetic *a priori* knowledge derives its character from its connection with epistemic activity, rather than from any particular connection to sensibility.

Hintikka does not ignore the connections between sensibility and intuition in the Kantian system. As he points out, the spatiotemporal characteristics of our sensations are the results of our mental activity. However, taking the connection between spatiotemporality and activity as a sufficient explanation of Kant's view is a mistake. Kant's reference to intuitions in his philosophy of mathematics is generally taken to mean that mathematical reasoning depends on 'non-logical' evidence; that is, that Kant's view is psychologistic. However, Hintikka believes that intuition need not make any appeal to perception or perception-like imagination.[24] Rather, he says, "…an intuition is simply anything which represents or stands for an individual object as distinguished from general concepts."[25]

In order to understand the confusion many commentators have suffered, Hintikka mentions Kant's reliance on Euclidean examples. Euclid routinely refers to individual objects, whether perceptual or imaginary, in his proof of geometrical theorems. Kant's insistence that mathematics relies on individual representations is a generalization of this feature of Euclid's proof style. Mathematical proof, then, deals with the existence or

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[23] Immanuel Kant, *The Critique of Pure Reason*, 108. (B xi-xii). Hintikka does not quote this passage in full, and he quotes from the Kemp Smith translation. I have chosen to quote whole sentence because the parts not quoted by Hintikka strengthen the claim that Kant is not intentionally psychologistic. I have used the Guyer/Wood translation for consistency.
[24] Hintikka, "Kant's 'New Method of Thought' and his Theory of Mathematics," 129-130.
[25] Hintikka, "Kant's 'New Method of Thought' and his Theory of Mathematics," 130

non-existence of individual objects. On some interpretations such proofs can be reconstructed in modern symbolic logic, with no reference to sensation. However, such an interpretation may seem to stretch Kant's views to their limit.[26] It has the advantage of avoiding the difficulty identified by Parsons. The limitations of our sensory activity now no longer need be taken into account. The only consideration is the mental capacity, in Parsons' language, to take figures as grounds as often as we like. Since the figures are no longer sensory, the difficulty raised by those inherently beyond our capacities is dissolved.

Finally, Hintikka considers the connection of intuition with sensation by considering whether Kant is correct to suppose that individual objects are only given to us in sensations. We should remember that this connection is an important part of Parsons' construal of intuition. Hintikka does not deny that Kant held this view, but he denies that he should.[27] This point identifies one of the important differences between Parsons and Hintikka. Parsons seems more scrupulous about discerning Kant's intentions, even if those intentions lead to insuperable conclusions. Hintikka, on the other hand, is willing to abandon parts of Kant's stated views to present a consistent *kantian* view, if not a Kantian one.

Kant seems to have based his view on the need to explain the generality of mathematics. Kant accepts the Aristotelian view that the knowledge of individual objects must come from the senses. Since Kant believes that mathematical knowledge is generally applicable because it is based on our mental activity, and that this knowledge pertains to individual objects and their relations, he must conclude that mathematical

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[26] Hintikka, "Kant's 'New Method of Thought' and his Theory of Mathematics," 130-131.
[27] Hintikka, "Kant's 'New Method of Thought' and his Theory of Mathematics," 131-132.

knowledge is related to the senses. This conclusion is based on his acceptance of the basically passive view of sensation Kant inherits from Aristotle. However, as we have seen, Kant seems to want to emphasize the role of human activity and construction in his epistemology. Hintikka believes that, if Kant had been consistent in his commitment, he would never have accepted the Aristotelian view. Thus, he would never have associated mathematical knowledge with sensation.[28]

In general Hintikka and Parsons disagree about the distinguishing criteria of intuition in Kant. For Hintikka, intuition is simply "…representation (concept) of a particular (individual in the present-day logical terminology)."[29] That is, they are representations of individual objects. This understanding allows Hintikka to dismiss any connection between intuition and sensation. Hintikka's view does depart from Kant's stated views, however. Parsons' interpretation has the advantage of taking Kant at his word. He is certainly correct that many of the passages from Kant seem to present intuition as immediate, in a way that associates them with sensation. The connection between the forms of intuition and the spatiotemporality of our sensation strengthens the association. However, the association seems to present serious problems for the viability of Kant's epistemology.

The coordinate difficulties faced by these two explanations do not seem easily resolvable through additional investigation of the Kantian corpus. However, it seems that these difficulties might be resolved by a reconsideration of the role of psychology, including sensation, in epistemology. It is my position that Dewey accomplishes this reconsideration. "Maker's knowledge" and epistemic activity form the core of Dewey's

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[28] Hintikka, "Kant's 'New Method of Thought' and his Theory of Mathematics," 131-132.
[29] Jaakko Hintikka, "Kantian Intuitions," *Inquiry*, 15, no. 3 (Autumn 1972), 342.

position from the beginning. I agree with Hintikka that the introduction of these concepts make Kant's account more consistent. However, there is no need to assert them through Kant. Rather than attempt to reform the Kantian system to make it consistent with these commitments, we can simply turn to a system that is constructed around them from the beginning.

The interpretation of intuition is not the end of the story, however. Intuition is, as we have seen, central to Kant's understanding of synthetic *a priori* knowledge, and, in consequence, to his view of mathematical knowledge. Both Parsons and Hintikka present interpretations of these consequences according to their respective views of intuition. In order to understand the issues involved in a Kantian philosophy of mathematics, then, we must consider these interpretations.

III. Geometry, Arithmetic, and Logic

Certainly, Kant had strong views on geometry and its practice. However, the references to arithmetic and algebra in Kant's work are few and obscure, and his view of logic is one of the most difficult aspects of his thought to accept. Kant notoriously believed that logic, as a domain of knowledge, had been exhausted by Aristotle.[30] It is doubtful whether this was an informed opinion, even in Kant's day, but it is absolutely impossible for any contemporary thinker to countenance. These lacunae in Kant constitute the greatest obstacle to the generation of any viable Kantian position on mathematics.[31]

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[30] Parsons, "Kant's Philosophy of Arithmetic," 116.

[31] For the sake of simplicity, I am including logic in the term 'mathematics'. Although I am not entirely comfortable with this inclusion it is merely terminological, and seems preferable to phrases like 'formal knowledge'.

Kantian interpreters respond to these obstacles by attempting to reconstruct, perhaps even construct, Kant's position on the basis of his other views. It is not surprising, then, that the difference between Hintikka's and Parsons' views of intuition lead them to different interpretations of Kant's view of mathematics. In this section, I will present a summary of their respective views. My hope is that this presentation will illuminate the connections between intuition and mathematics as well as presenting some of the general issues involved in any Kantian philosophy of mathematics.

A. Jaakko Hintikka

For the modern commentators considered here, the most important source for Kant's views on mathematics are his remarks on the difference between mathematical and philosophical method. This may seem surprising, since earlier commentators had focused on Kant's discussion of space and time in the Transcendental Aesthetic. However, the discussions in the Aesthetic are not specifically concerned with mathematics. Further, several commentators, including Hintikka, question the obvious relation between the views espoused in the Aesthetic and Kant's views on mathematics.

The most obvious source of Hintikka's understanding of Kant's views on mathematics is his essay "Kant on the Mathematical Method." It provides a succinct presentation of Hintikka's understanding of Kant's views on geometry, arithmetic, algebra, and logic. As we saw above, Hintikka's understanding of Kant as a proponent of 'maker's knowledge' is an important part of his interpretation of intuition. This theme is revisited in the present essay through a focus on 'construction' as a central concept in Kant's views of mathematics.[32]

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[32] Jaakko Hintikka, "Kant on the Mathematical Method," in *Knowledge and the Known*, (Dordrecht, Holland: D. Reidel Publishing Co., 1974), 160.

In Hintikka's view Kant's statement that "…mathematical knowledge is the knowledge gained by reason from the construction of concepts,"[33] is highly significant. The important feature of this definition is the invocation of construction. Construction of concepts involves the display of an intuition that corresponds to the concept. This means that the construction of a concept involves producing an intuition of an object that is an instance of the concept being constructed. In the case of mathematics this construction occurs *a priori*, without any appeal to experience. The exact nature of this production and its products are the essence of Kant's philosophy of mathematics.[34]

Given Kant's appeal to construction, and the predominance of Euclidean geometry in his time, it is natural to associate Kant's constructions with those of geometers. However, this seems to present difficulties. For example, Newton claimed, in the preface to the *Principia*, that mechanics was the basis of geometrical constructions. If this were correct, then the constructions would be no more certain than the practices that produced them. Our geometry would be subject to the inherent inaccuracy of mechanics; subtle defects in the mechanism of a compass, for example. Kant's view that geometrical constructions occur in intuition can be seen as a way of avoiding this conclusion, and preserving the certainty of geometry.[35]

However, the nature of intuition in Kant is far from straightforward. Hintikka points out that it seems plausible to understand Kantian intuitions as analogous to sensations. However, this opens Kant to objections from contemporary thinkers, who point out that modern geometry is carried out formally, without appeal to constructions of

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[33] Hinitkka, "Kant on the Mathematical Method," 160. Quoting Kant, <u>*Critique of Pure Reason*</u> (A 713=B 741)
[34] Hintikka, "Kant on the Mathematical Method," 160.
[35] Hintikka, "Kant on the Mathematical Method," 161.

any kind. Euclid's constructions were necessary because of defects in his axiom set; they are not inherently necessary. However, we have already seen that Hintikka will dispute this view. In this paper, his dispute amounts to the argument that the view of mathematics logically precedes the view of space and time in the Aesthetic.[36]

As we have seen, Hintikka views Kantian intuitions as characterized by individuality. Intuitions are of individuals. In this sense, which he here calls the 'unintuitive' sense, they are not associated with sensations or 'mental pictures'. Kant does reconnect intuitions with sensations, by pointing out that sensation is the only source humans have for intuitions. However this connection relies on the arguments of the Aesthetic, so any argument logically prior would not assume it.[37] So, when considering mathematics we must understand the intuitive constructions in the 'unintuitive' sense.

Hintikka summarizes his understanding of Kant's philosophy of mathematics, saying, "…mathematics as based on the use of constructions has to be taken to mean merely that, in mathematics, one is all the time introducing particular representatives of general concepts and carrying out arguments in terms of such particular representatives…."[38] However, this view takes intuition in its more basic sense, as distinguished from sensation. This interpretation, then, relies on showing that the discussion of mathematics is logically prior to the arguments of the Transcendental Aesthetic. This point seems to further illuminate the dispute between Parsons and Hintikka. Parsons' view, as we saw, connected intuition with sensation. This view had the advantage of taking many of the things Kant says at face value. Now it is clear that it also respects the structure of the argument of the *Critique of Pure Reason*. There, the

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[36] Hintikka, "Kant on the Mathematical Method," 161-162.
[37] Hintikka, "Kant on the Mathematical Method," 162-163.
[38] Hintikka, "Kant on the Mathematical Method," 163

discussion of mathematics comes after the Aesthetic. This seems to lend support to the connection of sensation and intuition. Hintikka's argument requires that we consider the structure of the arguments independent of their textual organization.

Hintikka provides two arguments for the logical priority of mathematics over sensation for Kant. The first is based on the reformulation of the arguments of the *Critique* in the *Prolegomena*. In the *Prolegomena*, Kant appeals to discussions of the methodology of mathematics in those arguments that correspond to the Aesthetic. There are also passages, mentioned by Hintikka, in the Aesthetic that seem to suppose only singularity as the criterion of intuition. He offers the argument for the intuitive character of space as an example. In that argument Kant concludes that space is given in intuition because space is singular. The concept of spaces, in general, comes about only after limitations are placed on the intuition of space, distinguishing 'here' from 'there'. Both of these passages seem to suggest that there is a 'pre-sensory' understanding of intuition that is logically prior to the arguments of the Aesthetic.[39] Hintikka also offers an historical argument based on the fact that Kant seems to view mathematics as predominantly concerned with individuals prior to the development of this mature system.[40]

Hintikka's view is further supported by its consequences for understanding Kant's view of algebraic reasoning. Hintikka points out that previous interpreters had attempted to understand Kant's views on algebra and arithmetic on the basis of their view that intuition amounts to a kind of mental drawing. In the case of geometry, such an understanding might provide an interpretive advantage. However, it is difficult to see

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[39] Hintikka, "Kant on the Mathematical Method," 163-164.
[40] Hintikka, "Kant on the Mathematical Method," 164-165.

how algebra and arithmetic require any 'mental pictures' to occur. This leads some interpreters to despair that Kant has any theory of algebraic reasoning.[41] Hintikka takes the inability to account for algebraic knowledge as further proof that the 'mental picture' view of intuition is flawed.[42]

If Hintikka is correct, how does the understanding of intuitions as simply singular allow him to account for algebraic and arithmetic knowledge, and what does that knowledge look like? Hintikka takes a rather sanguine view of the answer to these questions in the case of algebra. He says, "If we can assume that the symbols we use in algebra stand for individual numbers, then it becomes trivially true to say that algebra is based on the use of intuitions, i.e., on the use of representatives of individuals as distinguished from general concepts."[43] However, Hintikka's view does lead to a straightforward understanding of algebraic equations. The variables are simply representatives of individual numbers, and the equations produced by the introduction of operations likewise stand for some individual number determined by the values of their variables. Further, the creation of equations seems to constitute exactly what Kant means by construction. When one constructs the equation 'a + b= c' a new individual, 'c', has been brought into existence, and it represents the sum of the numbers 'a' and 'b'.[44]

Hintikka allows that the view of intuitions as 'mental pictures' does accommodate some of Kant's remarks about arithmetic knowledge. Kant seems to claim that to establish the truth of arithmetic propositions, like '7+5 =12', we must construct something like an 'image' of the numbers, using imagined points for example. This is

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[41] Hintikka mentions C.D. Broad as an example of this interpretation.
[42] Hintikka, "Kant on the Mathematical Method,"165-166.
[43] Hintikka, "Kant on the Mathematical Method," 166.
[44] Hintikka, "Kant on the Mathematical Method," 166-167.

usually taken to be the basis for Kant's claim that such propositions are 'immediate' and 'indemonstrable'. The sense of these terms seems to be that arithmetic knowledge is analogous to knowledge of an object's color. Though the understanding of intuitions as sensory seems to be able to explain these remarks, it does not provide a seamless interpretation of Kant's views on arithmetic. Hintikka points out that the procedure outlined above seems to be a kind of demonstration, even though it may not be considered a proof. The fact that it seems to require the enactment of a process also complicates the idea that it is immediate. Hintikka suggests that he can rectify these remarks by applying his view of intuition. However, their import is only made clear through an analogy with geometrical reasoning.[45]

It is clear that Kant's philosophy of mathematics was inspired by Euclid. It is not surprising, therefore, that Hintikka looks to Euclid to expand his interpretation. In general Euclidean propositions begin with general statements. However, the general statements, or 'enunciations', are not the basis of any further demonstration. The demonstrations are carried out on the second part of the proposition, the ecthesis. In this part of the propositions Euclid describes the figures under consideration. It is significant to note that Kant uses the German equivalent of 'ecthesis' in his explanation of construction. On the basis of the ecthesis, an 'auxiliary construction' is carried out. The auxiliary construction involves drawing additional lines and figures to illustrate features of the figure under consideration. Finally, the apodeixis, the proof itself, is carried out based on the construction. The proof involves an inference based on axioms, propositions already demonstrated, and the properties identified by the constructions.

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[45] Hintikka, "Kant on the Mathematical Method," 167.

The proposition concludes with the restatement of the general proposition, as a conclusion of the proof.[46]

Hintikka goes on to identify important analogies between Kant's view and the model of geometrical activity outlined above. In particular, Hintikka believes there is a close connection between Kantian constructions and Euclidean ecthesis and auxiliary construction. The examples Kant uses in the *Critique* to illustrate the difference between the philosophical and mathematical method support the idea that these constructions supply the information that allows the mathematician to exceed the philosopher's manipulation of concepts. However, this connection seems to weaken, rather than support, Hintikka's larger claim. To the extent that Kant's philosophy of geometry is dependent on constructions like Euclid's, it does seem to require some sensory intuition. However, Hintikka claims that it is the introduction of new individuals, the lines and figures of the auxiliary construction for example, that connect the Euclidean constructions with Kant's general notion of intuition.[47]

Hintikka discerns a further analogy between Kant's language and Euclid's geometry. In the development of geometry since Euclid, there is a traditional distinction between two methods of proof. The first method is described as 'analytic'. It is based on reasoning which begins with the assumption of successful construction and moves to the conditions of those constructions. The other method, the 'synthetic', reasons from features of the actual constructions. Hintikka says that the distinction between these methods is that in the analytic method no construction is necessary, its success is assumed as a premise, while in the synthetic method constructions must be carried out.

[46] Hintikka, "Kant on the Mathematical Method," 168-169.
[47] Hintikka, "Kant on the Mathematical Method," 169-170.

Hintikka draws an analogy between this terminology, which was current in Kant's time, and his own use of the terms 'analytic' and 'synthetic'. So, the paradigm case of synthetic reasoning, then, is provided by Euclidean geometry. On his analysis, this means that the characteristic feature of such reasoning is the introduction of new individuals.[48]

On the basis of these analogies, Hintikka is able to explain Kant's remarks on arithmetic. Since Kant believes that arithmetic is synthetic, it must involve some construction. If the paradigm of constructions is Euclidean, we can expect arithmetic constructions to occur in a similar way. Considering the equation '7 + 5 =12', the actual addition is carried out in, what Hintikka identifies as the third stage of the proof, the auxiliary construction. However, this construction requires some prior ecthesis. The establishment of the values '7' and '5' by some image, corresponds to this stage. However, there does not seem to be any stage in the arithmetic construction to correspond to the apodeixis, or proof proper. In the case of arithmetic, no inference seems to be required once the auxiliary construction has been carried out. It is obvious by inspection that the constructions of seven and five, taken together, equal twelve. It is this sense in which arithmetic knowledge is immediate and indemonstrable. Thus, there is no need to suppose that Kant believed arithmetic is based on sensation.[49] If Hintikka's interpretation of intuition is correct, then there is no more reason to suppose that the constructions of arithmetic require sensory experience than there is to suppose that geometrical constructions do.

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[48] Hintikka, "Kant on the Mathematical Method," 170-171.
[49] Hintikka, "Kant on the Mathematical Method," 171-172.

The interpretation of Kantian constructions on analogy with Euclidean ecthesis has implications in logic as well. Ecthesis, as a concept, appears in Aristotle. The meaning of the term is unclear, but Hintikka takes it that it involves the transition from general terms to particular instances of those terms. The transition from general terms to their individual instances provides Aristotle with the conversions of the various syllogistic forms to the two primary forms, *Barbara* and *Celarent*. For Kant, ecthesis is a specifically mathematic form of reasoning, it cannot be used in philosophy or, by extension, logic. Hintikka claims that this explains Kant's rejection of all forms of the syllogism other than *Barbara* and *Celarent*. He also claims that the concept can be made clearer by modern logic. The existential instantiation rule of modern quantification theory represents modern logic's improvement on the notion of ecthesis.[50]

Although the analysis provided by Hintikka is, as he says, preliminary, it does give some idea of the relationship among the parts of the Kantian system. It also provides an interesting suggestion of the possibilities of extending Kant's views into a contemporary context. Hintikka's reconstruction is particularly interesting in relation to the positions that Dewey will later defend. If Hintikka's interpretation is accepted as plausible, though perhaps departing too much from Kant's text, then the argument for Dewey's position as a reformation of the Kantian view is strengthened. Dewey will articulate a conception of experience that can be understood preceding the spatio-temporal ordering which Kant identifies with the Transcendental Aesthetic. Further, this experience, whose only necessary quality is continuity, can be shown sufficient for the generation, the construction, of arithmetic knowledge. Dewey's account, then, demonstrates both the logical order of Hintikka's reconstruction, as well as the emphasis

[50] Hintikka, "Kant on the Mathematical Method," 174-175.

on construction in arithmetic. This connection, again, seems to support the claim that Dewey's work is, in some sense, reforming the Kantian system.

B. Charles Parsons

Like Hintikka, Charles Parsons' view of Kant's mathematics is closely connected to his understanding of intuition. Parsons is more inclined to understand intuition as analogous to sensation. To some extent, Parsons' view must be correct. After the arguments of the Aesthetic, Kant is clear that the only source of intuitions available to humans is sensation. This view leads Parsons to include immediacy as an additional characteristic feature of intuition, along with singularity. Based on his understanding of intuition, Parsons diagnoses a problem in Kant's philosophy of geometry that seems to threaten its viability.

The most straightforward objection to Kant's philosophy of mathematics is based on developments in non-Euclidean geometry and physics in the Twentieth Century. Kant believed that it was possible to demonstrate *a priori* that space was Euclidean. However, developments since Kant's time have made that belief impossible. At the very least there are several other conceivable geometrical systems. Further, developments in physics have suggested that far from being the only conceivable system, Euclidean geometry may not even be the preferable system for describing the physical world.

On Parsons' view, this objection is surmountable. The Kantian could simply claim that, though Kant was wrong to think that the form of our intuition determined our mathematical knowledge, it does ground our knowledge of the more primitive properties of space. In particular, Parsons is interested in the fact that Kant takes his views on the form of intuition to ground our knowledge of the infinite divisibility of space. Since this feature is common to all the competing geometrical systems, and not obviously challenged by any physical results, at least some of the Kantian view could be maintained.[51]

So, if we allow for the developments that have occurred in physics and geometry since Kant's time, we might be able to maintain his view of the basis of mathematical knowledge. However, Parsons argues that the infinite divisibility of space, even though it does not succumb to the standard objections, causes even greater problems for Kant. If we consider the infinite divisibility of space a genuine piece of mathematical knowledge, a tension seems to arise. Parsons refers to this problem as the '"Antinomy' of Intuition."[52]

To develop this antinomy, Parsons makes a claim about the role of 'possible experience' in Kant. As we have seen, the notion of possible experience is intimately connected with the notion of intuition. The project of the *Critique* is to show the principles that are necessary preconditions of possible experience. To save the project from tautology, 'possible experience' must involve some meaningful limitation. Parsons says, "But of this [objects as they exist independent of their relation to possible perception] we can know nothing; everything about the object which we can know must be able to show itself in experience and must therefore be limited by the general conditions of possible experience."[53] Parsons understands 'possible experience' as primarily sensory; this is a consequence of his view of Kantian intuition. This understanding provides the basis for the development of the antinomy.

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[51] Parsons, "Infinity and Kant's Conception of the 'Possibility of Experience,'" 96.
[52] Parsons, "Infinity and Kant's Conception of the 'Possibility of Experience,'" 98.
[53] Parsons, "Infinity and Kant's Conception of the 'Possibility of Experience,'" 98.

Since Kant takes it as *a priori* that objects appear to our senses as spatial, and that their spatiality is Euclidean, the objects are infinitely complex. The space occupied by any object may be divided *ad infinitum*. These divisions define parts of the object. Since the divisions are potentially infinite, the object must be composed of infinitely many parts. Intuition, as we have seen, is the immediate representation of objects. On this interpretation, then, intuition of any object is the immediate representation of an infinite complexity. Parsons acknowledges that Kant seems to deny this point, but more analysis will be required to explain how he can consistently deny it.[54]

The second problem that seems to arise concerns the character of the parts. Kant says that the only way we perceive a manifold is by identifying its constituents one by one. Parsons says, "It is hard to see what the simple entities might be in cases like this if not the points of a line."[55] That is, if we consider our perception as determined by the character it must have to ground our mathematical knowledge, then the 'simple' parts of any object must be identified with the simple parts of Euclidean space, points. However, this interpretation contradicts Kant's view that the parts of space are not points, but spaces.[56]

Parsons' solution to the antinomy involves the introduction of a distinction that seems alien to Kant. He proposes distinguishing between what is implicitly contained in an intuition and what is explicitly contained. The immediate perceptions do not contain their parts explicitly, as the antinomy seems to require. Rather, they are contained implicitly. The point, then, is to recognize that sense perception contains its infinite complexity only potentially. We can always identify smaller and smaller parts of the

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[54] Parsons, "Infinity and Kant's Conception of the 'Possibility of Experience,'" 98-99.
[55] Parsons, "Infinity and Kant's Conception of the 'Possibility of Experience,'" 99.
[56] Parsons, "Infinity and Kant's Conception of the 'Possibility of Experience,'" 99-100.

objects of our experience, but these parts are not present in our experience at all times. We can, thus, identify three levels of complexity in objects of perception. Parsons uses the Gestalt distinction between 'figure' and 'ground' to illustrate this point.[57] The three levels are"…primary complexity or figure, which appears explicitly; secondary complexity or ground, which appears in a non-explicit way which is difficult to describe; and tertiary complexity, which does not appear at all but which might appear in some other perception of the same object."[58]

The explanation expressed above is not a real solution for Kant, however. Even if we ignore Parsons' acknowledgement that it is implausible to attribute this distinction to Kant, there is still a more basic conceptual problem. The problem is based on the kind of experience that seems possible for beings like humans. Human beings are, in Parsons' terms, 'thoroughly finite'. Human beings are limited in various ways, by biology and thermodynamics, as well as our inability to travel faster than light. It seems that Kant must regard these limitations as irrelevant for the determination of possible experience, if that experience is to be the ground of our mathematical knowledge. It must be the case that events occurring trillions and trillions of light years away, or objects smaller than the wave-length of light, are objects of possible experience. If these finite objects are beyond our ken, then the infinite must be.[59]

In Parsons' view the difficulty facing Kant's philosophy of mathematics is not limited to geometry. His view of intuition also exposes problems in Kant's philosophy of logic as it relates to arithmetic, and in his philosophy of arithmetic itself. In order to

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[57] Parsons, "Infinity and Kant's Conception of the 'Possibility of Experience,'" 101-102.
[58] Parsons, "Infinity and Kant's Conception of the 'Possibility of Experience,'" 102.
[59] Parsons, "Infinity and Kant's Conception of the 'Possibility of Experience,'" 104-109.

make these problems explicit, Parsons presents a brief description of Kant's views on logic.

The most important feature of logic is its generality. Logic applies to all knowledge equally, and determines the normative relations among the objects of knowledge. Logic also determines the outer bounds of possibility. Anything that is possible in some particular respect, physically possible for example, is also logically possible. The only requirement of logical possibility is that the object or event in question involves no contradiction. Logic's generality exceeds the forms of intuition, which provide the basis for geometrical knowledge. The truths of geometry are truths about the nature of human sensation. If any of the fact about sensation were different, then they would not hold. In addition, the application of geometrical knowledge is limited to objects as they affect human senses. The greater generality of logic accounts for logically possible geometrical systems that are excluded by the form of intuition.[60] It is the more specific nature of geometry that makes Kant's claims about its synthetic and intuitive character plausible.

Kant's claim about the synthetic and intuitive character of mathematics is not limited to geometry; arithmetic and algebra share these features. The plausibility of Kant's understanding of geometry derives from the fact that geometry seems to connect more easily with the actual features of space. Since spatiality is a feature of sensation, it seems natural to connect geometry with sensibility. Parsons sees no such easy connection in the case of arithmetic. There seems to be no reason to suppose that the only things which can be counted, and thus subject to the operations of arithmetic, are sensible objects. It also seems more difficult to specify exactly how arithmetic possibility

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[60] Parsons, "Kant's Philosophy of Arithmetic," 116-117.

exceeds logical possibility. However, if arithmetic is to be regarded as synthetic, it must be distinguished from logic.[61]

Parsons considers the second problem first. He points out that the distinction between arithmetic and logic has been challenged by philosophical developments in the Twentieth Century. Many philosophers of mathematics have become convinced that arithmetic can be understood as a kind of logical relationship. Parsons presents a construction intended to express the arithmetic expression '2 + 2 = 4' as a tautology in first-order predicate logic. The details of the construction are not important for our purposes. The formula does allow a more detailed consideration of what the relationship between logical and arithmetic possibility might be.[62]

To differentiate logical and arithmetic possibility, it is necessary to show that there is something that is logically possible, but not arithmetically possible. Parsons suggests that a demonstration that '2 + 2 = 5' is logically possible would satisfy this demand. He is able to provide such a demonstration based on his logical formula. Since the formula is a conditional, any model which makes the antecedent false will satisfy the demand. The antecedent of Parsons' conditional expresses the claim 'There are at least four things.' So, on any model in which there are fewer than four names the formula associated with '2 + 2 = 5' will be true. Since it is clearly logically possible that there are fewer than four things, then it seems that logical and arithmetic possibility must be distinct.[63]

Parsons' formulation of logical formulae associated with arithmetic expressions requires the inclusion of existential quantifiers. The presence of such propositions,

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[61] Parsons, "Kant's Philosophy of Arithmetic," 128-129.
[62] Parsons, "Kant's Philosophy of Arithmetic," 129-131.
[63] Parsons, "Kant's Philosophy of Arithmetic," 130-131.

according to Parsons, is one of the features of arithmetic at stake for Kant. Since arithmetic makes claims about what exists, it necessarily exceeds what can be derived from logic alone. The model in which there are no objects entails no contradiction. It is the necessary postulation of objects that gives mathematics its synthetic character for Kant.[64]

However, the possibility of a logical construction illuminates the first challenge Parsons identifies as well. A formula like the one Parsons produces might be taken to show that there is no connection between arithmetic and sensibility. It suggests that arithmetic is based on the completely unintuitive relationship of classes.[65] This possibility is in no way addressed by the considerations above. Many philosophers have been quite content to regard mathematics as involving necessary existence assumptions, but denying any connection to sensible intuition.[66]

One possible source for a connection between arithmetic and sensation is the connection between arithmetic and time. We have seen that the connection between geometry and space substantially contributed to an understanding of the connection between geometry and sensation. However, Parsons points out that the connection between time and arithmetic is not so close. The significant concept is succession, which does not have a necessary relation to sensible time. The connection between succession and arithmetic is based on the dependence of the concept of 'number' on the act of successive addition. Numbers are defined by the activity of adding units together. The number '12', for example, is determined, in part, by the act of successively adding five

[64] Parsons, "Kant's Philosophy of Arithmetic," 132.
[65] Parsons, "Kant's Philosophy of Arithmetic," 130-131.
[66] Parsons, "Kant's Philosophy of Arithmetic," 132-133.

units to seven units. Arithmetic relations among the numbers, then, are also based on successive addition.[67]

The significant connection between arithmetic and time is based, not on the necessity of time, but its sufficiency. By generating arithmetic objects by successive addition, or performing a series of arithmetic operations, a temporal structure is generated. There is no explicit reference in these structures to time, or its features, but their structure does correspond to the succession of moments in time. Thus, time is not a necessary precursor to arithmetic knowledge, but it is sufficient. The temporal order can provide a concrete model for any arithmetic object or operation, even though these things are not based on the features of time. However, even this connection is not sufficient to demonstrate the desired connection between arithmetic and sensation. To finally establish such a connection, Parsons says it is necessary to consider Kant's view that structures that can be represented in space and time are objects of possible sensation.[68]

We have already seen the complications caused by the intersection of possible perceptions and geometrical knowledge. The connection with arithmetic is similar, although Parsons does not focus on the difficulties raised. Since the objects of arithmetic knowledge, numerals, can be constructed in time, they are objects of possible perception. However, the successive generation of arithmetic objects is indefinite. It is always possible to continue the iteration process, in principle. However, as we saw with geometry, such infinite constructions seem to require a very particular sense of 'possibility' when relating to sensation. In the case of simple propositions, like '2 + 2 = 4", the relation is fairly straightforward. However propositions licensed by mathematical

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[67] Parsons, "Kant's Philosophy of Arithmetic," 133.
[68] Parsons, "Kant's Philosophy of Arithmetic," 139-140.

induction, for example, require an insight that seems difficult to ground in intuition, as Parsons construes it. Such propositions seem to require insight into the forms of intuition themselves; in which case, it seems that they are no longer grounded in particular intuitions.[69]

Although time is a general, and sufficient, structure for the generation of arithmetic knowledge, it is clearly not the only structure capable of instantiating arithmetic propositions. There are numerous structures that instantiate the successor relationship essential to the concept of 'number'; not least the sequence of numerals themselves. Since these empirical structures are representative of the abstract structures, the intuitions they cause remain pure intuitions. The relationship between the two is similar to the relationship between an imagined triangle and triangles in general. The intuition of the triangle is pure to the extent that only these features essential to its triangularity are considered. In case of empirical arithmetic structures, the significant feature is the one-to-one correspondence with any other such structure. So, whether one successively counts imagined points, actual fingers, or actual seconds, the intuitions generated are pure to the extent that only the succession is considered.[70]

This relationship is important for understanding Kant's views on algebra, according to Parsons. The algebraist is able to acquire knowledge that cannot be obtained from concepts alone. Just as the geometer was able to know more about a triangle based on her constructions, so the algebraist gains knowledge based on, what Kant calls, 'symbolic constructions'. These constructions are, according to Parsons, symbolic because they take algebraic symbols as their raw material. However, in the

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[69] Parsons, "Kant's Philosophy of Arithmetic," 140-141.
[70] Parsons, "Kant's Philosophy of Arithmetic," 135-136.

case of geometry, the additional knowledge is licensed by the perceptible features of the constructions themselves, whether on paper or in the imagination. The question is why algebraic symbols should provide analogous knowledge?[71]

The answer to the question is based on the relation between the existence claims made by mathematical propositions and the symbolic constructions that license them. Parsons says, "Certain 'symbolic constructions' associated with propositions about number actually involve constructions isomorphic to the numbers themselves and their relations, or at least an aspect of them."[72] This relation is very clear in the case of geometry. The question of the application of any proposition about triangles is settled by the construction accompanying the proof. The reference of the proposition is determined by the demonstration. In a similar way, the action of calculating settles the question of reference for certain kinds of functions.[73]

Although Parsons' remarks about algebra and symbolic construction are brief, the connection between them and his larger view is clear. The constructions of algebra are interpreted according to the connection between intuition and sensation. The symbolic constructions are symbolic because they use symbols to display the relevant mathematical features to intuition. However, this view raises familiar problems for knowledge about the infinitary features of the structures involved. The view also mitigates Kant's desire to distinguish mathematics from logic. Modern logic seems to become a symbolic construction, essentially similar to arithmetic.[74]

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[71] Parsons, "Kant's Philosophy of Arithmetic," 136-137.
[72] Parsons, "Kant's Philosophy of Arithmetic," 138.
[73] Parsons, "Kant's Philosophy of Arithmetic," 138-139.
[74] Parsons, "Kant's Philosophy of Arithmetic," 139.

The dispute between Parsons and Hintikka becomes the basis for more contemporary commentators' work on Kant's philosophy of mathematics. We will consider two of those commentators in the subsequent sections of the chapter. However, it is important to note the conceptual features that this debate illuminates for our more general project. Clearly, any philosophy of mathematics that takes Kant as a pioneer must address the nature of intuition. Is intuition related, in any salient way, to sensation? How can knowledge based on intuition exceed the thoroughly finite capacities humans possess? How can knowledge gained from intuition ever be truly *a priori*? Further, these questions will have to be answered in a way that illuminates the mathematical issues at stake. In our subsequent investigations, these preliminaries provide a set of core concepts, as well as a cautionary example.

The issues of relating Parsons' interpretation of the difficulties faced by Kant to Dewey's work are too complicated to precede the presentation of Dewey's work. However, some very general remarks are possible. In the first place, Dewey seems to articulate a concept of experience which does not rely on sensation. This more general conception of experience might allow an account of 'intuition' without connection to sensation. The question of the thoroughly finite nature of human cognition is more difficult. Dewey, and any naturalist position, seems bound to accept the finitude of human experience. However, Dewey does not seem to accept that finitude is as 'thorough' as Parsons supposes. Further, he presents a view of the nature of number that is substantially different from the one supposed here. The ordering of numbers, generated by the concept of succession, seems to be a consequence of numerical concepts rather than a precondition. Finally, the question of the *a priority* of mathematical concepts will have to be revisited. The answer will depend on whether a satisfactory account of the *a priori* can be generated which allows for a connection to experience, while it maintains its characteristic independence.

III. Recent Interpretations

Although the work of Parsons and Hintikka represents a turning point in the understanding of Kant's philosophy of mathematics, it is not the end of the story. Here we will only consider the work of Michael Friedman and Lisa Shabel. Their work is significant for this project, not because it is definitive, but because it emphasizes an aspect of Kant's thought that will be particularly important for understanding the connection between Kant and later figures.

Both Friedman and Shabel focus on Kant's engagement with the mathematical practice of his time. In the work of Parsons and Hintikka, we saw that their competing interpretations of Kantian intuition determined their understanding of the philosophy of mathematics. In Friedman's and Shabel's cases, intuition remains an essential concept, but the understanding of mathematics takes a more prominent role. In both of their interpretations, construction plays a central part. The focus on mathematics and construction will help to connect Kant with Dewey, who focuses on construction and activity.

A. Michael Friedman

Friedman's reading of Kant's philosophy of mathematics occurs as an antecedent to his work on Kant's philosophy of physics. He begins with the familiar objection that Kant's views have been exposed by developments in physics and mathematics. Friedman also expresses a particular interest in Bertrand Russell's criticism of Kant. Russell argued that Kant's philosophy of mathematics was flawed, not because it had been superseded, but because Kant lacked an understanding of the logic of relations, modern polyadic logic. Rather than treating this as a criticism, however, Friedman considers Kant's philosophy of mathematics in the light of his own understanding of logic.[75]

We have already encountered Kant's view that mathematics is synthetic, that it cannot be conducted on the basis of logic alone. It is not surprising, given Friedman's focus on the role of logic in Kant's philosophy of mathematics, that he begins by considering why Kant believed mathematics was synthetic. Friedman says, "What is most striking to me about Kant's theory, as it was to Russell, is the claim that geometrical *reasoning* cannot proceed 'analytically according to concepts' – that is, purely logically – but requires a further activity called 'construction in intuition'.[76] His interpretation of Kant begins by considering that activity in its relation to geometrical proof.

In Kant's description of the difference between philosophical and mathematical reasoning, he outlines the standard Euclidean proof that the sum of the interior angles of a triangle is 180º. What is striking about this description, according to Friedman, is the way in which Kant takes the proof to be a spatiotemporal object. Kant's description of the proof requires that the geometer construct a triangle and several line segments, even if the construction occurs only in imagination. He also requires that the segments that compose the construction be imaginatively generated as well. This description conflicts with modern understandings, which take the proof to be a purely formal object. Contemporary formulations allow the proof to be generated on the basis of an axiom set

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[75] Michael Friedman, *Kant and the Exact Sciences* (Cambridge, Mass.: Harvard University Press, 1992), 55-56.
[76] Friedman, *Kant and the Exact Sciences*, 56.

and the rules of logic. The question is, why should Kant think that the construction is a necessary part of the proof?[77]

The difference between Kant's understanding of the proof and the modern understanding is based on logic. Kant's logic was monadic: it allowed only single-place predicates. This feature restricts the power of the logical system to prove the existence of new objects. Monadic logic generates models containing, at most, 2^k objects, where k is the number of primitive predicates. In order to carry out Euclid's proofs, it is necessary to establish the continuity of the segments involved. In modern formulations, the continuity is guaranteed by a formal axiom asserting the continuity of these segments. However, such an axiom requires a polyadic formal language. Without such formal tools, it is impossible to represent the concept of continuity formally. Since this feature of the segments cannot be represented by a formal axiom, Kant, like Euclid, relies on the construction procedure to establish the continuity of the segments. So, Kant's assessment of the necessity of the intuitive constructions is correct, based on the logic available to him. The essential difficulty is that the resources of the logic Kant uses to carry out the proofs is not sufficient. Claims about the infinitary composition of the objects involved are necessary, but inexpressible in terms available to the logic. [78]

The discussion of the relationship between Kant's conception of logic and geometrical proofs has shown why Kant thought logic alone was inadequate to demonstrate geometrical theorems. However, this does not explain why he thought the constructions compensate for this inadequacy. Friedman points out that even the constructions Kant and Euclid rely on are not continuous, in the modern sense. The

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[77] Friedman, *Kant and the Exact Sciences*, 58.
[78] Friedman, *Kant and the Exact Sciences*, 59-64.

space generated by Euclidean construction procedures is only part of the space of the real numbers.[79] However, the construction in intuition can be used, according to techniques available to Kant, to generate any real number. Friedman describes this process by considering how one might ‘construct’ a segment of length π. The construction involves treating the convergence of any finite decimal expansion with π as a continuous temporal process. In this construction the termination of any temporal process guarantees the convergence.[80]

Friedman goes on to consider what role construction in intuition plays in arithmetic and algebra. As we saw in Parsons’ analysis, successive addition plays an essential role in the generation of numbers. Such a process involves construction in intuition because of its essentially temporal character. The features of the process guarantee the determinate character of the basic arithmetic operations. In addition, the limitless character of temporal succession guarantees the infinity of the series of natural numbers. The role of the process of successive addition further distinguishes mathematical reasoning from logical reasoning. Arithmetic propositions are legitimated by calculation, not proof.[81]

Friedman takes this last point, that mathematical reasoning operates by calculation and not logical argument, to be a significant point in Kant’s understanding of mathematics. The use of constructions establishes the greater certainty mathematical demonstrations possess. Philosophical demonstrations, based on the logical manipulation of concepts, are always subject to illegitimate equivocation and confusion of meaning. The possibility of such mistakes is imposed by the abstract character of logical reasoning.

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[79] Friedman, *Kant and the Exact Sciences*, 61-62.
[80] Friedman, *Kant and the Exact Sciences*, 73-74.
[81] Friedman, *Kant and the Exact Sciences*, 84.

Mathematical reasoning, in contrast, is based on demonstrations that present the objects of reasoning as concrete individuals. This presentation gives mathematical demonstrations the same apodictic character of observations.[82]

The connection between arithmetic and geometrical reasoning, and their distinction from philosophical reasoning, can be further specified by considering the distinction between functions and predicates. The most important distinction between functions and predicates is that both the values and the arguments of functions are individual. This distinguishes the calculation of a function's value from the subsumption of a name by a predicate. In practice this difference manifests itself in the iterability of functions. It is perfectly permissible to take the value of any function, f(a), and use it as the argument of a further function, f(f(a)). Predicates are not similarly iterable. This distinction most clearly applies to the reasoning employed in algebra and arithmetic, where calculation is most prominent. However, the distinction can be extended to cover geometrical reasoning as well. If the constructive procedures of Euclidean geometry are interpreted as functions, the analogy holds. Geometrical constructions modify objects in much the same way that functions modify numbers. Further, the results of the constructions can be taken as the starting point of further constructions.[83]

One of the most interesting points in Friedman's analysis of the role of functions in mathematical reasoning is that it seems to invert the standard interpretations. In the work of both Parsons and Hintikka, we saw that geometrical reasoning constituted a paradigm case for Kant. Here, the indefinite iterability that characterizes arithmetic functions constitutes that paradigm. By taking arithmetic as a paradigm case, Friedman

[82] Friedman, *Kant and the Exact Sciences*, 85.
[83] Friedman, *Kant and the Exact Sciences*, 86-87.

further illuminates the synthetic nature of mathematical reasoning. His interpretation locates the synthetic character of mathematical reasoning in the in-principle iterability of mathematical operations. Any such procedure requires a synthesis in intuition analogous to the synthesis that occurs in successive addition.[84] This interpretation of the synthetic character of mathematics will be important for later discussions; particularly the connection between activity and syntheticity.

Although Friedman identifies functions as a common part of Kant's theory of arithmetic and geometry, he does not assimilate the cases. The distinction between arithmetic and geometry remains important, but Friedman provides an account of their difference that is contrary to prior interpretations. Both Parsons and Hintikka took geometrical constructions as providing a model for geometrical reasoning. Friedman disagrees; according to his interpretation the constructive functions in geometry are tools of calculation. The difference between algebra and geometry, on Friedman's interpretation, involves the existence of a set of primitive functions in the case of geometry. Geometry also requires a specific equality relation, congruence. It would seem that the successor function operates in a similarly primitive way in arithmetic. However, according to Friedman, Kant does not understand the successor function as a specific function at all. "…[R]ather…," he says, "…it expresses the general form of succession or iteration common to all functional operations whatsoever."[85] There is no need to postulate such a function, as it is guaranteed by the form of temporal intuition.

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[84] Friedman, *Kant and the Exact Sciences*, 87.
[85] Friedman, *Kant and the Exact Sciences*, 89.

One of the advantages of this interpretation is that it explains Kant's belief that geometry is axiomatic, while arithmetic is not.[86]

Based on his interpretation of Kant's understanding of mathematical knowledge, Friedman considers Kant's understanding of the relationship between intuition and concepts. In the case of both Hintikka and Parsons, the understanding of mathematics was based on a prior understanding of intuition. Friedman inverts this relationship; Kant's views on mathematics serve to illuminate the relationship between intuitions and concepts. The discussion of these categories must answer several important questions about mathematics, according to Friedman. In particular, the discussion must make clear the relationship between mathematics and the spatiotemporal forms of intuition. It must also clarify the content of Kant's assertion that mathematics is synthetic *a priori* knowledge.[87]

Friedman begins his discussion by responding to the view that intuition provides models for the reasoning involved in mathematics. On this interpretation, spatial intuition provides objects that correspond to our knowledge of geometry, and time provides those objects to arithmetic. We have already seen that this interpretation is insufficient in the case of arithmetic, but its failure is more general. Even in the case of geometry, one cannot view spatial intuitions as providing objects corresponding to concepts. The most obvious reason for this is that such intuitions are empirical, not *a priori*. Friedman points out that, on Kant's view, only empirical intuition can provide objects corresponding to concepts. The cost of adopting this attractive interpretation,

[86] Friedman, *Kant and the Exact Sciences*, 88-89.
[87] Friedman, *Kant and the Exact Sciences*, 98.

then, is reducing mathematics to an *a posteriori* science. Since such a cost is insuperable, a new understanding of these relationships must be developed.[88]

The attraction of the reading Friedman criticizes is an apparently simple understanding of geometry. On this view, geometrical knowledge is based on the construction in intuition of spatial objects. However, this attraction vanishes when the case of arithmetic is considered. Kant is explicit, in several passages, that arithmetic does not concern temporal objects. Since the intuition of time lacks a distinguished unit, it cannot contain the successor function, although it can model the successor function once a unit has been arbitrarily determined. In order to develop a consistent view of Kant's understanding of the relationship of mathematics and intuition, then, it is necessary to consider the relationship between quanta and quantity.[89]

The distinction between quanta and quantity is first made in a discussion of the difference between geometry and arithmetic. Geometry, according to Kant, has axioms that concern only quanta, line segments, for example. Arithmetic, on the other hand, concerns magnitude, quantity per se. It has no axioms, though it relies on propositions that are synthetic and indemonstrable. The distinction is later connected to two different kinds of construction, geometrical or ostensive and symbolic. The latter type of constructions is associated with algebra. Friedman points out that, although Kant mentions algebra in connection with symbolic constructions, it seems that arithmetic constructions are also symbolic. Algebra, on Kant's view, constitutes a 'general arithmetic'.[90] Algebra is 'general', not in the sense that it is more abstract, but in that it considers a wider class of objects. Arithmetic considers only rational magnitudes,

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[88] Friedman, *Kant and the Exact Sciences*, 101-104.
[89] Friedman, *Kant and the Exact Sciences*, 105-107.
[90] Friedman, *Kant and the Exact Sciences*, 107-108.

whereas algebra considers these magnitudes as well as irrational magnitudes.[91] Having made these distinctions, Friedman returns to the question of the relationship of arithmetic, and now algebra, to intuition.

Friedman has already established that algebra and arithmetic concern quantity and not quanta. Thus, unlike geometry, neither has any special relation to some set of objects. Rather, both are techniques for determining the magnitude of any object, by arbitrarily establishing a unit. The generality of algebra and arithmetic depend, not on their general application to objects, but on their independence from the objects of their calculations. Friedman says, "In the theory of magnitude itself we assume absolutely nothing about the nature of and existence of the magnitudes to be thereby determined: we merely provide operations (such as addition, subtraction and also the extraction of roots) and concepts (above all the concept of ratio) for manipulating any magnitudes there may be."[92] So, though algebra and geometry must always concern some intuited magnitude, they do not assume anything particular about that intuition.[93]

At this point it may appear that Friedman's interpretation has completely divorced algebra and arithmetic from any intuition whatsoever. However, although the connection between the content of these domains and intuition has been weakened, there is still a sense in which they depend on intuition. Friedman has characterized both domains as essentially active; that is, they are determined by the particular activity of calculation. Such activity is necessarily temporal. The activity of calculation involves the construction of the concept of number, based on the successive addition of units, and that

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[91] Friedman, *Kant and the Exact Sciences*, 109-110.
[92] Friedman, *Kant and the Exact Sciences*, 113-114.
[93] Friedman, *Kant and the Exact Sciences*, 113-114.

concept has an essentially temporal character. Thus, it is not the objects of the theory that are connected with intuition, but the concept of quantity.[94]

Friedman's argument against the view that understands the synthetic character of mathematics in terms of its objects also applies to geometry. Although geometry does deal with intuitive objects, it also shares the essentially temporal character of arithmetic and algebra. Friedman argued that geometry involved functions in a way that was analogous to arithmetic and algebra. These functions, based on the primitive constructive operations, are necessarily temporal in just the way that arithmetic and algebraic functions are. Thus, the relation to intuitions common to all mathematical disciplines, and in virtue of which they are synthetic, is the necessarily temporal character of constructive activity.[95]

Although Friedman has provided substantial reason to think that Kant located the synthetic character of mathematical knowledge in the connection between time and iteration, it is unclear whether this view is reasonable. In particular, Friedman is concerned to address the fact that indefinite or infinite iterability is expressible in logical formulas. If logic were capable of expressing the iterable character of series, then it would seem to refute the necessity of time in understanding them. Here Friedman refers to Parsons. Parsons has shown that the iterability of such series is only expressible in logic that allows quantifier dependence, polyadic logic. Such expressions are impossible in the logic available to Kant. It is understandable, then, that he took mathematical knowledge to have content that exceeded that of logic alone.[96]

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[94] Friedman, *Kant and the Exact Sciences*, 115-116.
[95] Friedman, *Kant and the Exact Sciences*, 118-119.
[96] Friedman, *Kant and the Exact Sciences*, 121-122.

Friedman's interpretation has done a great deal to explain the relation between intuition and mathematics. However, there is a further connection to be made. Friedman goes on to show a connection between constructions and schemata. This connection will finally establish both the synthetic and *a priori* character of mathematics in Kant's system. In several passages Kant makes the point that it is impossible to think of mathematical concepts without representing them. We have seen some interpretations connect this requirement with the objective reality of the concepts; by construction we insure that the concepts are instantiated at all. However, the constructions seem to be a necessary component in the representation of the concepts, not just a guarantee of their applicability.[97]

In the case of geometrical concepts, the Euclidean construction procedures are identified with the schema of the associated concepts. Friedman says, "Any particular figure produced by such a construction counts as an *image* of the corresponding concept, but it is the general procedure for producing any and all such figures that is the *schema* of the concept…."[98] The distinction between image and schema is maintained in the case of arithmetic concepts as well. When one constructs some number by imagining points or counting fingers, the image of the concept (number) is produced. However, the method of production, in this case sequential enumeration, give the schema for the concept. In the case of arithmetic, such iterative procedures also produce a schema for the concept of magnitude.[99]

The schema connect the concepts of mathematical knowledge with pure intuition. It is through the schemata that mathematical manipulation of concepts is able to exceed

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[97] Friedman, *Kant and the Exact Sciences*, 122-123.
[98] Friedman, *Kant and the Exact Sciences*, 124.
[99] Friedman, *Kant and the Exact Sciences*, 124-125.

logic. Friedman refers to the demonstration of the Euclidean proposition that for any given point and line, there is a circle that takes the point as its center and the line as its radius. This claim, since it depends on the dependence of quantifiers ($\forall\forall\exists$), cannot even be stated in Kant's logic. However, the point can be rigorously expressed by considering the construction that is possible, given the primitive objects. Friedman also offers an analogous claim in arithmetic; that every number has a successor, or "…for every *n* there is a number *n*+1."[100] It is only on the basis of the schema for constructing the number concept and its iterability, that we can know such a proposition is true.[101]

Friedman concludes his discussion by showing how such an interpretation explains the significant characteristics of mathematical knowledge. He has shown that mathematical concepts require schematic constructions. These constructions are objects of pure intuition. This means that it is only possible to think about mathematics by supposing constructions, although we may not always actually perform the constructions. The necessity of such constructions, and the impossibility of their representation in logic, makes mathematics synthetic. Since thinking of mathematical concepts at all requires the supposition of such constructions, and those constructions constitute an image or instance of the concept involved, it follows that true mathematical propositions are necessarily true. If they can be thought at all, then they must be true. Friedman says, "… the a priori status of mathematics rests, in the end, on a kind of transcendental argument or transcendental deduction…."[102] The transcendental character of the association between constructions and concepts makes mathematics *a priori*.[103]

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[100] Friedman, *Kant and the Exact Sciences*, 126.
[101] Friedman, *Kant and the Exact Sciences*, 126.
[102] Friedman, *Kant and the Exact Sciences*, 127.
[103] Friedman, *Kant and the Exact Sciences*, 127.

In Friedman's work, we can see a substantial departure from the work of Parsons and Hintikka. Rather than treating the notions of concepts and intuitions as primary, Friedman has focused on the mathematics. By beginning with the mathematics, and generating the interpretation of concepts and intuitions subsequently, Friedman is able to understand all of Kant's explicit claims, as well as make those claims plausible, if only on Kant's own terms. In the discussion of Parsons and Hintikka, we saw that these two goals were not equally met in either interpretation. In this sense, at least, Friedman's view must be taken as superior. It is also significant that Friedman locates the essentially intuitive nature of mathematics in activity. In order to connect mathematical concepts with intuitive constructions, Friedman regards mathematics as a constructive activity governed by the schema. This focus on activity becomes particularly important for the last interpretation I will consider, and it will constitute a central theme in the discussion of Dewey's position.

B. Lisa Shabel

The most recent interpreter of Kant's philosophy of mathematics I will consider is Lisa Shabel. Shabel's most sustained treatment of the subject appears in the published version of her dissertation, entitled *Mathematics In Kant's Critical Philosophy: Reflections on Mathematical Practice*. Shabel's view is interesting for two reasons. The first is that she articulates strong criticisms of the tradition of interpretation to which all of the other figures here belong. Thus, her views provide a counter-point to views that may be overly influenced by traditional interpretations. The second reason her view is particularly interesting is that she considers Kant's philosophy of mathematics *through* mathematical practice.

Like the other commentators considered, Shabel begins by noting the obvious tensions in Kant's account of mathematical knowledge. How can mathematical knowledge be *a priori* when it is based on the 'construction' of concepts, and 'construction' appears to be connected to empirical, *a posteriori*, intuition? Answering this question requires Shabel to examine Kant's account of intuition. However, her view differs from the others. While she does provide an account of the distinction between 'pure' and 'empirical' intuition, it is informed by her previous work on mathematical practice arising out of Euclid and Wolff. In addition to the difficulty posed by intuition, she must also account for the universality of mathematical concepts arising out of constructions.[104]

Shabel begins with the familiar problem of accounting for the relation between mathematical constructions and *a priori* knowledge. She rejects accounts that find the resolution of this problem in abstraction or independence from experience. Her claim is that the intuition involved in mathematical construction is 'pure' to the extent that we consider only the action of construction. However, this formulation may be misleading, as it is not the action alone that constitutes the intuition. Actions cannot constitute intuitions alone, as intuitions require some content. So, the pure intuition provided by mathematical constructions involves the conjunction of the individual object constructed, the triangle or circle for example, and the consciousness of the act of constructing. There are two features of the conjunction of the figure and the act that determine the pure intuition. The first is the recognition that the construction follows a rule. The second is

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[104] Lisa Shabel, *Mathematics in Kant's Critical Philosophy: Reflections on Mathematical Practice* (New York: Routledge, 2003), 92-93.

the recognition that following such a rule provides general knowledge. In particular, we obtain knowledge about the relations among the elements of the construction.[105]

The concept of 'pure intuition', then, is given content only in the context of mathematical demonstrations. The concept is clarified by the juxtaposition of two types of mathematical demonstrations, identified by Wolff. Mathematical demonstrations can be either 'mechanical' or, properly 'mathematical'. The synthetic *a priori* character of mathematical knowledge is provided by the latter alone.[106] Shabel examines the two versions of the demonstration of Euclid's Proposition 32. The mechanical demonstration of this proposition involves the measurement, with a compass, of the interior angles of a triangle, and their comparison with the exterior angles. Euclid's proof of the proposition, which Wolff labels 'mathematical' is based on the equality of opposite interior angles. Shabel points out that it is not merely the use of instruments that distinguishes these two demonstrations; Euclid often refers to constructions with compass and straight-edge in his mathematical demonstrations. Rather, it is the way that the geometer observes her activity that distinguishes the demonstrations. In the mechanical case, the mathematician relies on her observation of the compass measurement to ascertain that the angles are equal. In the mathematical demonstration, the mathematician need only observe the relations of the parts in the diagram, and so no specific measurement is necessary.[107]

The distinction between mechanical and mathematical demonstrations illuminates the synthetic and *a priori* character of mathematical knowledge. In the first place, the activity of the geometer is distinguished from the philosopher. The philosopher can

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[105] Shabel, *Mathematics in Kant's Critical Philosophy*, 94-95.
[106] Shabel, *Mathematics in Kant's Critical Philosophy*, 96.
[107] Shabel, *Mathematics in Kant's Critical Philosophy*, 99-100.

never obtain 'new' knowledge, while the geometer can. The novelty of geometry is provided by the auxiliary constructions involved in mathematical demonstrations. In determining the measure of the interior angles of a triangle, the geometer constructs additional lines, and on the basis of relationships between these lines and the original angles, infers the measure of the original angles. These relationships are not part of the original concept of the interior angles of a triangle; thus, they are unavailable to philosophical investigation. In this way, the geometer produces new, *synthetic*, knowledge about her objects.[108]

It is worth noting, that at no point has this explanation distinguished between mathematical and mechanical demonstrations. Mechanical demonstrations provide synthetic knowledge in the same way that mathematical demonstrations do. Thus, the reference to *pure* intuition must pertain to the *a priori* character of mathematical knowledge. The purity of intuitions is based on the conjunction of the cognition of the object of the intuition with the cognition of the rule governed activity that produced it. These activities have implications for the properties of the objects they produce. When the geometer constructs parallel lines, she can attribute properties to the lines, and any resulting angles, that are a consequence of that intention. This is possible even though the actually constructed lines are certainly not perfectly parallel.[109] Shabel says that the geometer discerns features of the constructed object, "…which are introduced and defined by the constructive act."[110] The *a priority* of the demonstration is a consequence of the necessity of the connection between the constructive act and the features the geometer infers. Shabel says, "The process is *a priori* since these implications and

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[108] Shabel, *Mathematics in Kant's Critical Philosophy*, 102-103.
[109] Shable, *Mathematics in Kant's Critical Philosophy*, 104-105.
[110] Shabel, *Mathematics in Kant's Critical Philosophy*, 105.

properties follow from my construction necessarily, that is, they follow from what I have myself 'set into it', and are not the result of empirical contingencies…."[111]

At this point in the explanation Shabel has not yet explained how the synthetic *a priori* judgments produced by mathematical demonstrations attain universal validity. Even the pure intuition that occurs in mathematical demonstrations is singular. The constructions and the activities that produce them are distinct. The geometer constructs *this* triangle by *these* means. The question is how, on the basis of such singular activities, mathematical knowledge becomes universal? The answer to the question involves another Kantian concept, 'schematism'. Shabel claims that there is an association between the pure intuition and the construction analogous to the association between a concept and an individual that instantiates that concept. The association is produced by a mediate schema.[112]

In order to understand the schemata of mathematical, or 'pure sensible', concepts, it is necessary to understand the nature of the schemata of pure concepts. The example Shabel considers in this case is the application of the pure concept of magnitude. It is possible to distinguish between an image of a concept, the number five for example, and its schema. '|||||' is an image of the number five, the schema of the concept is the method used to construct the image. So, in the case of the pure concept of magnitude, the schema corresponds to the rule of counting that allows for the construction of images of any numerical concept. Thus, the rule links the pure concept, 'the number five', with any empirical concept instantiating it, 'the number of fingers on one hand'.[113]

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[111] Shabel, *Mathematics in Kant's Critical Philosophy*, 105.
[112] Shabel, *Mathematics in Kant's Critical Philosophy*, 109.
[113] Shabel, *Mathematics in Kant's Critical Philosophy*, 110-111.

Mathematical concepts are importantly different than pure concepts of the understanding. Concepts are objects of the understanding, and the empirical concepts that instantiate them are sensible. In order to bring the objects of these disparate faculties together the schema, which is an objects of the imagination, is necessary. However, mathematical concepts are distinguished by being constructible. Thus, the link between the concept and its instances is guaranteed by the rule for construction that defines the concept. However, Kant claims that there are schema of mathematical concepts. Shabel explains this by interpreting the schema in terms of the distinction between a pure intuition and an empirical intuition.[114]

The nature of pure intuitions is based on the conjoint cognition of the intuition along with the rule for its construction. The rules for construction are universal. That is, the rules for construction determine that the resulting construct is adequate to the concept. Thus, considered only according to the rules of construction, any particular triangle, whether isosceles, equilateral, or obtuse, is adequate to the concept. Shabel explains, "…it [the constructed triangle] has the capacity to represent 'triangle' universally insofar as its central feature is its accord with the rule of construction specified by the schema for the concept triangle."[115] So, if the individual triangle is considered only insofar as it is constructed by the rules, which do not determine the particular angles involved, it can be taken as a representative of the concept. Thus, the particular construction provides universal knowledge.[116]

At this point in Shabel's interpretation, there is not a strong difference between her view and the view of other interpreters. Certainly, her view emphasizes the role of

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[114] Shabel, *Mathematics in Kant's Critical Philosophy*, 112.
[115] Shabel, *Mathematics in Kant's Critical Philosophy*, 113.
[116] Shabel, *Mathematics in Kant's Critical Philosophy*, 113.

activity in mathematical knowledge, but her understanding of geometrical knowledge is not substantially different. Her view of algebraic knowledge, Kant's 'symbolic constructions', does differ considerably from previous views. Her view on algebra is based on the claim that Kant does not intend to draw a strong distinction between symbolic and ostensive construction. Symbolic constructions are merely an extension of ostensive constructions; algebra is only an extension of geometry. [117]

Shabel provides an interesting examination of the work of prior prominent Kant scholars, whose views have been considered here. She claims that their understanding of Kant's philosophy of algebra and arithmetic are based on problematic assumptions, originally inherited from C.D. Broad. The first of these assumptions is that the values of algebraic variables range over "…infinitely many possible numeric values."[118] This assumption takes algebra to be a generalization of arithmetic. The second problematic assumption is the view that Kant's 'symbolic constructions' are constructions out of symbols. Algebraic equations, on this view, correspond to geometrical diagrams. The symbols, x, y, +, etc., correspond to the primitive segments and lines that are the basis of geometrical construction.[119] She provides examples from the work of Hintikka, Parsons, and Friedman to support her view.[120]

Shabel argues that the views espoused by previous commentators are neither consistent with Kant's text, nor with contemporary mathematical practice. She points out that all of these views draw a strong distinction between algebra and geometry based on their particular type of construction. However, the constructions that Kant mentions in

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[117] Shabel, *Mathematics in Kant's Critical Philosophy*, 115.
[118] Shabel, *Mathematics in Kant's Critical Philosophy*, 118.
[119] Shabel, *Mathematics in Kant's Critical Philosophy*, 118.
[120] Shabel, *Mathematics in Kant's Critical Philosophy*, 119-121.

numerical contexts seem largely ostensive. The construction of numbers, for example, are based on constructions of points or 'strokes'. It is also problematic to assimilate Kant's view, based on the algebraic practices of the eighteenth century, to modern conceptions of the relations among mathematical disciplines. Finally, it seems that all of these views fail to take into account the role that constructions play in geometry. Constructions explain the synthetic character of geometrical knowledge. Algebraic constructions, understood as arbitrary formal objects, do not seem sufficient to such a role.[121]

Shabel's own interpretation of Kant's philosophy of algebra begins with an exposition of the distinction between magnitudes (*quanta*) and 'mere magnitude' (*quantitas*). Magnitudes are objects of a determinate size; that is, their size is determined by some relation to a pre-established unit. Magnitude in general is the relation to the unit, considered in abstraction from any quality. Kant says that algebra considers magnitudes in general. Thus the distinction between *quanta* and *quantitas* allows Shabel to characterize the necessary condition of an algebraic construction. She says, "…the algebraist construction must exhibit how many of some antecedently given homogeneous units make up the particular sized object in abstraction from the construction of the objects itself."[122] The specific nature of this condition becomes clear through the consideration of algebraic practices in the eighteenth century.[123]

In the development of algebra in the seventeenth and eighteenth century, it was common to view algebra as a technique for generating solutions to geometrical problems. Wolff understands the values of arithmetic and algebraic symbols to refer to the lengths

[121] Shabel, *Mathematics in Kant's Critical Philosophy*, 121-122.
[122] Shabel, *Mathematics in Kant's Critical Philosophy*, 124-125.
[123] Shabel, *Mathematics in Kant's Critical Philosophy*, 124-125.

of lines segments. Unknown magnitudes are constructed in terms of an antecedent unit, also used to describe the magnitudes of the known quantities, their values determined in terms of a fourth proportional. Kant shares Wolff's understanding of magnitudes, as well as his reliance on the construction of the fourth proportional. So, when Kant describes the construction of a 'mere magnitude', he means the construction of a line segment with a particular length determined by the proportion. The magnitude thus constructed can be taken as the *quantitas* of any *quantum*, abstracted from all others qualities.[124]

Algebraic constructions, then, can be considered mediate geometrical constructions. The construction is based on the geometrical construction of segments. The relationships of these segments, also determined by the geometrical construction, can then be represented in algebraic equations. In this way, the algebraist is able to represent the construction of all possible relations of the magnitudes, not only the particular relations established by the geometrical construction. For example, the algebraic equation 'a ÷ b = c' corresponds to the construction of segments such that a:b::c:unit. This equation is a 'symbolic construction'.[125]

On Shabel's view, Kant's view of algebra is determined by his recognition that these constructions can be considered independently of their geometrical correspondents. The solution of the problem is equally well represented by the algebraic equation as it is by the geometrical construction. However, the symbolic construction does not construct any mathematical concept in intuition. It is the segments that exhibit the concept in intuition, though they may not be actually constructed. The purpose of such constructions is practical. Symbolic constructions focus the mathematician's attention on

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[124] Shabel, *Mathematics in Kant's Critical Philosophy*, 125-126.
[125] Shabel, *Mathematics in Kant's Critical Philosophy*, 126-127.

the crucial features of the problem, and compress the information into an easily remembered form. Thus, symbolic construction is a tool for ostensive construction, required by limited attention and memory.[126] In this way, Kant's philosophy of algebra can be seen as an extension of his philosophy of geometry. Although, this view may not be adequate to modern understandings of algebra, it does seem to capture the algebraic practice of Kant's time.[127]

Shabel, in this interpretation, has extended Friedman's strategy of beginning from the mathematics. Her interpretation has the advantage of presenting Kant as a product of the mathematics of his time. In this project she is, perhaps, more successful than Friedman. She has shown how Kant's views were specifically informed by mathematical practice. However, by extending Friedman's project she has amplified its cost. Friedman allows us to understand Kant's views as products of his time, at the expense of the relevance of those views. His position that Kant can be better understood in terms of an obsolete logic may serve to increase our understanding, but it seems to make Kant obsolete along with his logic. Shabel has given a plausible interpretation of Kant's philosophy of algebra, but at the expense of making it entirely inadequate to modern conceptions.

Shabel's discussion will be particularly important in the consideration of Dewey's work. Shabel's understanding of Kant as locating the *a priority* of mathematical knowledge in a particular understanding of the relation between a constructed object and the rule for its construction will be strongly echoed in Dewey's understanding of the nature of arithmetic. Further, her explanation of the role of magnitude and 'mere

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[126] Shabel, *Mathematics in Kant's Critical Philosophy*, 127-128.
[127] Shabel, *Mathematics in Kant's Critical Philosophy*, 131.

magnitude' also connect with Dewey's position. The connection between this distinction and algebra will also suggest an important extension of Dewey's views.

IV. Conclusion

None of these interpretations resolve all of the issues of Kant's philosophy of mathematics. Rather, all of them identify difficulties in the Kantian position. The exposition of these problems might seem to obscure the possibility of a viable position. However, it is the problems of Kant's position that provide the clarity. If the *a priori* is to be saved, it must first be saved from Kant himself. The interpretations considered here suggest several dangers that subsequent positions will have to avoid.

First, the debate between Parsons and Hintikka shows that Kant's understanding of intuitions will have to be revised. In particular the question of the relation between intuition and sensation must be explored. The debate seems to suggest that if intuitions are closely associated with sensations, Kant's view suffers serious, if not mortal, damage. However, the view that separates intuitions from sensations requires an admittedly 'unintuitive' view of intuition. If a serious defense of synthetic *a priori* knowledge is to be mounted, some more rigorous notion of intuition must be provided. In terms of the debate, it is clear that we must defend a view related to Hintikka's, but, in that defense, avoid the problems pointed out by Parsons.

Second, Friedman demonstrates that any contemporary Kantian position must account for advances in logic since Aristotle. On his interpretation the development of polyadic logic eliminates the need for a Kantian philosophy of mathematics. Kant required additional resources to account for the very infinitary features Parsons identifies as problematic. Friedman's assertion seems to be that the formal tools provided by polyadic logic are sufficient to capture spatial continuity. If this is the case, then mathematics can be carried out through formal manipulation. This view seems to ally Friedman with the flawed formalism presented in the Introduction. However, Friedman's identification of the connection between these issues is critical. Ultimately, the inadequacy of the formal techniques, on which Friedman relies, necessitates a return to a conception of the synthetic *a priori*.

Friedman also makes the connection between the synthetic character of mathematical knowledge and the activity of calculation. Mathematics is synthetic not because it concerns objects of intuition, but because it involves synthetic activity. This activity is inextricably connected to intuition. It is based on the form of intuition, however, and not the intuitions themselves. This view seems to provide a model for an understanding of mathematics as based on intuition, but still independent of experience. Now mathematics is the result of experience, *per se*, and not any particular experience.

Finally, Shabel makes it very clear that Kantians must pay close attention to mathematical practices. Her account of 'pure intuition' is particularly important in this respect. By providing an account of pure intuition based on mathematical activity, she moves closer to relieving the tension between the *a priori* nature of mathematics and the reliance on intuition. Shabel's account does not necessarily resolve all of the problems of this relationship. Her connection of the purity of mathematical intuition with rule following may be illuminating, but seems to lead from one problem into another. By making the connection, she has provided a plausible account of the Kantian view. However, the cost of this interpretation is to involve Kant with contemporary puzzles about rule-following. For the purposes of this dissertation, such a cost is not insuperable, as the Pragmatist tradition offers valuable resources for addressing rule-following problems.

At the end of our examination of Kant, then, we are left with a set of questions. The first set of questions concerns the nature of intuition. How is intuition related to sensation? Do the 'pure intuitions' of mathematics derive their purity from their relationship to rules? Can an account of mathematical knowledge based on intuition demonstrate the synthetic and *a priori* character of that knowledge? The second set of questions concern the relationship of mathematical knowledge and mathematical practice. What is the relationship of mathematics and logic? What are the roles of calculation and construction? How are the various types of mathematical practices, geometric, arithmetic, algebraic, related? In the remainder of this dissertation, I will try to show that Dewey can provide compelling answers to these questions.

Chapter 2: Dewey's Early Work; Psychology, Meaning, and Organic Unity

I. Introduction

In order to appreciate Dewey's novel conception of the *a priori* it is necessary to begin by examining his early work. Over the course of his career, Dewey develops an epistemology that seems antithetical to *a priori* knowledge. The first question that must be considered, then, in any discussion of Dewey's position is whether he can accept any knowledge as *a priori*. The answer to this question is complex. If *a priori* knowledge is understood in the orthodox Kantian sense, then neither Dewey, nor, it seems, any Pragmatist, can accept it. However, this leaves the distinctive character of traditionally *a priori* knowledge, like logic and mathematics, unexplained. It seems reasonable to assert that these kinds of knowledge strike us as special. The issue is how to explain the special status of certain pieces of knowledge, while distinguishing that account from the objectionable aspects of Kantianism.

At the beginning of his career, Dewey identifies a set of problems, which he retains. By making these questions clear, it becomes possible to establish Dewey's continuity with the philosophical tradition. This context will make clear which aspects of the traditional understanding of *a priori* knowledge Dewey wishes to retain. The development of his response to these questions, over the course of his career, will make clear how Dewey substantially revises the orthodox conception. In the following sections, I hope to develop the first part of this claim. The full development of Dewey's innovative response will only be possible through the consideration of his more mature works. However, some brief anticipatory remarks will be helpful.

Dewey's criticism of Kant takes the *a priori* to impose norms on experience from a position completely outside of experience. He thoroughly rejects the idea that there are external forms imposed on experience. However, he is committed to the existence of a general standard for knowledge. He argues that any theory of knowledge based on the claim that knowledge is 'relative' already implies the existence of some absolute. This absolute is an analogue to the *a priori*. It provides the stable grounding that makes general knowledge claims possible.

Dewey's suspicion of traditional philosophy is based on his assessment of developments in empirical science. The focus on science has been the hope of many who have struggled with epistemological questions since the 17th Century. Science seems to provide the most obvious cases of genuine knowledge available. Thinkers since that time have struggled, however, with the divergence of science and traditional, deductive, understandings of epistemic legitimacy. If Dewey's project succeeds, or even indicates potential avenues for further inquiry, it will provide an account of knowledge based on the most compelling instances of knowledge. If, further, it supplies an account of the instances of *a priori* knowledge, then it will succeed where so many other accounts have faltered.

The epistemic hope that Dewey's work inspires can be evaluated in terms of its ability to account for *a priori* knowledge. In this early period, Dewey struggles with a tension between his desire to abandon traditional philosophy, understood as a debate between Empiricists and Rationalists, without succumbing to the fragmentation of knowledge. However, this tension is only provisionally resolved in these early works. Dewey's discomfort with the speculative nature of the Idealist standpoint he adopts leads him in the direction of naturalism. The culmination of this development is his mature work on inquiry. It is this body of work which ultimately resolves the tension of his early work, and bears out the hope created by his project.

II. Dewey's Early Psychological Work

The role of psychology in Dewey's early development can hardly be overestimated. In his early essays, he argues for the establishment of psychology, properly understood, as the fulfillment of philosophical aspirations. He regards psychological methods as providing an increasingly *scientific* account of those features of the world traditionally investigated by philosophy. It considers the world as known; that is, as related to consciousness. Philosophy, since Kant, has explicitly focused on the relation of the world to consciousness. By exploiting this analogy, Dewey hopes to introduce the empirical methods of psychology to philosophy. In order to do so, however, he must overcome the philosophical aversion to 'psychologism;' an excessive subjectivism and attendant relativism. The manner in which Dewey resolves this issue establishes the set of problems that occupy the rest of his career. These works also make clear Dewey's commitment to some non-relative epistemic standard. It is the explanation of that standard that provides the first locus to examine Dewey's conception of *a priori* knowledge.

In one of his earliest essays, "Knowledge and the Relativity of Feeling," Dewey identifies a particular problem in contemporary thought. He says that the doctrine of the relativity of knowledge is "…one of the most characteristic theories of modern thought." He describes relativism as claiming, "[t]hat we cannot know Being, but must confine ourselves to sequences among phenomena…."[128] Although this view was developed by several philosophical theories, it was most compellingly advocated in conjunction with the theory of evolution. The theory of evolution begins, according to Dewey, by assuming an objective existence. The objective world, then, is taken as the condition of the development of human beings and, consequently, their sensations. As a consequence of such a development, human sensation is inherently subjective. There is no sense in which human sensation, derived from a particular developmental path, is any more 'real' than chiropteran sensation, derived from a different path. Given that the theory supposes an objective reality, that reality must be, in some sense, beyond both the human and the bat. Both are restricted to the various products of their respective sensory apparatus.

The theory of evolution, according to Dewey, must defend the relativity of knowledge because the very organs of that knowledge are themselves relative. The organs by which both rational and empirical knowledge are acquired are developed in relation to some environmental pressure. Since these organs are in a process of development, but their objects are not, knowledge of those objects *per se* must be regarded as impossible.[129] According to such theories, Dewey says, the state of the organism conditions the knowledge it acquires. Since the theories began by supposing the objective existence of an external world, any sensory apparatus which conditions knowledge of that world must distort it. The conclusion is that, "…objective existence, … must remain forever unknown and unknowable."[130] It is not merely the case, then, that the human and the bat are restricted to the consideration of their various sensations.

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[128] EW, 1, 19. John Dewey, *The Early Works, 1882-1898*, Vol. 1., ed. Jo Ann Boydston, et. al. (Carbondale and Edwardsville; Southern Illinois University Press, 1969). Citations to the *Early Works* will be abbreviated EW, vol., p..
[129] EW, 1, 20-21.
[130] EW, 1, 20.

Any knowledge, if the word can be used for bats, must be relative to those sensations. Since the objective world must be the same for both, this world cannot be fully known by either.

The attraction of evolutionary theories, according to Dewey, is that they are scientific. They are scientific in the sense that they assume "objective existence." Such theories also explain the development of humans, and their intellectual faculties, on the basis of such objects. Through these means, evolutionary theories seem to save the empiricist position from Humean skepticism. In evolutionary theories, epistemology seems to have it both ways. Dewey says, "Here, then, is a theory which may satisfy the demands of physical science and of 'common sense' as to existence independent of subjective feeling; pay a compliment to the former by adopting its methods and results, and at the same time forever silence all who claim that we have absolute knowledge."[131]

Dewey's discomfort with the relativity of knowledge, and the structure of his criticism, is indicated by his question posed to any such theory: "Can a consciousness made up exclusively of feelings which are *ex hypothesi* relative ever transcend this relativity, and make assertions regarding an absolute object as referred to which alone that could be termed relative?"[132] Although this statement is rather cumbersome, it indicates the broad structure of Dewey's concern. The issue, to which he will return throughout his early work, is whether any theory can assert 'relativity' without, also, asserting some absolute to which things may be relative. This issue will become particularly acute in the consideration of psychology, which will consider all objects as relative to consciousness. The significance of this formulation is that the issue is also

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[131] EW, 1, 20.
[132] EW, 1, 22.

connected with the theory of biological evolution. Ultimately, Dewey will look to biology, as well as psychology, to identify the object to which feelings may be relative.

In 1886, Dewey published two essays in *Mind* that represent his first sustained treatment of the relationship between philosophy and psychology. In the first of these essays, "The Psychological Standpoint," Dewey develops his account of the nature of experience. He begins to examine the nature of sensation, and the role of sensations in the generation of knowledge. He is continually interested in defining the relation of sensation to consciousness in such a way that he can explain the relation between sensations, as relative, to consciousness, as absolute. It is this relation that constitutes experience. In this sense, these essays develop the concerns established in "Knowledge and the Relativity of Feeling." It is also in these essays that Dewey's first formulation of the absolute in this relation, 'Universal Consciousness,' appears.

Early in the essay Dewey provides his definition of the psychological standpoint. He says, "We are not to determine the nature of reality or of any object of philosophical inquiry by examining it as it is in itself, but only as it is related to our mind, or is an 'idea'."[133] Since psychology is the study of ideas, it provides the data of philosophical inquiry. Early exponents of this method, Locke and Hume for example, fail to adhere to it consistently. Regardless of his failure, Hume identifies a crucial component of the psychological standpoint; the role of sensation in knowledge. Hume's failure is to infer that, since sensations are necessary for knowledge, they must have some prior independent existence.[134] Dewey's account of sensation begins with an explanation of the alternative to Hume's view.

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[133] EW, 1, 123.
[134] EW, 1, 124-125.

Dewey identifies a structural problem in any view that treats sensations as the foundation of knowledge. Dewey does not object to the claim that knowledge is composed of sensations and their relations. However, he does object to, "…the correctness of the procedure which, discovering a certain element *in* knowledge to be necessary for knowledge, therefore concludes that this element has an existence prior to or apart from knowledge."[135] He defends this objection by constructing an antinomy. If sensations are considered in their familiar form, they cannot constitute the origin of knowledge. As objects of knowledge themselves, they would require their own foundation. If, on the other hand, they are considered the origin of knowledge, then they cannot be sensations in their familiar form. Dewey says, "In this case, they must be something of which nothing can be said except that they are *not* known, *are* not in consciousness – that they are things-in-themselves."[136] To introduce such objects is to abandon the psychological standpoint.

The difficulty relies upon a distinction between sensations as objects of consciousness and as they exist. Such a distinction implies that there is a sense to 'existence' that is beyond existence for consciousness. This implication is explicitly denied by the psychological standpoint. To concede that there are sensations prior to knowledge is to abandon the commitment to treat all phenomena as related to consciousness; that is, it abandons the psychological standpoint.[137]

Although Dewey's argument focuses on an empiricist conception of the foundations of knowledge, his argument could equally well apply to a rationalist position. The rationalist foundations, whatever they may be, would be in the same position as the

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[135] EW, 1, 125.
[136] EW, 1, 126.
[137] EW, 1, 125-127.

empiricist sensations. Either, the foundations are known or they are not. If they are not known, they cannot function in an explanation of knowledge. If they are known, then they must be justified by some antecedent. If they are so justified, they cannot constitute the origin of knowledge. The challenge is identifying an ultimate condition for knowledge that is itself known.

The alternative to the foundational position involves rethinking the nature of consciousness to make it the condition of all knowledge. It is a consequence of the view, established by the psychological standpoint, that everything is relative to consciousness. This relativity applies to the data of any explanation, as well as its conclusions. The consequence of this view is that, "he sees that the starting-point (in this case, sensations) and the process (in this case, the integration of sensations) exists for consciousness also – in short, that the *becoming* of consciousness exists for consciousness only, and hence that consciousness can never have become at all. That for which all origin and change exists, can never have originated or changed."[138] Although the quotation is confusing, Dewey's point seems to be that consciousness is the stable object required to assert the relativity of knowledge. This changes the problem, faced by earlier thinkers, of accounting for knowledge. It is no longer the case that explanations provide a basis for knowledge that is external to it. Rather, the explanations show the relations of various elements of consciousness.[139] The explanations become maps of consciousness.

The conclusion of this line of reasoning is the first hint of the continuous nature of experience. Dewey concludes, on the basis of his account of the relation between sensation and knowledge, that consciousness is infinite. He says, "He [the investigator of

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[138] EW, 1, 129.
[139] EW, 1, 129-130.

the origin of knowledge] is showing that it [consciousness or experience] is not a bare form, but that since these different elements [pieces of knowledge] arise necessarily within it, it is an infinite richness of relations."[140] This statement seems to claim that it is in his account of experience that Dewey distinguishes himself from prior thinkers. His criticism of both Kant and Leibniz, which I will examine, is that they were restricted by their formalism. By adopting the account of the relation between knowledge and sensation required by the psychological standpoint, Dewey has shown that experience is not a set of empty relations. Its content is infinite.

Dewey's idea of the infinite content of experience is worth considering in some more detail. Experience, on Dewey's view, includes all particular objects of knowledge. The explanation of knowledge, from the psychological standpoint, is to expose the relations among all of these particular objects. These relations, then, become objects of knowledge themselves. It is important to note that these relations are not, at first, taken as abstract relations, but as relations among concrete objects. The breadth of this explanation makes clear how experience can become the condition of all knowledge. Dewey says, "In making out the origin of any or all particular knowledges (if I may be allowed the word), he [the psychologist] is but showing the elements of knowledge."[141] By locating particular pieces of knowledge within the complex, an absolute standard is applied without the implication of a transcendent object. The totality of experience constitutes the absolute object, to which all particular 'knowledges' can be relative. However, this totality is nothing other than experience. It introduces no occult thing-in-itself. It merely considers the particular elements of knowledge in a larger context.

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[140] EW, 1, 130.
[141] EW, 1, 130.

The account that Dewey has provided is subject to the criticism that universal consciousness, the infinite condition of individual development, exists only for individuals. In other words, the concern is that the 'universal consciousness' is substantially different than the individual consciousness studied by psychology. The concern here is that Dewey has smuggled in a transcendental condition on knowledge. What Dewey calls 'universal consciousness' with its infinite content may satisfy the demand for an absolute condition upon knowledge. However, such an entity does not seem to correspond to the instances of consciousness associated with individuals. Dewey's response to this objection is to point out that it makes assumptions not licensed by the psychological standpoint. In this case the psychological standpoint demands that the meaning of 'individual' and 'universal' be determined in their relations to experience. Dewey does not provide any exact determination of these relations.[142] He does conclude, "…since consciousness does show the origin of individual and universal consciousness *within itself*, consciousness is therefore both universal and individual."[143] This suggestion will be taken up again in *Psychology*, where a more detailed account is provided.

Dewey's second essay on psychology from 1886, "Psychology as Philosophic Method" develops some of the themes from his first essay. He spends a great deal of time considering the relationship between his conception of the psychological standpoint and Idealist philosophy. Although this discussion establishes Dewey's view that his psychological method is not essentially different from Idealism[144], as developed by Kant and Hegel, it does not contribute substantially to his views on experience. The remainder

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[142] EW, 1, 138-140.
[143] EW, 1, 140.
[144] EW, 1, 145-147.

of the essay treats two topics which are significant. First, Dewey argues against the traditional distinction between subjects and objects; arguing that both must be relative to consciousness. Second, he argues that psychology, as the study of experience, is a more appropriate method for philosophy than traditional logic.

Dewey provides several arguments in support of his position that any essential duality in human nature is impossible. This position develops naturally out of his consideration of the relation between philosophy and psychology. In defending his position he is refuting the idea that psychology and philosophy study separate topics; the former, human beings as conscious subjects, and the latter, human beings as parts of a larger system. By showing that both can be investigated using the same methods, Dewey supports his claim that the distinction is merely apparent. His first strategy for attacking this separation is similar to his tactics from the previous essay. He points out that the distinction necessarily exits for some consciousness; the distinction is part of experience.[145] Although this argument lends some support to his position, it does not seem sufficient.

His second argument is far more provocative. Here, Dewey provides an account that suggests that the entire phenomenon of consciousness is an unbroken continuum. The significance of such an argument is that a continuous consciousness might provide an absolute standard for knowledge, without requiring a foundation. The argument begins with the premise that perception is clearly within the scope of psychological study. However, once perception is admitted, then many other mental phenomena must be included as well.[146] He says,

[145] EW, 1, 149-150.
[146] EW, 1, 149-151.

> …those however who admit perception will find themselves hard put to it to give a reason excluding memory, imagination, conception, judgment, reasoning. … There is no possible break: either we must deny the possibility of treating perception in psychology … or, admitting it, we must admit what follows directly from and upon it – self-consciousness.[147]

In this essay, Dewey merely asserts this; he provides no argument for the connection of these phenomena. However, the quotation clearly expresses Dewey's position that the simplest mental phenomena are directly connected to the most complex.

Complex and simple psychological phenomena are not simply connected, they are also mutually contained. According to Dewey, simple mental phenomena are explained only when their interdependence with self-consciousness is understood. He says, "If there be such an act as perception, a candid, careful examination of it, *not of its logical conditions*, but of itself as *a matter of experienced fact*, will reveal what it is; and this revelation will be the declarations of its relation to that organic system which in its wholeness is self-consciousness."[148] The separation of mental life into distinct acts, such as perception, judgment, or feeling, amounts to an abstraction from the real whole. It is possible to consider these phenomena separately, but they never exist as such.[149] It is significant that Dewey identifies the failure of Kant to recognize the mutual entailment of the various psychological acts with the ultimate failure of his project. By illegitimately privileging logical considerations, Kant is unable to explain the simpler cognitive acts correctly.[150]

The final topic that Dewey considers in this essay is the relation between logic and psychology. Although Dewey's consideration of this relationship involves

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[147] EW, 1, 150-151.
[148] EW, 1, 151.
[149] EW, 1, 151-152.
[150] EW, 1, 152-153.

substantial comment on Hegel's treatment of the issue, Dewey's own position seems clear. Dewey understands logic, like the distinct mental acts, as an abstraction from the whole that is self-consciousness. His evaluation of the historical development of philosophy makes this commitment clear. He says, "The whole course of philosophic thought … has consisted in showing that any distinction between the form and the matter of philosophic truth, between the content and the method, is fatal to the reaching of truth."[151] Such a quotation might seem to deny logic, or indeed any formal considerations, a place within philosophical investigation. However, he later makes clear that, so long as form and content are afforded equal regard, no fatal difficulties arise.[152]

Since logic is an abstracted part of self-consciousness, it cannot be established as the ultimate standard for the elements of self-consciousness.[153] From this view, it is clear that a legitimate logic will, necessarily, derive from the actual relations present in consciousness. The final position of logic, in this formulation, is precarious. Dewey describes logic as, "…always balancing in unstable equilibrium between dualism and pantheism."[154] The force of his point is that investigations of experience using logic are always in danger of supposing some transcendental object opposed to the physical, or they are in danger of treating the physical as a mere consequence. The avoidance of this dilemma, which is here identified with Hegel, is the minimum condition on logical theory. However, Dewey's description of this positive moment is not fully articulated here.[155]

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[151] EW, 1, 163
[152] EW, 1, 164.
[153] EW, 1, 163-167.
[154] EW, 1, 165-166
[155] EW, 1, 166-167.

In these early essays, Dewey develops the major structures of his critical position. The problem he identifies is that any epistemic position based on sensation, as any defense of empirical science must be, is liable to succumb to a simple minded relativism. The problem with this position is not only that it undermines the legitimacy of the knowledge claims. Such a position is also subject to a deeper, structural, problem. The greater problem is the tendency of such theories to assert the relativity of knowledge claims without asserting any object to which such claims may be relative. In these early works, Dewey refers to 'universal consciousness' as a solution to this problem. The view seems to be that there is some immanent universal principle of knowledge. However, Dewey's use of the term is highly colored by the influence of idealist philosophy, especially Hegel. As his position develops, this aspect of the positive project is quickly abandoned in favor of less abstract explanations. The important point in charting this development is the recognition that Dewey never fully abandons the critical aspects of his project, although his solutions change.

It is important to recognize that Dewey's consideration of the nature of consciousness is closely connected to the Kantian discussion of intuition. Here, Dewey seems to identify a structure, distinct from sensation, that might possess the qualities necessary to ground a Kantian account of synthetic *a priori* knowledge. However, the positive account is still far too vague to assess whether a structure like 'universal consciousness' will be adequate to such a function. Further, even if it is shown to be adequate, it may still suffer the same shortcomings as Kant's view.

The early development of his positive position can already be discerned in his work on psychology. His essay, "Knowledge as Idealization," and his account of knowledge in *Psychology* both articulate accounts of the universal element in knowledge substantially different from the schematic descriptions presented in the previous essays. "Knowledge as Idealization" begins this development by identifying meaning as the significant distinction between knowledge and sensation. The process of the generation of knowledge is not taken up until his more sustained investigation in *Psychology*.

"Knowledge as Idealization" begins with the identification of two aspects of all ideas. Following Locke, Dewey claims that every idea has both an existential and semantic element. Every idea has, what he calls, "psychical existence," the reality of an idea as an idea. Ideas also have meaning; that is, they are interpreted as signifying something. One aspect of the signification of sensory ideas is their objectivity. They are taken to signify some existent object outside the mind, and independent of it. Dewey states that he is not, at this point, interested in considering the legitimacy of that significance. He will, rather, consider only the significance of ideas independent of their supposed connection to the world: their semantic significance.[156]

In their material aspect, ideas are nothing more than collections of sensations. Dewey uses the example, drawn from Locke, of the idea of gold. The material of the idea is a collection of sensory data; weight, color, etc.. Perception, however, is not synonymous with this collection of sensations. Perception already treats this collection as having some *significance*.[157] If we are considering the significance of "gold" in our perception of a gold coin, then the significance includes color and weight, but not shape. The significance of any idea, Dewey says, is due to mediation in the form of inference. The justification for such a claim is the recognition that complex processes occur in what

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[156] EW, 1, 176-177.
[157] EW, 1, 178-179.

appear to be simple perceptions. He takes this to demonstrate that the sensations, as merely existent, have almost no function in the operation of consciousness. Such operations begin with meaning.[158]

Although he has argued for the primary importance of perceptions as meaningful, Dewey has not yet explained what is involved in the distinction. He states his position, saying, "It is not sensation in and of itself that means this or that object; it is the sensation as associated, composed, identified, or discriminated with other experiences; the sensation, in short, as mediated."[159] This statement begins to specify what Dewey intends when he says that sensations become significant, in the process of perception. The inferential mediations that contribute significance are the imposition of relations between collections of sensations.[160] To continue the example of the gold coin, the collection of sense experiences is insignificant until they are connected with others. In the previous case, the significance of the material, gold, was distinguished. However, the significance of the object as a coin involves the isolation and collection of a different set of sensations. In both cases, the "psychical existent" is the same, but the significance changes.

Recognizing that there is significance in all perceptions, and that significance is essential to the function of perceptions in intellectual life, leads directly to Dewey's insistence that knowledge requires a universal component. Dewey has already argued that perceptions have significance in virtue of their relations, the connection and discrimination among the various components of sensations. However, significance also derives from connections to the totality of experience. The first example Dewey gives of this connection is between present ideas and past ideas. This cannot be a connection

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[158] EW, 1, 180-181.
[159] EW, 1, 183.
[160] EW, 1, 182-183.

among sensation, since past sensations no longer exist as sensations.[161] He says, “In short, the sole way of accounting for the fact that we have significant experience, […], is that the mind conserves permanently out of every experience the meaning of that experience, and, when it sees fit, reads this conserved meaning into a given sensation, thereby completing the transfer of significance.”[162] This idea, that the significance of ideas relies on their connection with both past experience and future experience, will be revisited later in Dewey’s career. Here, the significant point is that the phenomenon of meaning requires mental objects that are not simply sensory.

The explanation of the exact mechanism of the full generality of knowledge can only come from the *Psychology*. In “Knowledge as Idealization,” Dewey is not fully clear on why the generality of significance should lead to universality. He does, however, make another extremely significant point. At this point in the development of his description, there is no reason to suppose that Dewey’s understanding of meaning is any different than Kant’s. The relations that impart significance could simply be imposed, from the outside, on sensations. The final point of note in this essay is Dewey’s explicit denial of that understanding.

He says, “If it be asked, then, how psychical experience can begin, the answer is, indifferently, either that it does not begin, or that it begins as the beginning of the development – the manifestation – of internal content of intelligence.”[163] The claim expressed in this quotation, that meaning is a manifestation of an immanent component of intelligence, distinguishes Dewey’s view from Kant’s. This understanding of the development of significance has the consequence of removing many of the specific

[161] EW, 1, 187.
[162] EW, 1, 188.
[163] EW, 1, 188.

constraints Kant imposed on the *a priori*. He says, "We do not care whether they [sensations] are interpreted as in space and time; as possessing necessarily quantity, quality, relation and modality or not."[164] The question of what the *a priori* is, if it is not associated with any of these traditional categories, is left open.

Although he rejects the attribution of these specific features to the *a priori*, his belief in some definite condition imposed by intelligence is clear. The first important claim in this argument is that significance cannot be imposed on meaningless content. Dewey's claim constitutes a denial of the traditional empiricist mechanism for generating knowledge. It is not sufficient to suppose that sensations are merely associated, and from these associations knowledge arises. There is no association among simple sensations. In order for associations to arise, intelligence must recognize that sensations *can be* associated. He says, "A mind which does not come to sensations with an ineradicable pre-judgment that the sensations are interpretable, that is, possible bearers of an ideal quality, does not have the starting point for interpretation, and sensation could not ever get a beginning on the road of meaning."[165] Thus, meaningless content could be combined and distinguished indefinitely, without meaning ever arising.[166]

The fact that significance cannot be supposed to be imposed on meaningless content, "…leads us to recognize that intelligence has a necessary internal permanent content…."[167] Such content is not imposed upon sensation, as the Kantian categories are. The content contributed by intelligence, which is associated with the identification of significance in experience, is a consequence of the meaning of experience. This content

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[164] EW, 1, 189.
[165] EW, 1, 188.
[166] EW, 1, 188-189.
[167] EW, 1, 189.

is identified with the *a priori*. "…[I]ntelligence as ideal (or *a priori*) constitutes experience (or the *a posteriori*) as having meaning."[168] The implication of this statement is somewhat obscure. It is worth noting that '*a priori*' has already been substantially reconceived. The *a priori* is identified by the fact that experience has meaning. That meaning is inexplicable without the assumption of some prior content. At this point, it is unclear what that content is or where it originates. However, in Dewey's subsequent work, it will become clear that the meaning of experiences arises out of the fact that humans approach sensations, not merely as mental objects, but as values in a teleological structure.

The view expressed in "Knowledge as Idealization" makes Dewey's commitment to some conception of the *a priori* clear. However, it is equally clear that this conception is strikingly different from the traditional view. In the first place, it is not imposed by the mind upon experience, but identified as immanent in experience. It is a consequence of the meaning and the inferential association of ideas. Finally, and perhaps most importantly, it fulfills the function of the Absolute, or universal, in knowledge. It is through this universality that Dewey's view is most clearly associated with the traditional understanding of the *a priori*.

It is also important to note that this conception can be understood as a further specification of the role of logic, as described in "Psychology as Philosophic Method." As described above, Dewey is concerned to understand logic in a way that avoids dualism and yet maintains a role for concrete objects. The position articulated in "Knowledge as Idealization" seems to describe that role, albeit schematically. Experience is meaningful at every level; that is, it includes connections not imposed by

[168] EW, 1, 190.

the material. The meaning of experience is based on relations among ideas. These relations, taken as a whole, provide a universal context for particular claims. At this point, then, we have arrived at a description of *a priori* knowledge, in Dewey's work. Although this view will undergo substantial development, it is never wholly abandoned.

III. *Psychology*

Dewey's first major work, *Psychology*, published in 1887, and in subsequent editions in 1889 and 1891, develops the positive view presented in his early essays. It emphasizes his commitment to a universal component in knowledge, as well as providing a more detailed account of the development of knowledge. Like much of Dewey's work, *Psychology* is best understood as a whole. In his description of the work he makes clear that all the distinctions he makes are ultimately provisional.[169] My analysis of this work will be restricted to Dewey's remarks on knowledge, as the universal element of consciousness. Although it is in this discussion that Dewey's position on the *a priori* is developed, that view is ultimately supported by the relation of knowledge to the other aspects of consciousness, feeling and volition.

Dewey provides a similar, if more detailed, description of the psychological processes leading to knowledge as he did in "Knowledge as Idealization." The aspect of this description most pertinent to the consideration of *a priori* knowledge is his discussion of "Thinking." This stage is defined as, "…*knowledge of universal elements; that is, of ideas as such, or of relations*."[170] This stage is characterized, accordingly, as the mind's progress beyond perception or memory, as individual psychic objects. Here

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[169] EW, 2, 20.
[170] EW, 2, 177.

the mind is focused on "class qualities." These qualities constitute relations among ideas. Since these relations do not vary over time or space, they are universal.[171]

Dewey's description reiterates the point, made in "Knowledge as Idealization," that knowledge is always mediate. The third aspect of thinking, reasoning, is the explication of the relation that necessarily mediates all knowledge. He defines this stage as, "*…that act of mind which recognizes those relations of any content of consciousness though which it has the meaning which it has, or is what it is*."[172] This act may be either explicit or implicit, depending on whether or not the mind focuses on the relation. In either case, the universal fact of the relation is necessarily present.

The distinction between explicit and implicit reasoning explains the distinction between the *a priori* and the *a posteriori*, according to Dewey.[173] He says, "*A posteriori* knowledge is simply the *unconscious* recognition of the universal element, or relation, the ideal significance; *a priori* knowledge is the conscious recognition of it."[174] This passage makes clear that Dewey does not reject the *a priori* completely. Rather, as has been seen in the earlier essays, he objects to the conception of the *a priori* as an external criterion, imposed by the mind on the world. However, Dewey clearly identifies a universal element in human consciousness, and identifies that element with the *a priori*. It also seems highly significant that he identifies this content as relational. Although the account of meaning has not been fully articulated, it is clear that it depends on some relation among ideas. The *a priori* element in knowledge, then, is an explicit recognition of the relations that generate significance in experience.

[171] EW, 2, 177-178.
[172] EW, 2, 192-193.
[173] EW, 2, 194-195.
[174] EW, 2, 195.

The final important discussion in *Psychology*, is Dewey's presentation of the goal of knowledge. He has shown that knowledge presupposes the relation among ideas, and defined reasoning as the activity that attends to those relations. The development of reasoning, then, is taken to be a further relation of the relations. This relation of relations is called, by Dewey, "systematization." It is particularly associated with the activities of philosophy and science. He says, "It [systematization] is in result what we call 'science' and 'philosophy,' which are not only knowledge, but co-ordinated knowledge arranged in connected form."[175] The end of this process is philosophy, which is the "…attempt to systematize or arrange in their organic unity all special branches of science."[176] This last statement connects Dewey's understanding of the universal element in knowledge with the concept of 'organic unity.' This concept is only fully developed in Dewey's historical examinations.

Although the *Psychology* does not represent a fully detailed presentation of Dewey's position, it is possible to see that it develops some of the details left unclear by the earlier essays. Here Dewey provides a more detailed account of the nature of *a priori* knowledge as the identification of the inherently meaningful structures of experience. Such knowledge is not 'prior to' experience; such knowledge would imply dualism. Rather, it is drawn out of experience. The distinction between the *a priori* and *a posteriori*, is based on attention to the structures that generate meaning. When experience is simply regarded as meaningful, with no attention to the connections that make it so, then the knowledge gained is *a posteriori*. When those structures are attended to, the knowledge gained is *a priori*. Although distinct from traditional versions of the *a*

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[175] EW, 2, 201.
[176] EW, 2, 201.

priori, such knowledge retains the universal character of such knowledge. A significant aspect of this universality comes from the organic character of the semantic relations, taken as a whole. The idea of consciousness as an 'organic unity' is explored more fully in Dewey's discussion of the history of philosophy.

Before moving on to the question of the 'organic unity' of experience, it is important to evaluate what progress has been made. At this point, many of Dewey's ideas about the *a priori* and its relation to meaning are schematic and vague. The claim that there are structures within experience that generate significance is clear. These structures are identified as relations between ideas. Unfortunately, Dewey does not provide a detailed account of these relations, and the manner in which they generate meaning. Fortunately, such an account is provided in later writings. To clarify this material, therefore, it is necessary to anticipate that discussion. The structures that generate meaning connect ideas or sensations that are immediately present to a future experience, which fulfills some subjective end. For example, the appearance of a chair signifies sitting down. These connections, once instituted, acquire regulative force. In this sense, when they are explicitly recognized, it is possible to derive *a priori* knowledge from them.

IV. Dewey's Historical Work

Dewey's historical work restates the broad structure of his critical enterprise, the rejection of strong hypostasized duality, and also introduces some features of his later positive views. In particular, this work demonstrates Dewey's earliest interest in the concept of 'organic unity,' characterized by continuity. It is the conception of experience as a continuous unity that allows it to fulfill the role of the absolute condition of relative knowledge. By the end of Dewey's early period this conception, supplemented by a naturalistic understanding of organism, fulfills the functional role of 'Universal Consciousness'. In performing this function, the concept of organic unity, and the emphasis on continuity that it implies, remain consistent throughout Dewey's career.

Dewey's early historical work largely focuses on his criticism of dualism and the unquestioned acceptance of formal logic, or logic based on the principle of identity. One of Dewey's first published works, "Kant and Philosophic Method," examines the innovation that justifies Kant's place as "…the founder of modernist philosophy…."[177] Kant's contribution involves the resolution of philosophical difficulties caused by the methodological shortcomings of Rationalism and Empiricism. Specifically, Kant focuses philosophical attention on the synthetic activity of mind, and is thus able to surpass the achievements of the earlier systems. The recognition of Kant's advance beyond the Rationalists and Empiricists, and the identification of this advance with synthesis, is clearly important to a defense of synthetic *a priori* knowledge.

Dewey analyzes Kant's philosophical development in terms of two rejections. In the first place, Kant rejects the analytical method of the Rationalists. The method, begun by Descartes and continued in Kant's time by Wolff, identified logical analysis as the sole criterion of truth. He says "To discover truth is to analyze the problem down to those simple elements which cannot be thought away, and reach a judgment whose predicate may be clearly and distinctly seen to be identical with its subject."[178] This quotation is significant because it expresses, succinctly, the conception of logical analysis that Dewey attacks throughout his early work. The difficulty comes because the method

[177] EW, 1, 34.
[178] EW, 1, 34.

of analysis, dependent on identity, never captures reality. For Kant, the problem was most palpable in the consideration of causation. Causation involves the production of a new entity out of an old. The two are connected, but to suppose them identical renders the concept of causality meaningless; that is, if the effect, as a predicate, is identical with its cause, as subject, then nothing new has been produced. The reduction of all concepts to pure identity is the inevitable outcome. This recognition leads Kant and Dewey to abandon the Rationalist project as fatally limited.[179]

Empiricism represented the most obvious alternative to Rationalism. The Empiricist method, begun by Bacon and continued through Hume, involves the elimination of subjective elements in knowledge. The Empiricist mind, according to Dewey, must "…become a mirror, to reflect the world of reality."[180] Locke adds to this negative moment the positive method of analyzing perceptions according to a criterion of agreement. Where the Rationalists began with concepts, the Empiricists begin with percepts. Thus, they account for novelty as the contribution of the world to mind. This would seem to solve the Rationalist problem, but it is soon seen to lead to Berkeley's idealism and Hume's skepticism.[181]

Kant's insight is to isolate the implicit supposition that made each method possible, and was subsequently forgotten; the synthetic element. Dewey summarizes the Kantian contribution as the recognition "…that thought *in itself* is analytic, it is synthetic when applied to a material given it, and that from this material, by its functions, it forms the objects which we know."[182] It is neither the case that knowledge arises out of

[179] EW, 1, 34-35.
[180] EW, 1, 35.
[181] EW, 1, 35-36.
[182] EW, 1, 37.

relations among pure concepts, nor is it concatenated out of independent sense perceptions. Rather, it is the outcome of an active process; an interaction between a manifold, known through sensation, and a synthesis, known by Reason through concepts. Kant's contribution to philosophical method, then, amounts to the sum of these two insights.[183]

In the first place, then, Kant must explain the role of categories in knowledge. The most obvious understanding of the categories is that they are the synthesis of a group of objects, based on some feature shared by all the objects. The relation between the isolated feature and the category it determines is the basis for logic. As such, the categories are, as Dewey says, "…subject to analysis according to the law of identity…."[184] That is, the categories are analyzed according to the identity of the defining feature possessed by all objects they subsume. However, the categories are related to the objects, as constituted to constituent, and are therefore synthetic. This relation is not determinable by logic alone, as it is not governed by the 'law of identity'. The categories, as true of objects or objectively valid, require a new criterion of truth beyond the law of identity. This criterion is established by possible experience. Dewey says, "In other words, the categories have objective validity or synthetic use because without them no experience would be possible."[185] In this sense, concepts are the necessary constituents of any experience.

Concepts, then, seem to be contradictory. They are, at once, the necessary conditions of experience, and the outcome of synthetic activity upon experience. However, in the explanation of this contradiction, Dewey introduces the concept which

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[183] EW, 1, 37.
[184] EW, 1, 37.
[185] EW, 1, 37.

makes his analysis of Kant independently interesting, the notion of organic unity. In a provocative passage, he says

> And experience is a system, a real whole made up of real parts. It as a whole is necessarily implied in every fact of experience, while it is constituted in and through these facts. In other terms, the relation of categories to experience is the relation of members of an organism to a whole.[186]

According to Dewey, Kant's innovation is to recognize the necessarily organic character of knowledge. At this point, the full significance of the organic nature of knowledge is not apparent. However, it is a thread that runs through all of Dewey's work.

At this point, Dewey admits that his examination of Kant has, so far, only considered the formal properties of knowledge. It is also a tenet of Kant's system that the synthetic activity of the categories is enacted upon a foreign, and discrete, material. The discrete objects are known through sensation; through the mind's capacity to be affected. It is in considering this aspect of Kant's system that Dewey discerns flaws. The categories apply to objects only for beings who are able to be affected in the requisite ways. That is to say, the categories do not apply to objects *per se*, and so do not truly apply to them at all. The understanding of the categories as an organic unity also supposes that that unity can be known. However, in the light of these considerations, only objects which are capable of affecting minds, objects as foreign, can be known.[187] Dewey articulates his assessment of the ultimate success of the Kantian system, "The golden prize, which seemed just within our hands as long as we confined ourselves to the Transcendental Logic, turns out to be a tinsel superfluity."[188]

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[186] EW, 1, 38.
[187] EW, 1, 39.
[188] EW, 1, 39-40.

It is important to recognize the connection between this criticism of Kant, and the difficulties in interpreting intuition. The specific relation between intuition and sensation was the principal issue identified by both Hintikka and Parsons. Hintikka's solution to the difficulty, the emphasis on activity in the generation of intuition, seems closely connected to Dewey's identification of Kant's innovation. Further, Dewey's recognition of Kant's ultimate failure in this area seems similar to Hintikka's recognition that his interpretation of Kant requires a departure from the text. The question, then, is whether Dewey understands Kant's position, and particularly the synthetic *a priori*, as salvageable.

Given the connection between the synthetic *a priori* and intuition, it is not surprising that the salvage of the former requires a reevaluation of the latter. The problem of synthesis arose out of Kant's concession that the synthetic activity of knowledge required a foreign material upon which to work. However, the remainder of Dewey's analysis argues that this concession is completely unwarranted. He points out that the subject and its external objects, which Kant identifies as the participants in knowledge, are themselves already constituted in experience, and by the categories. By taking the subject-object relation as immanent, rather than transcendental, Dewey argues that knowing is the first manifestation of the dual nature of Reason. It is now neither purely analytic, as it was for the Rationalists, nor is it purely synthetic, as the earlier analysis of Kant concluded. Dewey says, "[Reason] separates itself from itself, that it may thereby reach a higher unity with itself."[189] Rather cumbersome phrasing, to be sure, but the point is significant. The same circle that characterized the organic unity of the concepts, before the consideration of foreign material, can be maintained. The only

[189] EW, 1, 41.

cost is a reevaluation of the nature of intuition, which treats it as an immanent phenomenon, rather than a transcendental one.[190]

Dewey understands Kantian intuition as the imposition of a mental structure on unstructured external objects. Although I don't think that Dewey's interpretation of Kant is completely accurate, the force of his criticism remains. What Dewey objects to is the illegitimate assertion of primary duality. The distinction between mental structure and receptive objects is assumed, and Dewey has provided arguments against any such assumption. These arguments do not go so far as to assert that there is no structure and no content. Rather, as the last quotation claims, these aspects are distinguished from some antecedent unary experience. Intuition, then, is not an ur-experience. It is the result of the identification of structural features already present in all experience. Thus, intuition ceases to be the origin of or an imposition on experience, and it becomes a significant aspect, among others, of experience itself. At this point in the development of his position, Dewey is not explicit about the nature of that structure. However, it seems reasonable to identify this structure with the connections that produce meaning. Those connections, and the structure they generate, will be more closely examined in the next chapter.

Dewey's book, *Leibniz's "New Essays Concerning the Human Understanding,"* provides an essential expansion of the notion of organic unity, which motivates the philosophical significance of the psychological work. The work on Leibniz also shows the beginning of Dewey's attempt to connect these questions to issues in formal logic. Although Dewey's work on Leibniz contains many suggestive elements, I will restrict my analysis to his critical, rather than expository, comments.

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[190] EW, 1, 40-42.

Dewey believes that Leibniz, like Kant, suffers from contradiction. In brief, Dewey's view is that Leibniz suffers from a contradiction inherent in his attempt to join scholastic logic with scientific innovation. The essay on Kant focused on Leibniz's logical side, but here he is presented as prefiguring Kant in his emphasis on the synthesis exposed by scientific investigation. The first pole of the contradiction, then, needs little rehearsal. On Dewey's view, Leibniz establishes the principle of identity as the ultimate criterion of knowledge.[191]

His insistence on the analytic character of knowledge does not exhaust Leibniz's philosophy, however. More importantly, he introduced the notion of "…the universe as a unity of inter-related members, -- as an organic unity, not a mere self identical oneness."[192] It is his attempt to reconcile this conception of the universe with the analytic criterion of knowledge that entangles him in contradiction. The exact nature of this contradiction reveals significant features of Dewey's view of the concept of organic unity and the nature of logical analysis. Here the content of Leibniz's philosophy, characterized by organic unity, is associated with harmony. It is, he says, "… a unity which essentially involves difference."[193] It is also "…a unity of activity, a dynamic process."[194] The logic of identity, in contrast, excludes process. Although these remarks are brief, they give a good first indication of the nature of organic unity. Organic unity is characterized by the inclusion of differences through attention to process. Provocatively, they also give some indication of Dewey's views on logic. Logic, for Dewey, will

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[191] EW, 1, 414.
[192] EW, 1, 415.
[193] EW, 1, 415.
[194] EW, 1, 415.

abandon identity as a criterion. In place of identity, Dewey will consider developmental processes tending toward 'organic unity' as the basis for logic.

The concept of organic unity, as it appears in Leibniz, is further developed through Dewey's examination of the role of the Principle of Sufficient Reason. The principle can be interpreted as purely formal; asserting, merely, that everything has some cause. In this sense, the principle does not, in any way, determine the nature of the cause. It only guarantees that there is one. However, the formal interpretation does not seem to be Leibniz's conception. On this interpretation, the principle merely asserts a connection between arbitrary discrete facts. However, Leibniz understands the principle as teleological, providing a criterion to understand the whole universe. The promise of this view is not realized, however, as its full realization would require a radical rejection of logic based on identity. By retaining his logical commitments, Leibniz fails to attain the full potential of his ideas.[195] If full use is to be made of the idea of organic unity, then it is clear that logic will require a radical reevaluation.

These early historical essays present Dewey's attack on traditional philosophy. He attacks the traditional dualities that form the basis of that account. Most important, is his rejection of the distinction between the knowing subject and the known object. Dewey insists, throughout this material, that it is impossible to develop an epistemology based on the imposition, by the mind, of structure on inherently unstructured material. The activity of the subject and the material must be understood as insolubly connected, although, in some sense, distinct. It is the retention of this distinction that prevents Kant's ultimate success. Progress is offered by Hegel, who provides an account based on the rejection of this distinction. It is this account that largely informs Dewey's

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[195] EW, 1, 415-417.

subsequent work on psychology. In psychology, Dewey believes he has found an expression of the unity of subject and object carried out in experimental science. However, as this account developed, internal conflicts arose between the empirical disposition of psychology and the commitments of Idealism.

It is important to note that the ultimate resolution of these tensions is the expansion of the role of 'organic unity' in Dewey's work. The discussion of Leibniz has already indicated the importance of this concept, but its ultimate systemic role will not be brought out until much later. Eventually, the concept will allow Dewey to account for the function of 'Universal Consciousness' in completely naturalistic terms. This account, then, allows him to retain his rejection of relativism while retaining his preference for scientific models of knowledge.

V. "The Reflex Arc Concept in Psychology"

"The Reflex Arc Concept in Psychology" represents the culmination of Dewey's early concerns. Through a psychological examination of the connection between stimulus and response, the reflex arc, Dewey lays the foundation for a naturalistic conception of the organic unity of consciousness. This naturalistic conception is the basis for Dewey's subsequent work in epistemology. Further, the view of the relation between organism and environment presented, taken in the context of a response to relativism, will support an interpretation of Dewey's conception of experience, developed in his subsequent work. If *a priori* knowledge, of any description, is to be found in Dewey's work, its origins are to be found here.

Dewey begins the essay by pointing out that the psychological understanding of the reflex arc reinstates the traditional divisions between subject and object. The distinction between stimulus and response, and their respective location in the peripheral and central nervous system, reinstates the distinction between sensation and ideas.[196] Dewey rejects this view of the reflex arc, as he has rejected the original philosophical versions of these dichotomies. In place of a rigid division between stimulus and response, Dewey will argue that "…sensory stimulus, central connections and motor responses shall be viewed, not as separate and complete entities in themselves, but as divisions of labor, functioning factors, within the single concrete whole, now designated as the reflex arc."[197]

To explain the distinction between his view and the traditional view, Dewey describes an example taken from James's *Psychology*: a child's interaction with a candle. The traditional view will decompose this interaction into several discrete stimulus-response pairs. The first is the stimulus of the candle's light, to which the child responds by grasping. The second is the stimulus of the burn, to which the child responds by withdrawing. Rather than regarding the impetus for the child's original action as the mere perception of light, Dewey claims it is an act of looking. The act of looking is habitually coordinated with the act of reaching. The visible object stimulates the desire to reach it, and the reaching requires a coordination of vision. The object must be held in the visual field, for example. The outcome of this reconsideration is, "…an enlarged and transformed co-ordination; the act is seeing no less than before, but it is now seeing-for-reaching purposes."[198] Finally, the burning must be closely connected with the seeing-

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[196] EW, 5, 96-97.
[197] EW, 5, 97.
[198] EW, 5, 98.

reaching coordination. If it were not, there would be no learning. In this way the burn transforms the character of the seeing-reaching.[199]

Dewey's revision of the traditional understanding seems significant to his epistemological project in two ways. The first, and most obvious sense, is that this description provides a concrete example of the continuity of experience. The connection is demonstrated by the fact that the complete experience is informative. The original sensory stimulus, the light, takes on a new character after the burn. If the two sensations were completely distinct, such information would be impossible. Although this description does not constitute a justification of such a connection, it does clarify the significance of the continuity of experience. Given that this description preserves the view of experience as continuous, it is also significant that this description is completely without Idealist language. In this sense, Dewey's reinterpretation of the reflex arc provides an even more naturalist grounding for his view of experience than the *Psychology*.

Although this example is suggestive, it does not constitute an argument for Dewey's revision of the stimulus-response model. The positive construction begins with the recognition that the distinction between stimulus and response is not a substantial distinction, but a teleological one. Two stages in the recognition of stimulus and response can be distinguished. However, this statement is already deceptive, because, in the first stage there is no distinction between stimulus and response. There is an ordered series of acts. Dewey offers acts that have become thoroughly habitual as an example of this stage. There is a sense in which the tactile sensations of the ground stimulate walking as a response. For example, walkers do not consciously respond to variations in

[199] EW, 5, 97-98.

terrain, but various surfaces require different muscular responses. The walker is not conscious of the distinction between the sensation and the muscular orientation. The only stimulus the walker recognizes is the desire to get from here to there. According to Dewey, the lack of distinction, in these cases indicates the continuity of the psychological components.[200]

The continuity of this sense of the relationship between stimulus and response is strengthened by the common character of the components. In the traditional stimulus-response model, the distinction is reinforced by the difference between sensation, as stimulus, and motion, as response. Dewey points out that in the cases identified as lacking any substantial distinction there is also no difference in the character of the supposed stimuli and responses. To continue the example of walking, the stimulus, the tactile interaction of the walker's feet, legs, and the floor, is, what Dewey calls, "sensori-motor". The sense of this term is that the interaction with the floor is not a passive reception of sensory information. The sensation is itself a consequence of the motion involved in walking. In the same sense, the supposed response is equally sensorimotor. The character of the movement, in this case, is a consequence of the continued sensory information gathered.[201]

This analysis of certain intentional actions, which are strongly governed by established habits or instinct, shows that, in at least these cases, there is no substantial method for rigorously distinguishing between stimulus and response. The entire process is continuous. The question that remains after this analysis is why the distinction between stimulus and response ever arose. The reason for the distinction, Dewey says, is

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[200] EW, 5, 104-105.
[201] EW, 5, 105.

that not all actions are so thoroughly habitual. There are some sensorimotor phenomena whose outcome is uncertain. It is the uncertainty that produces the apparent difference between stimulus and response. The analysis of this second type of sensory motor-phenomena will also make clear the full sense in which such distinctions are teleological.

Dewey claims that the fallacy involved in treating all acts as though they were the result of established habits is retrospective. He points out that the distinction between stimulus and response can only be made after the act is complete. When the child reaches for the candle flame, the light is taken to be the stimulus. However, if we suppose that the outcome of the act is questionable, for example if the reaching for bright lights has resulted in pleasure as well as pain, then the stimulus becomes equally questionable. Dewey says,

> The question of whether to reach or to abstain from reaching is the question what sort of a bright light we have here? … The stimulus must be constituted for the response to occur.[202]

The fallacy lies in assuming the character of the sensation antecedes the response.[203]

The distinction between stimulus and response arises because of the uncertainty inherent in the character of certain sensations. When there is no difficulty with the action occasioned, as in the case of walking, there is no distinction. Where there is a question, then there is a distinction between the stimulus and the response. However, the character of the two components is only determined when the act has been completed. The determination of the act as a whole by its completion is the sense in which the distinction is teleological.[204] Dewey says,

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[202] EW, 5, 106.
[203] EW, 5, 105-106.
[204] EW, 5, 106-107.

> We must have an anticipatory sensation, an image, of the movements that may occur, together with their respective values, before attention will go to the seeing to break it up as a sensation of light, and light of this particular kind. It is the initiated activities of reaching, which, inhibited by the conflict in the co-ordination, turn round, as it were, upon the seeing, and hold it from passing over into further act until its quality is determined. Just here the act as objective stimulus becomes transformed into sensation as possible, as conscious, stimulus. Just here also, motion as conscious response emerges.[205]

The quotation above, when read in context, indicates a fundamental component of Dewey's view. The analysis of the action demonstrates the character of primary experience. The continuity of experience is identifiable as primary. Its decomposition is identifiable as a consequence of analysis after the fact. The character of the products of that analysis depends on the character of the outcome of the completed action. Further, the character of these products is never fully settled. They are continually reevaluated as the context for their evaluation expands. None of the components acquire permanent existence through the analysis.[206]

It is now possible to see how the discussion of the reflex arc constitutes a culmination of the issues identified in Dewey's earlier work. Dewey implies the significance of the essay in its final sentence. He says, "The point of this story is in its application; but the application of it to the question of the nature of psychical evolution, to the distinction between sensation and rational consciousness, and the nature of judgment must be deferred to a more favorable opportunity."[207] As a conclusion to my discussion of Dewey's early work, I will attempt to indicate what I take the application of this story to be.

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[205] EW, 5, 107.
[206] EW, 5, 107-108.
[207] EW, 5, 109.

VI. Conclusion

The ultimate significance of Dewey's early period is twofold. The first significant point is the recognition of Dewey's interest in the problem of relativism. He explicitly recognizes that any epistemological position which understands knowledge as relative to something, whatever it may be, faces certain inherent challenges. The recognition of this challenge, and the attempt to meet it, will be a central feature of Dewey's later epistemological work. The second significant feature of Dewey's early work is the presentation of his first attempts at solving the problem of relativism. Although the solutions presented in these works are, at best tentative, they indicate the trajectory of Dewey's subsequent views. By establishing the continuity of Dewey's thought, it becomes possible to understand the context of his later work more fully. More specifically, it becomes possible to understand that work as providing a reevaluation of the *a priori*, and not merely a rejection.

Overall, the focal problem of Dewey's early epistemology is to account for the non-relative conditions of knowledge without imposing any transcendental or dualistic criterion. The establishment of psychology as the model and method of philosophical investigation constitutes the beginning of this account. Consciousness and experience, the two objects of psychological investigation, avoid the assumption of any of the traditional dualities Dewey regards as untenable. The assumption of the 'psychological standpoint' amounts to a commitment to avoid such assumptions. However, such a commitment does not yet avoid the problem of relativism.

Ultimately, relativism can only be avoided by exposing the general content of experience. This investigation begins with the recognition that experience is fundamentally meaningful. Even the most basic experience, like the experience of isolated sense data, must be regarded as potentially meaningful. In some sense, the above description already betrays the position Dewey is defending. The simple elements of experience are not genuinely fundamental. Rather, they are the consequence of the analysis of a more fundamentally interrelated experience. By taking experience as already meaningful, already constituted by continuously interrelated elements, Dewey is able to account for the absolute condition of knowledge without the assumption of any foundational content.

The task of philosophy, based on this new conception of experience, is to expose the relations inherent in it. Exposing these relations, which do not depend on particular experiences but on experience as a continuous whole, involves the generation of a new logic. Such a logic cannot be based on the principle of identity, which involves the reduction of plurality to unity. It must be based on relations that allow difference to persist through identification. This reconstruction is not fully articulate in these works, but as Dewey's career progresses the details become clearer. What is clear, here, is the connection between the fundamental continuity of experience, its organic unity, and any legitimate conception of logic.

The picture of the *a priori* that emerges from these early works is strikingly different than the Kantian, but still recognizable. *A priori* knowledge is not imposed by the mind on plastic content to constitute full experience. Rather, full experience is primary. Intuition, in the Kantian sense, is no longer of simple structures. Intuition, in this new sense, includes the full continuity of experience. Within this expansive intuition, *a priori* knowledge is exposed by attention to general, ultimately universal, features of that experience. In this sense, then, the *a priori* is not *prior to* experience, but in its generality, it acquires a certain independence from all particular experiences. Thus, it is not a transcendental condition, but the exposure of an immanent structure. The exact features of that structure must now be discerned through consideration of experience itself.

Chapter 3: Radical Empiricism

In the early decades of the Twentieth Century, Dewey's epistemological interests turn to empiricism; or in his terms, "Radical Empiricism" or "Immediate Empiricism." This interest, which includes an increased focus on the issues of experimental science, is the fulfillment of Dewey's earlier commitments. Dewey's goal is to establish a criterion for claims of knowledge that is not restricted to the mind of any single individual; that is an absolute criterion. It is worth noting, at the outset, that Dewey's empiricism is not a simple assumption of the empirical tradition established by Locke, Hume, and Mill. The precise details of Dewey's innovation will be the central occupation of this chapter.

Given the claim that Dewey maintains a commitment to *a priori* knowledge in some sense, the discussion of his Radical Empiricism becomes especially important. In a general sense, Empiricism is a philosophical tradition largely defined by its opposition to various understandings of *a priori* knowledge. Locke's *Enquiry Concerning Human Understanding* opens with an attack on innate ideas. Although the conception of innate ideas in that work is not identical to the more subtle conception of the *a priori*, the two are related. We may take for granted that any position which claims the mantle of Empiricism and still supposes some ideas independent of experience, at the very least, must explain this apparent inconsistency. This explanation, which includes the modification of the traditional definitions of both Empiricism and the *a priori*, will be the specific occupation of this chapter.

I. From Consciousness to Experience

Dewey's early work was organized by his interest in psychology. Because of this central interest, Dewey largely considered issues of epistemology in terms of consciousness. As his career developed his interests diverge, and consciousness loses its central position. This trend is already visible in his work on the reflex arc concept. In his work around the turn of the century, Dewey's focus shifts from a discussion of consciousness to a discussion of experience. Although this shift marks an important development in his thought, it is important to recognize that continuity is maintained. Dewey's response to relativism was largely stated in terms of consciousness. It will be important that Dewey retains these concerns, even through he largely abandons that terminology. In order to understand this transition, we may consider Dewey's essay "'Consciousness and Experience".

The first significant fact about Dewey's essay is the title. Dewey published the essay twice during his career. When he first published it, in 1899, he did so under the title, "Psychology and Philosophic Method."[208] This title bears striking resemblance to his early essay, "Psychology as Philosophic Method." The second title, "'Consciousness and Experience," was used when the essay was republished in 1910 in the collection *The Influence of Darwin on Philosophy*.[209] The change of titles belies the conceptual and terminological transition that Dewey implemented during this period.[210]

The development of Dewey's position is evident from the very beginning of the essay. He begins by pointing out that all sciences are determined by conditions external to them in the "…practical life of the time."[211] Psychology, although concerned with

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[208] MW, 1, 113. n. John Dewey, *The Middle Works of John Dewey: 1899-1924*, Vol. 1: 1899-1901, ed. Jo Ann Boydston (Carbondale, Il.; Southern Illinois University Press, 1976). Citations to the *Middle Works* will be abbreviated MW, vol., p.
[209] MW, 1, 113. n.
[210] Throughout this chapter I have followed the chronology of the essays original appearance, as provided by the *Middle Works*, rather than the order of their inclusion in *The Influence of Darwin on Philosophy*. The chronological presentation seems to me to preserve the conceptual development of Dewey's position better than the organization of that work.
[211] MW, 1, 114.

phenomena linked to individuals is equally determined by external forces. Although psychology is concerned with the phenomena of consciousness, which are inextricably tied to individuals, the individual herself is determined by larger social forces. He says, "An autocratic, an aristocratic, a democratic society propound such different estimates of the worth and places of individuality; they procure for the individual as an individual such different sorts of experience; they aim at arousing such different impulses and at organizing them according to such different purposes, that the psychology arising in each must show a different temper."[212] This determination, according to Dewey, makes psychology "a political science".

The significance of this analysis lies in its demonstration of the expansion of psychology. In the early work on psychology, Dewey asserts the general significance of psychology. However, he seems to struggle to explain specifically how psychology acquires that significance. In that work he often invokes "universal consciousness" to explain psychology's importance. Here we see a more concrete account. Although it is concerned with the individual psychology is able to acquire broader significance through the implications of the individual in society. We also see an example of the organic connections among various aspects of experience; in this case the individual phenomena of psychology and the social phenomena of political life.

The more substantial discussion in this essay focuses on the problem of subjectivity, which seems to continue the concerns of relativism from Dewey's early period. Dewey takes his remarks as a response to a growing tendency to treat psychology as essentially subjective. This restriction is supposed to provide a definite set of data for psychology; specifically, 'states of consciousness'. Such a conception of psychology, if

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[212] MW, 1, 113.

true, would refute any significant connection between psychology and philosophy.[213] The insistence that psychology is not simply a study of subjective phenomena maintains the commitment of the early work to respond to relativism. It is important to note that the locus of that response has shifted. It is no longer the case that psychology will provide an 'absolute' or 'universal' basis for philosophy. Rather, the focus on the social implications seems to imply a weaker sense of commonality.

It is the social situation of psychology that makes clear that any subjectivist position cannot be maintained. Any limitation of the sphere of psychological data can only be provisional. "If the individual of whom psychology treats be, after all, a social individual, any absolute setting off and apart of a sphere of consciousness as, even for scientific purposes, self-sufficient, is condemned in advance."[214] This rejection is connected to an understanding of consciousness as a 'symbol' of the larger social conditions. "To know the symbol, the psychical letter, is important; but its necessity lies not within itself, but in the need of a language for reading the things signified."[215]

The significance of this passage lies in the connection of the nature of psychology to the question of meaning. The particular investigations of psychology constitute the signifiers of the larger meanings. The importance of this connection lies in the discussion of the nature of meaning in the early work. Meaning involved the complex connections among phenomena. The significant innovation here is that meaning is no longer considered as a relation among psychological objects; it now involves a connection between the psychological and the social. The continued interest in the meaning of psychological phenomena will also be significant to Dewey's revision of Empiricism. It

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[213] MW, 1, 113-114.
[214] MW, 1, 114
[215] MW, 1, 114.

is important to note that many of the elements in these connections are not, in a strict Lockean sense, empirical.

In order to consider the status of the proposed restrictions of psychological data, Dewey focuses on an examination of what psychology would be, if those restrictions were to hold. Such restrictions consider psychology to include only questions of analysis and synthesis of the 'modes and processes' of consciousness. On this conception, psychology does not treat any normative questions. Such questions are the domain of philosophy.[216] It is worth noting the connection of this conception of psychology with the naïve Empiricist accounts Dewey criticizes. The notion of psychology as the consideration of the concatenation of some atomic elements can be considered a revival of the Empiricist treatments of sensation in epistemology. An example of this type of combination is Locke's description of the complex idea of lead out of simple sensory ideas. The idea of lead, according to Locke, is composed of "…a certain whitish colour…," and, "…certain degrees of Weight, Hardness, Ductility, and Fusibility…."[217] It is significant to the empirical position that Dewey develops that he rejects this view. The rejection of atomic sense data supports the continuity of his thought, and imposes a negative criterion on any interpretation of his own Empiricism.

Dewey goes on to consider what psychology becomes when the objectionable conception of sensation is abandoned. It is important to note that he does not wholly discard sensory experience as a source of data. His innovation is to suggest that such data, including the results of its analysis and synthesis, are not the ultimate object of psychological study. Rather, the "states of consciousness" become the signifiers of those

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[216] MW, 1, 114-115.
[217] John Locke, *An Essay Concerning Human Understanding*, ed. Peter H. Nidditch (Oxford: Clarendon Press, 1975), 165.

ultimate objects. The data of psychology are the manifestation of the real object of study. "It may be that the psychologist deals with states of consciousness as the significant, the analyzable and describable form, to which he reduces the things he is studying. Not that they *are* that existence, but that they are its indications, its clues, in shape for handling by scientific methods."[218] Before considering the exact meaning of this claim, it is important to note that it makes further connection with Dewey's early work, as well as dispelling any claim that Dewey's empiricism fits the classical mode.

Psychology, in this new sense, is interested in the *significance* of states of consciousness. Dewey provides an analogy to make clear how the ultimate objects of psychology are related to the basic data of consciousness. He compares psychology to paleontology. In paleontology, the scientist studies fossils. However, paleontology is not the study of fossils. Rather, it is the study of the animals whose remains constitute the fossils. The fossils themselves are merely specifically shaped rocks before they become the paleontologists object. Dewey extends his explanation with another analogy, this time to painting. Painters are certainly interested in paint, but, again, not for its own sake. The painter's ultimate interest is in the significance of the paint.[219] Dewey says, "…he [the painter] reveals to us the mysteries of sunny meadow, shady forest, and twilight wave. These are the things-in-themselves of which the oils on his palette are phenomena."[220]

Although these analogies are illuminating, there is still the issue of making their application to the question of psychology explicit. Dewey argues that the specific states of consciousness, which the strong empiricist would insist are the sole and ultimate

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[218] MW, 1, 116.
[219] MW, 1, 116-117
[220] MW, 1, 116.

objects of psychology, are like the painter's oils or the paleontologist's fossils. They are the signs of the activity which is the psychologist's true interest. That activity, like the painting or the extinct animal, are unavailable directly. They can only be considered through these indices, but the ultimate objects are not reducible to those indices.[221]

In support of the claim that particular states of consciousness cannot be the proper objects of psychological study, he makes a remarkable claim. He says, "I conceive that states of consciousness (…) have no existence before the psychologist begins to work."[222] Such a claim would seem to completely vitiate the analogy Dewey has constructed. Clearly paints exist before paintings and fossils exist before paleontology. In what sense, then, do states of consciousness arise only after the investigation of the psychologist? He returns to the paleontologist to illustrate his claim. Consider a paleontologist investigating a set of footprints. These footprints clearly exist as depressions in the rock. However, the paleontologist treats them as signs of the habits and activities of the animal that made them, not solely as topological curiosities. By taking the standpoint that the salient feature of the footprints is the evidence that they provide about their maker, the paleontologist brings a new entity into existence; the footprint-as-signifier.[223] Dewey explains,

> The supposition that these states are somehow existent by themselves and in this existence provide the psychologist with ready-made material is just the supreme case of the "psychological fallacy": the confusion of experience as it is to the one experiencing it with what the psychologist makes out of it with his reflective analysis.[224]

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[221] MW, 1, 116-117.
[222] MW, 1, 117.
[223] MW, 1, 117-118.
[224] MW, 1, 118.

Dewey begins to describe the generation of states of consciousness out of the activity of psychological analysis. He says, "Acts such as perceiving, remembering, intending, loving give the points of departure; they alone are concrete experiences."[225] These experiences are then analyzed by psychologists into constituent 'states of consciousness'. It seems reasonable, here, to think about the analysis of the reflex arc into stimulus and response. In such a context, this essay becomes a reinterpretation of the nature of psychology when its objects are treated as continua, rather than as discrete atoms. The 'states' into which these experiences are analyzed have no independent significance. They are only important in relation to the concrete complexes. It is important to note that the complexity of these objects need not be fully continuous, in the sense identified in Dewey's earlier works. Complexity is necessary, but full analysis may, in some cases be possible.

Dewey provides a further analogy that strengthens the connections to his earlier work, and to his essay on the reflex arc in particular. Physical processes, like digestion, respiration, and locomotion, are not directly observable. The organs associated with those functions are observable. In some circumstances, the function is ignored. For example, an anatomist may simply describe the structure of the musculature of the leg. However, the reason for the interest in that structure is the role of those muscles in walking. It is the reference to the function that generates the significance of the discrete facts.[226] "But nevertheless it is the function that fixed the point of departure, that prescribed the problem and that set the limits, physical as well as intellectual, of subsequent investigation. Reference to function makes the details discovered other than a

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[225] MW, 1, 118.
[226] MW, 1, 118-119.

jumble of incoherent trivialities."[227] Again, this description serves to connect the understanding of experience with the understanding of consciousness. The connection of discrete facts with continuous processes provides those facts with significance they do not have independently. The suggestion is that the processes precede the facts, which are the result of subsequent analysis. The importance of function, as a teleological process, in this analysis will become more significant as Dewey's position develops.

The remainder of the essay involves Dewey's response to anticipated criticism and more detailed description of the exact character of the new psychology. For our purposes, the only important aspect of this discussion is the reinforcement of the connection to Dewey's earlier writings on experience. In the course of his description of the nature of sensation he says, "Questions of limits of stimuli in a given sense, say hearing, are in reality questions of temporary arrests, adjustments marking the favorable equilibrium of the whole organism; they connect with the questions of the use of sensation in general and auditory sensations in particular for life-habits; of the origin and use of localized and distinguished perception; and this, in turn, involves within itself the whole question of space and time recognition; the significance of the thing-and-quality experience and so on."[228] This quotation seems significant as it makes clear that, though the emphasis has shifted from idealist language to more naturalistic language, the characteristics of experience are substantially the same. The suggestion of the mutual implication of all psychological phenomena, from the most specific to the highly general, suggests that psychology, when conducted with a focus on process, still discerns continuity among mental phenomena. He concludes his discussion by conceding that

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[227] MW, 1, 119.
[228] MW, 1, 123-124.

individual psychologists need not each be concerned with the entire scope of the phenomenon. Thus, limited investigations retain their legitimacy. However, the focus of psychology, as a whole, is full comprehension.[229]

The final point Dewey makes in the essay is that psychology, properly understood, is identical with philosophy. This is a statement familiar from his earlier work, and his responses to hypothetical criticisms here echo that work. The innovation here is the connection of the objectionable conception of philosophy to the operant social and political conditions.[230] Specifically, he connects a lack of control of external circumstances with the imposition of arbitrary political authority. These conditions, in turn, lead to a conception of philosophy that devalues individual experience in favor of eternal truths. He says, "Under such circumstances, reference to the individual, to the subject, is a resort only for explaining error, illusion, and uncertainty."[231] As the social and political conditions change, so to may the philosophical conceptions. It is Dewey's view that contemporary changes provide the explanation for the identification of philosophy and psychology.[232]

In conclusion he makes the following statement,

> Modern life involves the deification of the here and the now; of the specific, the particular, the unique, that which happens once and has no measure of value save such as it brings with itself. Such deification is monstrous fetichism [sic], unless the deity be there; unless the universal lives, moves, and has its being in experience as individualized.[233]

The full significance of this statement cannot be explored here. However, it will be very important that Dewey has already advocated this conception of philosophy at the turn of

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[229] MW, 1, 124-125
[230] MW, 1, 126-127.
[231] MW, 1, 127
[232] MW, 1, 127-128.
[233] MW, 1, 128.

the Century. It is this conception of philosophy that he will develop fully in his mature work; *The Quest for Certainty* and *Logic: The Theory of Inquiry* in particular. It is also significant that it occurs in an essay with so many significant connections to his early work. These connections, both prospective and retrospective, support the contention that there is a conceptual continuity to Dewey's work.

II. Reformed Empiricism

The question of the continuity of Dewey's thought is central to the primary focus of this chapter, Dewey's empiricism. Dewey is clearly interested in the data of consciousness; that is, in experience. In "Consciousness and Experience," Dewey indicated some of the dimensions in which his own view differs from classical Empiricism. Most importantly, he seems to dismiss the classical view that Empiricism must restrict itself to the analysis and synthesis of ideas. As his view develops the direction of his departure must be brought to the fore. It is not sufficient to see that Dewey rejects the strictures of classical Empiricism. The issue now is to understand Dewey's positive view, and determine whether that view includes a role for *a priori* knowledge.

"Consciousness and Experience," included in *The Influence of Darwin on Philosophy*, begins where the earlier essay concludes; with the question of the development of the dominant philosophical standpoint. Here, Dewey again presents the historical narrative of the connection between the general lack of control exercised by humans over their environment and strongly dualistic epistemology. In the traditional view the particular knowledge acquired by individuals through experience is subordinated to the universal knowledge acquired through reason alone.[234] In the modern period, this division developed into a division of fact and value. The division held until the development of modern science began to encroach upon the domain reserved for values.[235] It is in the instability created by this encroachment that Dewey believes a reconstruction of philosophy is possible.

So long as philosophy attempts to retain the dualism imposed in the past, it cannot accommodate the successes of science. Dewey says, "I shall suggest, first, that the progress of intelligence directed upon natural materials has evolved a procedure of knowledge that renders untenable the inherited conception of knowledge…."[236] He describes this progress as the revelation of a paradox in the traditional conception of knowledge. Because inquiry, as exemplified in experimental science, is always "in process," it is condemned by traditional epistemology. The paradox arises between inquiry, as the method of attaining knowledge, and the continual refusal of traditional epistemology to regard any knowledge so acquired as "genuine".[237] Although it seems excessive to describe the situation Dewey identifies as a 'paradox,' there is clearly a tension. His point is that traditional epistemology cannot regard the products of empirical science as knowledge. Knowledge, in the traditional sense, is defined by deductive certainty, and science cannot provide such certainty.

The solution to this situation is to valorize precisely those processes which were held in contempt by the tradition. In this description, Dewey provides a description of the revaluation he intends to impose on epistemology. Although the passage is long, it

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[234] MW, 3, 88-89.
[235] MW, 3, 91-92.
[236] MW, 3, 92.
[237] MW, 3, 92-93.

seems worth quoting in full as it provides the connection between the discussion of psychology, experience, and inquiry.

> Belief, sheer, direct, unmitigated belief, reappears as the working hypothesis; action that at once develops and tests belief reappears in experimentation, deduction, demonstration; while the machinery of universals, axioms, *a priori* truths, etc., becomes a systematization of the way in which men have always worked out, in anticipation of overt action, the implications of their beliefs with a view to revising them in the interests of obviating unfavorable, and securing welcome consequences. Observation, with is machinery of sensations, measurements, etc., is the resurrection of the way in which agents have always faced and tried to define the problems that face them; truth is the union of abstract postulated meanings and of concrete brute facts in a way that circumvents the latter by judging them from a new standpoint, while it tests concepts by using them as methods in the same active experience. It all comes to experience personally conducted and personally consummated.[238]

Here, in the broadest of outlines, Dewey has provided the content of his reconstruction of philosophy. The considerable task of providing the details of this outline occupy much of Dewey's subsequent career.

Dewey concludes his essay by trying to, as he says, "…say a word or two to mitigate – for escape is impossible – some misunderstandings."[239] The first of these misunderstandings is that the position Dewey advocates is, in some way, skeptical. The origin of such an interpretation is not difficult to see. To the traditional epistemologist any position which proposes to make belief, and not some antecedent conception of reality, its focus will seem skeptical. However, Dewey is clear that his position licenses more, rather than fewer, real objects. He says, "He [the radical empiricist, humanist, or

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[238] MW, 3, 94.
[239] MW, 3, 97.

pragmatist][240] is not concerned, for example, in discrediting objective realities and logical or universal thinking; he is interested in such a reinterpretation of the sort of 'reality' which these things posses as will accredit, without depreciation, concrete empirical conscious centers of action and passion."[241] This statement makes clear that Dewey's position still allows for some version of *a priori* knowledge. However, it also makes clear that that knowledge will be considerably different than its traditional counterpart.

The second misconception that Dewey seeks to mitigate is the contrary of the first; that his position is somehow more credulous than traditional philosophy. Again, the origin of such an interpretation is not obscure. The traditional epistemologist must see the extension of credit to individual belief as an invitation to anarchy. The mitigation of this misconception is more complicated. As Dewey says his position, "…starts from and ends with the radical credulity of all knowledge."[242] The objection is mitigated by the fact that his position insists on care. It is not anarchic precisely because of this care. Dewey illustrates the point with a metaphor. The content of the objection is tantamount to the assertion that because a watch is intended to tell present time, and not absolute time, it may be made carelessly. That is, it need not be made with a view toward telling correct time in the future. Dewey claims, on the contrary, that in his view beliefs "…are the more, not the less, amenable and responsible to the full exercise of reason."[243] Here, again, we can see that Dewey is explicitly including a role for holistic and regulative objects in his theory of knowledge. However, there is little additional information provided as to exactly how those roles will be filled.

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[240] In a previous sentence Dewey uses these terms synonymously. It seems important to make that clear here in order to note the connection of radical empiricism with pragmatism.
[241] MW, 3, 97.
[242] MW, 3, 98.
[243] MW, 3, 98.

Having provided this basic outline of his "radical empiricism," Dewey begins his development of the specific details. The essay that begins this development is "The Experimental Theory of Knowledge." This essay provides a more detailed view of how Dewey will understand knowledge. It continues many of the themes familiar from Dewey's work on psychology, particularly the continuity of experience. It also connects that material to his work on the meaning of ideas. As such, it is a perfect introduction to Dewey's innovative empiricism.

The essay begins by emphasizing the empirical character of what is to follow. Dewey identifies the beginning of any theory of knowledge as a search for some typical example. The project, he says, is "…to discern and describe a knowing as one identifies any object, concern or event."[244] In the first instance there is no interest in justification; that is, the purported piece of knowledge may be false. The first question is to identify, "…something which takes itself as knowledge, rightly or wrongly."[245] This description of his starting point already points to the distinction between Dewey's theory of knowledge and the classical. When compared to the "Justified True Belief" conception of knowledge, Dewey's position is already more parsimonious.

The apparent poverty of Dewey's position introduces a complication. There is a danger, he says, in choosing a typical example that begs the question. His proposed solution is to choose, "…an example so simple, so much on its face as to be as innocent as may be of assumptions."[246] In some sense, the stricture imposed does not seem to mitigate the danger, and it may actually compound it. However, I think it is possible to consider the example on its own merits, and leave questions of tacit assumptions until it

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[244] MW, 3, 107.
[245] MW, 3, 107.
[246] MW, 3, 107.

has been articulated. The example chosen is a simple sensory experience that provokes an active response. In this case, it is the odor of a rose that leads to picking the flower. It is worth noting, at the outset, that this example shares many features with the discussion of the circuit between stimuli and responses in "The Reflex-Arc Concept." The question to be pressed throughout the example is at what point in the sequence described knowledge arises.

In the first place, the experience may be taken as a series. The component experiences are not experienced as part of the series, but only as atomic. In terms of the example, there is first the smell, *S*. It is important to note that, in this instance, it is not the smell *of the rose*. To suppose that would connect it to a subsequent atom in the series. The smell is succeeded by a "felt movement, *K* , which is, in turn, succeeded by a "fulfillment," *G*. These last two correspond, in the particular example to the movements involved in picking the rose, and the fulfillment experienced in having achieved the picking. The significant aspect of this description is that, "Nowhere is there looking before and after; memory and anticipation are not born." As such the description "…neither is, in whole or in part, a knowledge, nor does it exercise a cognitive function."[247]

One might object that any experience involves some knowing, however minimal. At the very least, there seems to be an awareness that sensation is occurring. When the original sensation of the smell occurs, there seems to be knowledge that there is sensation. Dewey describes the object of this knowledge as a "knowledge *that*" in the absence of any "knowing *what*."[248] To this objection, "No, we must reply; there is no

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[247] MW, 3, 108.
[248] MW, 3, 108.

apprehension without some (however slight) context; no acquaintance which is not either recognition or expectation."[249] Such a claim may seem trivial, but, Dewey says, if true it constitutes the very distinction that is at issue; the distinction between being and knowing.

The statement that the distinction between being and knowing, and thus the characteristic feature of knowing, involves mediation, is the first explicit statement of Dewey's position. He describes knowing as, "…that way of bringing things to bear upon things which we call reflection – a manipulation of things experienced in the light one of another."[250] The obscurity of this statement is addressed in response to, what Dewey takes as, a typical objection. The objection is that feeling includes an immediate apprehension of its own quality.[251] In terms of the example, this would involve the immediate knowledge of some particularities of the original odor. It may not extend to the knowledge that the smell is *of a rose*, but it would include some minimal apprehension of quality; sweetness perhaps. Dewey explicitly denies this claim. He reiterates that the transition from feeling to knowing involves some mediation. He says, " The first [feeling] is genuine immediacy; the second [awareness of the quality] is a pseudo-immediacy, which in the same breath that it proclaims its immediacy smuggles in another term…."[252] This description is highly suggestive, particularly in the light of Dewey's earlier conceptions of the continuity of experience. However, before this connection can be fully explored the statement of the position must be completed.

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[249] MW, 3, 108.
[250] MW, 3, 109.
[251] MW, 3, 109.
[252] MW, 3, 110.

The pseudo-immediacy that Dewey identifies as the recognition of some quality of a sensation involves acquaintance. In the description above "pseudo-immediacy," may be considered overly obscure. What is now needed is, "…to have done forever with this uncanny presence which, though bare and simple presence, is yet known, and thus is clothed upon and complicated."[253] This obscurity can be avoided by considering the ordinary experience of acquaintance. To be acquainted is to know, based on a relatively simple indication, how an object will behave if interaction continues. Dewey makes this explicit, saying, "To be acquainted is to anticipate to some extent, on the basis of prior experience."[254] This anticipation provides the possibility of control over the situation. The acquaintance provides the range of possibilities indicated by any experience.[255]

Having introduced these specifications, Dewey returns to his example. In this new analysis the original sensation, *S*, is not simply supplanted by the subsequent experiences. It persists, and in persisting is qualitatively altered. The termination of the process, *G*, which we identified as picking the rose becomes, in Dewey's phrase, "…Gratification-terminating-movement-induced-by-smell."[256] Such a phrase is cumbersome, but significant. The point is that the entire process is taken not as a series of discrete parts, but as a continuous process. It is also significant that, considered as part of this process, the original sensation now acquires a new dimension. The original sensation, the smell, is now symbolized by Σ. It is distinguished from *S* by the acquisition of an "…increment of meaning due to maintenance and fulfillment through a

[253] MW, 3, 110.
[254] MW, 3, 110.
[255] MW, 3, 110-111.
[256] MW, 3, 111.

process."[257] Σ is now connected to both the movement, *K*, and the gratification, *G*; it signifies those subsequent experiences.

At this point it is possible to draw some important conclusions about Dewey's view. In the first place, it is possible to see that this view is strongly similar to the view he proposed in "Knowledge as Idealization." However, here the view is more developed. Meaning, even in its most primitive form, depends upon the connections among experiences. Further, that interconnection can now be more definitely described. The character of that description exposes the second significant feature of this view, its connection to the reflex-arc. The critical innovation of "The Reflex-Arc Concept in Psychology" was the insistence on the continuous nature of what psychology often treats as the discrete stimulus-response relation. The current essay draws these two positions together, and makes their importance for epistemology clear. If experience is understood as continuous, then it is possible to understand the origin of significance without recourse to metaphysical supposition or the insistence on irreducible sensory atoms. The "immediate acquaintance" that sensation seems to provide of its object is only mysterious if the sensation is arbitrarily disconnected from the larger experience of which it is part.

Although these connections are important, Dewey's position is not yet fully developed. He points out that, though the reconfigured sensation has acquired meaning it is not yet knowledge. He introduces a distinction between cognitive and cognitional, which must be explained. The sensation that has been fulfilled in gratification, Σ, is cognitive. The significance has been attributed to the original sensation after the fact of the gratification process. Experiences which share the quality of retrospective

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[257] MW, 3, 111.

significance are cognitive. Such cognitive experiences are not yet knowledge. The fulfillment, which is the hypothetical terminus of a cognitive experience, seems to be knowledge, on the assumption that knowledge is an assurance.[258] The picking of the rose, to continue the example, is a kind of assurance that the original sensation, the smell, was *of a rose*. However, because the meaning of the original sensation was only instituted retrospectively, the terminus cannot be *its* assurance. Dewey says, “This reflective attitude cannot be identical with the fulfillment experience itself; it occurs only in retrospect when the worth of the meanings, or cognitive ideas, is critically inspected in the light of their fulfillment; or it occurs as an interruption of the fulfilling experience.”[259]

Again, it is important to note the point that has been made in the preceding explanation. In the case of cognitive experience, a sensation acquires meaning through its continuity with some fulfilling experience. The traditional Empiricist, and many contemporary philosophical traditions, might be inclined to identify the fulfilling experience as knowledge. One can consider a simple version of a verificationist position to illustrate this point. The supposition is that the original sensation includes some immediate mark of its identity. This indication becomes knowledge when it is either confirmed, when the subject sees the rose from which the odor comes, or is disconfirmed, when she sees that it emanates from a bottle of perfume. Dewey’s point, contrary to any such position, is that such an experience cannot be knowledge. It cannot because the meaning of the sensation has been attributed to it only after the final ‘confirmation’ has occurred. It remains to understand how such an experience can produce genuine knowledge.

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[258] MW, 3, 112.
[259] MW, 3, 113.

Dewey describes the critical addition that produces knowledge as "…something which *means* to mean something…"[260] The rhetoric is less than ideal, but his point is clear. The critical component in knowledge is projective, rather than retrospective. On the supposition that the example provided was the first instance of an experience, there can be no knowledge. The meaning of the original sensation is only available in retrospect. However, if the example is considered as a repetition of a previous experience, the possibility for knowledge arises. Some sensation, *S'*, occurs and is identified as bearing some similarity to Σ. More specifically it bears resemblance to the sensation that was the inception of the process producing Σ. This new experience, *S'*, already includes the promise of the fulfilling experience. This inclusion makes the new experience cognitional, rather than merely cognitive. Such an experience, "…is contemporaneously aware of something beyond itself, instead of having this meaning ascribed by another at a later period."[261]

The example that Dewey provides, of the experience of picking a flower, is complicated by the fact that he seems to be cavalier in some of his descriptions. When he ascribed the meaning, or significance, of the original sensation, he describes it as "of a rose." However, it seems that the basic experience described is far from providing such distinct significance. For example, it is unclear how the gratification experience, in this case picking the flower, would be different if the original sensation was the smell of a daisy. The implication seems to be that some, minimal connection is established by the connection between the sensation and the terminating experience. As experience continues, and the intersecting series increase, the final significance of the smell as "of a

[260] MW, 3, 113.
[261] MW, 3, 113.

rose" might be possible. However, the linguistic difficulty in describing the intermediate series seems to mitigate Dewey's carelessness.

Based on the introduction of cognitional experience, experience with projective significance, Dewey is finally able to provide the definition of knowledge that is the project of the essay. As promised his definition is a description of a kind of experience. He says, "An experience is a knowledge, if in its quale there is an experienced distinction and connection of two elements of the following sort: *one means or intends the presence of the other in the same fashion in which itself is already present, while the other is that which, while not present in the same fashion, must become so present if the meaning or intention of its companion or yoke-fellow is to be fulfilled through the operation it sets up*."[262]

Again, the rhetoric of this definition is cumbersome. However, it reinforces several points already made. In the first place, knowledge depends on the continuity of experience. If experience were genuinely atomic, there could be no genuine connection between the original sensation and its fulfillment. Second, knowledge requires a semantic element. It is only after the meaning of the original sensation has been determined by the cognitive experience that the cognitional experience is possible. Both of these points tie this account of knowledge to Dewey's earlier work. The final point is an innovation. It is critical to note that Dewey's view of knowledge is directional, specifically progressive. The knowledge experience described above requires the *absence* of the fulfilling experience. This aspect of his theory distinguishes Dewey from all traditional Empiricists, and, indeed, traditional philosophers in general. The vast majority of the traditionalists would only countenance knowledge that is fully

[262] MW, 3, 114-115.

accomplished; that is, a meaning *having been fulfilled*. Dewey's great innovation is to reject that insistence.

The final point that Dewey makes in this essay is to explain the importance of experimental science, based on the conception of knowledge that he has advanced. Experimental science is a practice in which the meaning of terms is an explicit focus. Meaning, as has been seen, functions in all experience. However, in certain situations special control is exercised to determine precisely what fulfillments are possible based on a given experience. The special control exercised involves experiment. Because Dewey's theory of knowledge, now explicitly identified as Pragmatic, shows the dependence of all directed experience on meaning, the exact determination of those meanings has an obvious centrality.

At this point, we have arrived at a relatively detailed statement of Dewey's theory of knowledge. It is important to pause and consider what progress has been made concerning the status of *a priori* knowledge. In many respects, the preceding discussions would seem to diminish the hopes of anyone defending a pragmatic conception of the *a priori*. Dewey has provided an account of knowledge based, it would seem, solely on experience. Beginning with the continuity of the experience of stimulus and fulfillment, a new cognitive experience arises. Based on the accumulation of these experiences, truly cognitional experience arises. Finally, knowledge is defined through explicit reference to the promissory unfulfilled quality. The basis of this account is certainly experience itself; thus the introduction of an extra-experiential feature seems impossible. The culmination of this account involves an indeterminacy which seems antithetical to the certain and settled character usually attributed to the *a priori*. Although the situation seems dire, the next essay I will consider treats the question of the *a priori* explicitly and will make clear that, though it is substantially revised, a recognizable conception of the *a priori* is an integral part of Dewey's theory of knowledge.

Dewey begins his essay "Experience and Objective Idealism" with a short history of epistemology. Beginning with the Greeks he identifies a progression that leads to Idealism, in its Kantian form. In response to Humean skepticism, Kant instituted, "…thought or reason as … the constitution that gives objectivity, even the semblance of order, system, connection, mutual reference, to sensory data that without its assurance are mere subjective flux."[263] It is in this aspect that thought is taken to be *a priori*. Dewey endeavors to show that idealism, as a development of the Kantian position, is determined to fluctuate between two inconsistent conceptions of the *a priori*. In the course of this criticism, Dewey provides insight into whether there is any possibility of a legitimate *a priori*, and what that might be.

In the first place, Kant treats the *a priori* as regulative. Kant's assertion that his contribution to philosophy is analogous to the contributions of construction to geometry, and experiment to physics and chemistry, requires the *a priori* to be taken in a regulative sense. When one considers the synthetic *a priori*, and specifically its role in geometrical construction, this conception becomes clear. The concept of a triangle, in Kant's view, is a rule for construction. In this way, any particular triangle constructed according to the rule will have certain determinate qualities; like the quality of having interior angles whose sum is 180°. These qualities can be supposed without need of individual scrutiny.[264] In this sense, Kant must treat the *a priori* as, "…consciously, intentionally,

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[263] MW, 3, 132.
[264] MW, 3, 133.

making an experience *different* in a *determinate* sense and manner."[265] The experience of the triangle has altered in the recognition of the rule. It now includes new significance. Triangle has come to *mean*, "a figure the sum of whose interior angles is 180°."

The second pole of the inconsistency involves Kant's response to Hume. Hume inherits from Locke the notion that sensory experience imposes itself on the subject. He diverges from Locke in his rejection of the given relations among sensory data. In Hume, "The 'objects' and 'operations,' which to Locke were just given and secured in observation, become shifting complexes of subjective sensations and ideas, whose apparent permanency is due to discoverable illusions."[266] As a response to this position, Kant's conception of the *a priori* as regulative is obviously insufficient. To respond effectively, Kant must treat the *a priori* as something already present in all experiences. As such, the *a priori* aspect of thought can make no difference from one experience to the next.[267] Dewey summarizes the inconsistency saying, "The concept [the *a priori*] is treated first as that which makes an experience actually different, controlling its evolution towards consistency, coherency, and objective reliability; then, it is treated as that which has already effected the organization of any and every experience that comes to recognition at all."[268]

Given this analysis, one might suppose that Dewey is ready to merely dispense with the *a priori* entirely. However, Dewey resolves the inconsistency by abandoning the *a priori* as constitutive, while preserving it in its regulative function. The regulative understanding of the *a priori* is, he says, "…intelligible, and makes a definite

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[265] MW, 3, 133.
[266] MW, 3, 131.
[267] MW, 3, 133.
[268] MW, 3, 133.

contribution to the logic of science."[269] He goes on to point out that such a conception is not the property of a successful idealism. Rather, it is a component of a "revised empiricism." The second sense of the *a priori*, as a constitutive function of thought, is, Dewey says, "a dark saying."[270] The question now, is to understand the legitimate role of the *a priori*.

Dewey's "revised empiricism" begins by acknowledging that experience is organized. This organization makes "profitable" thought possible. In this sense, Dewey does agree with Kant against Hume. However, his disagreement with Kant begins with the assertion that the cause of the organization, to be found in all experience, is thought. He also disagrees with Kant that the organized character of experience has any "sacrosanct or finally valid and worthful character."[271] Although these specifications are negative, and most directly concern the *a priori* as constitutive, it is important to consider them. In the first place, they identify limits on the pragmatic *a priori*. Further, it will be helpful to identify precisely those aspects of the Kantian *a priori* that Dewey believes are illegitimate.

Dewey's objection to the notion that *a priori* thought is the source of the organization of experience is that it would expand the definition of "thought" beyond reasonable bounds. The explanation of organized experience does not require anything so mystical as pervasive and eternal 'thought'. Rather, organization can be explained by the imposition of patterns by ordinary human activity. "Social institutions, established political customs, effect and perpetuate modes of reaction and perception that compel a

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[269] MW, 3, 134.
[270] MW, 3, 134.
[271] MW, 3, 134.

certain grouping of objects, elements, and values."[272] On Dewey's analysis, the organized character of experience is a sociological, rather than a metaphysical, phenomenon. He is careful to concede that such organizations involve thought in their development. However, they are clearly more than thought. In effect, he says, the aspect of these organizations that involve thought ends where their persistent organizing capacity begins. The function of thought is to generate those organizations and customs which, then, vitiate the need for continued thought. To the extent that thought does interact with existing social organizations and customs, it is not constitutive but evaluative.[273]

In the course of his explanation of the interaction between thought and social organizations, Dewey provides a short explanation of the role of the *a priori* as regulative. Its function, he says, is to refine ordinary activity. He uses geometry as an example. He says that a geometric concept, such as a triangle, "…is a practical locomotor function of arranging stimuli in reference to maintenance of life activities *brought into consciousness*…."[274] The current significance of the description is that the geometric concept is an originally practical concept brought explicitly into consciousness. By making this transition, it becomes possible to treat the concept independently of practical activity. This independence, in turn, allows for more refined activity. It becomes possible to direct activities more accurately, and with more control.[275] On this view, "The concept is the practical activity doing consciously and artfully what it had aforetime done blindly and aimlessly, and thereby not only doing it

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[272] MW, 3, 124.
[273] MW, 3, 134-135.
[274] MW, 3, 135.
[275] MW, 3, 135.

better but opening up a freer world of significance."[276] The important feature here is that the function is now considered *explicitly*. This explicit consciousness of the activity was the criterion Dewey identified with the *a priori* in "Knowledge as Idealization."

Dewey concludes his explicit discussion of the *a priori* by discussing the second point on which he disagrees with Kant; the "ultimate validity" of the *a priori*. According to Dewey, the rejection of the *a priori* as constitutive has the additional consequence of removing the sacrosanct status *a priori* concepts enjoy in Kant. He says, "Their [the concepts'] value is teleological and experimental, not fixedly ontological."[277] The danger of treating concepts as though they had final validity is the danger of dogmatism. The concepts become so fixed that they become tyrants rather than tools.[278] This second point, then, forms an additional negative criterion on the pragmatic *a priori*. Whatever other qualities it may possess, it must retain the possibility of revision. This criterion is additionally significant because it distinguishes Dewey's conception of the *a priori* from traditional conceptions. Clearly, many thinkers identify the value of the *a priori* in its unassailable certainty. However, part of Dewey's later project will be to reevaluate the status of certainty, as an epistemic criterion. Any final evaluation of the concession to the status of the *a priori*, therefore, must wait until Dewey's full reconstruction has been accomplished.

The final significant point that Dewey makes in this discussion explicitly connects his discussion of the *a priori* with his discussion of the role of experiment in his theory of knowledge. Such a connection is particularly important as it makes the role of the *a priori* in a "revised empiricism" clear. He says, "Every biological function, every motor

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[276] MW, 3, 135.
[277] MW, 3, 136
[278] MW, 3, 136.

attitude, every vital impulse as the carrying vehicle of experience is thus *apriorily* regulative in prospective reference…."[279] We have already seen the significance of projection in Dewey's epistemology. The "prospective reference" Dewey invokes here seems identical with the forward looking attitude essential to his definition of knowledge. Although Dewey has made a number of claims in this section that make clear the degree to which his conception of the *a priori* diverges from the traditional, this connection makes it equally clear that it still retains an essential position in his theory of knowledge.

Although this discussion is largely critically focused, it does reveal some significant positive aspects of Dewey's conception of the *a priori*. In the first place, it makes clear that Dewey does not summarily reject *all* inclusion of the *a priori* in his theory of knowledge. More importantly it provides a basic description of the role the *a priori* will play in that theory. It is clear that the *a priori* is not, as it is in Kant, solely due to the function of mental faculties. It is far more pervasive, and finds its origin in experience at large. Secondly, as a specifically mental phenomenon the *a priori* is the explicit recognition of certain aspects of experience. Its role is to allow the consideration of these aspects in a more controlled manner. This control, then, allows for the refinement of those functions. Finally, the *a priori* is directly connected to knowledge as it involves meaning and significance. The *a priori* has an important role in the extension of significant experience to their expected consequences, and, thus, to knowledge itself.

Significant though all of these revelations are, they are not sufficient. Dewey does not here provide a full explanation of several critical aspects of his position. In the first place, he does not provide a full description of the manner in which the practical activities that are the origin of *a priori* concepts develop into those concepts. The

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[279] MW, 3, 136.

suggestion that the concept of a triangle is merely the explicit consciousness of a "practical locomotor function" is not at all obvious, and seems susceptible to several obvious objections. In the second place, Dewey has not yet made fully clear how the *a priori* concepts function in the regulation and refinement of practical activity. Here we have more indications, however. It seems clear that the *a priori* will play a significant role in experiment. By supporting experimental activity, the *a priori* is reconnected to practical activity. The presentation of both of these accounts will be the primary goal of the remainder of the dissertation.

III. Reformed Empiricism and Experimentation

Dewey concludes "Experience and Objective Idealism" with a statement about the characteristics and possibilities of a reformed empiricism. He says, "An empiricism that acknowledges the transitive character of experience, and that acknowledges the possible control of the character of the transition by means of intelligent effort, has abundant opportunity to celebrate in productive art, genial morals, and impartial inquiry the grace and the severity of the ideal."[280] In less lofty terms, empiricism, sufficiently reformed, may achieve the promises of idealism, even when idealism fails. I believe the last section provided sufficient *prima facie* evidence that some conception of the *a priori* is an essential part of that reformation. In the remainder of this chapter, I will examine the further details of Dewey's position. The final analysis of Dewey's position must await the presentation of his fully mature works, in particular *The Quest for Certainty* and *Logic: The Theory of Inquiry*.

The presentation of reformed empiricism in "The Control of Ideas by Facts," is particularly helpful. The essay appeared in its final form in 1916 in *Essays in*

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[280] MW, 3, 144.

Experimental Logic. In this essay, he considers the dispute between empiricism and idealism. The locus of the dispute considered here is the relation between facts and ideas. He suggests, in his introduction, that his own position represents a third option beyond the traditional dyad. The purpose of the essay is to defend his position from the attacks made by partisans on both sides. Given that he is offering a response, Dewey begins by presenting his objections to both traditional positions.[281] Since I have presented several similar arguments, I will focus on his positive presentation.

Dewey considers the relation between ideas and facts through an example; in this case, of a man lost in the forest. The man is faced with the problem of finding his way home. According to the traditional positions, the practical idea, the plan of action that will lead to getting home, depends on the theoretical idea, which is a representation of the environment. In particular, the success of the practical idea depends on the successful representation, or agreement, of the theoretical idea with the real world. Dewey's own position arises out of the realization that the two ideas supposed by his critics are not rigidly distinct, and, further, that the concepts of 'success' and 'agreement' are similarly fluid.[282] In the remainder of the essay, he demonstrates that many traditional problems can be solved by exploiting the proximity of these concepts.

When the example of the lost man is considered more closely, the issue of the nature of 'the environment' becomes more prominent. The hypothetical traditionalist has supposed that the man's success depends on an idea that agrees with 'the environment.' However, Dewey points out that such a claim is not as simple as it seems. Certainly the environment includes the man's immediate surroundings, the trees, bushes, etc..

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[281] MW, 4, 78-82.
[282] MW, 4, 82-83.

However, forming an adequate idea of those things seems irrelevant to his purpose. A successful practical idea, on the other hand, must include facts which are not part of the man's immediate environment. It must include, for example, a representation of his spatial relation to his home. When one considers the full requirements of the idea of this inclusive environment, it becomes clear that this full conception is what is meant by the term 'idea'.[283] He says, "It [the idea] is not some little psychical entity or piece of consciousness-stuff, but is *the interpretation of the locally present environment in reference to its absent portion*…."[284] Considered in this way, the idea, as a whole, is simply the practical idea. There is no need to suppose an abstract theoretical counterpart. Further, it is the exigencies of the situation that determine the limits of the idea. What 'the environment' is, in both its present and absent portion, is determined by the requirements of finding the way out of the woods.[285]

Based on this conception of the idea, as a plan of action based on a relation between the immediately present environment and its absent portion, Dewey considers the question of agreement. Traditionally, agreement of the idea with the environment was determined by a kind of comparison. Based on the revised conception, no such comparison seems possible. The present reality is available, but it does not encompass the whole content of the idea. Nor is it possible to compare the idea with the full reality, as the absent portion of that reality is unavailable. The alternative is to treat the comparison as a process of testing. Dewey says, "What kind of comparison is possible or

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[283] MW, 4, 83.
[284] MW, 4, 83-84.
[285] MW, 4, 84.

desirable then, save to treat the mental layout of the whole situation as a working hypothesis, as a plan of action, and proceed to *act* upon it…."[286]

At this point in the development, Dewey has made several important claims. First, ideas are most properly considered as plans of action. Second, the most natural form of verification for such ideas is to act, rather than to engage in some form of purely intellectual comparison. The last component of the argument, then, is to make explicit how action on an idea can demonstrate that idea's adequacy. The adequacy of an idea, according to Dewey, can only be demonstrated through the success of the idea as a plan. In terms of the example, the only way that the man's idea of his environment can be shown adequate is for him to find his way home.[287] The traditional alternative to such a procedure seems to be, "…that we first look a long while at the facts and then a long time at the idea until by some magical process the degree and kind of their agreement becomes visible[.]"[288]

Before considering the exact mechanisms of replacing 'agreement' with 'success,' it is important to draw some significant connections between the conception of 'idea' here advanced to earlier claims. In particular, it is worth noting the connection between this conception of 'idea' and the earlier discussions of meaning in earlier essays, such as "Knowledge and Idealization," and "The Experimental Theory of Knowledge." The understanding of 'idea' has obvious parallels to the description of the 'knowledge experience' in the latter of those two. The idea is based on an immediate set of circumstances, and connects them to an absent set. To 'know' one's way home, in this sense, is to connect the present configuration of the environment to an ultimate absent

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[286] MW, 4, 84.
[287] MW, 4, 84
[288] MW, 4, 85.

one. In more specific terms, we can imagine the lost man recognizing a particular rock or tree, and understanding that turning left will lead him home. In the terms used earlier, the rock means the way home.

Having considered the revised status of ideas, it is now necessary to consider, in more detail, the role that experiment plays in their verification. Dewey has already said that, in general, the notion of 'agreement' may be replaced by the notion of 'success.' Now it is necessary to specify the nature of success. The general criterion for success is specified in terms of the harmony, or lack thereof, that results upon the termination of the plan presented in the idea. If the "disordered or disturbed situation persists," it is sufficient to demonstrate some inadequacy in the original idea. However, the demonstration of this inadequacy presents another problematic situation, which can occasion a new plan of action. In this way, the experimental conception of the idea provides a means for its own improvement and rectification. Such provision seems to be a further improvement upon the traditional model of comparison and agreement.[289]

One of the lessons derived from this revision is the injunction to retain the flexible, hypothetical character of both the ideas and the facts in any problematic situation. In any given situation it is unclear, at the outset, whether the proper selections and discriminations have been made. In terms of the example, the lost man will be unsure whether he has correctly identified the rock he believes will lead him home. The more willing the lost man is to treat that identification as revisable, the more likely he is to find his way home. A similar situation holds of ideas. The more rigidly the man maintains his idea of his way home, even in the face of failure, the further afield he goes. Dewey says, "Due progress is reasonably probable in just the degree in which the

[289] MW, 4, 85.

meaning, categorical in its existing imperativeness, and the fact, equally categorical in its brute coerciveness, are assigned only a provisional and tentative nature with reference to control of the situation."[290] The increase in this provisional treatment characterizes the progression of science from the Greeks to modern times.[291]

Given Dewey's blurring of the distinction between ideas and facts, a possible objection arises. The issue concerns experiences which do not seem problematic. Given the descriptions provided above, there seems to be no possibility of a purely non-reflective experience. In one sense, Dewey simply acknowledges this fact. He says, "It may be true that any experience which can properly be termed such comprises something which is *meant* over and against which is given or there."[292] However, the meaning inherent in experience is present in degrees. Many problems are sufficiently trivial that they require no evaluation. Dewey offers the example of travel through a very familiar environment. In such situations, there is no need to form a conscious plan of action; one simply acts. However, even these situations include the extension of present stimuli to eventual fulfillments, though the distance between the two may be vanishingly small.[293]

It is also possible to object to Dewey's account on the basis that, even if it were true, it would be possible to consider the facts as real, and the significance introduced as a subsequent relation. In response he offers the example of the 'fact' of water. It is certainly possible to regard water as existing at a certain time, in a certain place. Further, this water may signify thirst quenching. The supposed objector will argue that there is nothing hypothetical about the existence of the water. However, Dewey offers several

[290] MW, 4, 86.
[291] MW, 4, 86-87.
[292] MW, 4, 87.
[293] MW, 4, 88.

examples that demonstrate that error is as likely to result from a mischaracterization of what exists, as it is to result from a mistake concerning the significance of the facts. For example, when "water" is drunk, the drinker dies. The "water" in this case was not water, but a poison that appeared to be water. There was no mistake about the significance of water, but a mistake of the fact. Based on such situations, Dewey says, "There is no ground for giving the 'things' any superior reality."[294] The distinction between the significance and the facticity is only made provisionally. The last remaining issue is to explain how that provisional distinction is made.

To understand why certain experiences do not seem to include both facts and ideas, it is necessary to understand how that distinction is made vivid. Dewey says, "The knowledge function becomes prominent or dominant in the degree in which there is a conscious discrimination between the fact-relations and the meaning-relations."[295] So long as there is no tension between the two, as in the example of walking through familiar surroundings, the meaning relations in the experience are muted. In situations where there is some distinction between the two, as when we are concerned that 'water' may not really be water, the distinction between the relations is emphasized, and the meaning relations are emphasized.[296]

At the conclusion of this essay it is possible to draw some further conclusions concerning Dewey's theory of knowledge, and its relation to experience. "The Control of Ideas by Facts," demonstrates that, on Dewey's view, meaning or significance relations pervade all experience. Certainly, in some circumstances, these relations are not emphasized. However, it is clear that there is no experience so 'factual' that it has no

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[294] MW, 4, 89.
[295] MW, 4, 89.
[296] MW, 4, 89.

further meaning. Such a claim does not have immediately obvious application to the question of the *a priori*. However, when it is taken in connection with his position in previous essays, its importance becomes clear. We have already seen, in several of Dewey's essays, that the *a priori* has an essential role in the constitution of knowledge. It serves to regulate the forward looking aspect of experience, and it is these very aspects that constitute ideas as meaningful. To the extent, then, that all experience contains an element of significance, all experience contains an element of the *a priori*. Again, the exact nature of that content must be considered in those writings in which Dewey treats the specific forms of *a priori* knowledge, logic and mathematics, explicitly. It is through consideration of those texts that further insight into the nature of the *a priori* may be gained.

IV. Conclusion

The most important issue in this chapter concerns the relation between Empiricism and *a priori* knowledge. In the introduction, I presented several *prima facie* arguments against the possibility of any empirical theory of knowledge accepting a role for the *a priori*. I believe it is now possible to draw some finer distinctions, and show that Dewey's empiricism not only may, but must, include some conception of the *a priori*. Further, the inclusion of the *a priori* in his theory of knowledge constitutes a continuation of Dewey's commitment to respond to relativism, made explicitly in his earlier works. While I believe that this chapter has demonstrated Dewey's commitment to the *a priori*, I also believe it demonstrates the distance between his conception and the traditional Kantian conception.

I believe it is possible to understand Dewey's position on *a priori* knowledge through a comparison to the positions of Hume and Kant. A comparison to Hume, and in particular a response to the skeptical position Hume derives from Lockean Empiricism, will demonstrate the necessity of some conception of *a priori* knowledge. A comparison to Kant's understanding of the division of the *a priori* into the analytic and synthetic varieties will demonstrate precisely how Dewey's view represents a particular development of Kant's view. Since Dewey has responded to the work of both of these figures in the material already considered, I will begin with those comments.

Hume, according to Dewey's analysis, develops Locke's Empiricism in a particular way. In Locke, the information provided by sensation is taken as largely unproblematic. Locke views sensation as including relations among atomic sensations, and, thus, providing a means to generate meaningful knowledge out of them. Such material is a legitimate source for knowledge because it seems imposed on a passive spectator by an external reality. Whether such a simplistic view may be successfully attributed to Locke, I sincerely doubt. However, such a simple statement of the position does seem to capture some of the attraction of an Empiricist position over others. There is something attractive in explaining the origins of knowledge through a phenomenon as humble as sensation. In many ways, such a position seems to be common sense. The attraction of such a position is exposed by Hume, who shows that it ultimately relies on a postulate that cannot be verified on its own terms.

Hume's argument, as it appears in Section V of *An Enquiry Concerning Human Understanding*, is that all of the associations of ideas based on empirical sources require for their justification the assumption that like causes will produce like effects. For example, the knowledge that an apple sates hunger is not fully legitimated by past instances of satisfaction, unless it is also assumed that the past will be substantially like the future. However, claims about future eventualities cannot be legitimated by experience, as experience only includes past events. As such, empirical claims never attain full legitimacy, though they are trusted out of habit and custom.[297] The result of this criticism is to rob empiricism of objective validity. As Dewey has said, "The 'objects' and 'operations' …[of Empiricism] … become shifting complexes of subjective sensations and ideas…."[298]

Dewey's response to this issue is subtle. He holds that all experience contains some organization, and that the experienced organization has its origin in, "…some prior existential mode of organization…."[299] However, he attributes the propagation of this organization to Hume's habits and customs.[300] Dewey's difference from Hume is that he regards the origin of those habits and customs as significant instances of knowledge. Habits and customs, for Dewey, trace their origins to practical experimental activity. Specifically habits and customs arise from the activity described in "The Experimental Theory of Knowledge," and they are legitimated by the success of that activity, as described in "The Control of Ideas by Facts." The process described in those two works provides a legitimacy to the organization of experience beyond any which Hume allows. It is this legitimacy that contributes the objective character to Dewey's theory of knowledge.

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[297] David Hume. *An Enquiry Concerning Human Understanding*, ed. Tom L. Beauchamp (Clarendon Press: Oxford, 2000), 35-37.
[298] MW, 3, 131.
[299] MW, 3, 134
[300] "Social institutions, established political customs, effect a perpetuate modes of reaction and of perception that compel a certain grouping of objects, elements, and values." MW, 3, 134.

In order to recognize this character, it is necessary to reconsider the examples of practical problem solving activity that Dewey has described. We can reconsider the man lost in the woods as an illustration. The man's knowledge of the route home may be customary or habitual. However, that knowledge can trace a genealogy to some successful past experience. The man, or his ancestors, wanted to find their way home through the woods. They treated certain sensory experiences, like specifically shaped rocks, as signs of the way home. Taking those experiences as significant they either succeeded or failed. That success or failure is an objective matter. These experiences, as cognitive, contributed to the assignment of future significance to those sensory experiences. That is, the sensory experiences acquired projective significance; they became cognitional. Through this process, experience acquires an objective dimension that is beyond the scope of Hume's analysis.

The objective dimension is only possible through an element in the generation of knowledge that goes beyond experience. However, the analysis above has also shown that all knowledge is originally experiential. What Dewey seems to describe is a method, specifically experiment, whereby experiences acquire a supra-empirical element. That supra-empirical element is what Dewey has described as meaning or significance. It is also the difference between 'the knowledge experience' and all others. The *a priori* in Dewey is thus shown to be an essential part of all knowledge experiences. It is the means by which the present signifier is connected to the absent signified, and establishes the criterion for their satisfactory connection. This conception will be developed in Dewey's analysis of domains traditionally treated as *a priori*; specifically mathematics and logic. It will also be developed in his more sustained treatments of experiment and knowledge.

Having gained some sense of what the *a priori* may be for Dewey, it is necessary to consider its limitations. I have argued that Dewey requires some conception of the *a priori* to avoid the extremes of Humean skepticism. However, this does not, as yet, distinguish him from Kant. Kant also insisted on an *a priori* element of knowledge to refute Hume. However, his version differs substantially from Dewey's. Dewey's analysis claims that Kant relies on an ambiguity between *a priori* knowledge as constitutive and *a priori* knowledge as regulative.[301] I believe Dewey has confused Kant's commitment to both types of *a priori* knowledge with a failure to distinguish. It seems to me that Kant is committed to a constitutive *a priori*, as analytic, and a regulative *a priori*, as synthetic. Dewey's criticism, taken in this light, amounts to a rejection of the analytic *a priori* and a retention of the synthetic.

Kant's conception of the analytic *a priori*, as well as Hume's and later analytic philosophers', involves the connection between ideas based on their content. The classic example of this type of knowledge is the knowledge that all bachelors are unmarried men. This knowledge is taken to derive from the fact that the concept "bachelor" simply means "unmarried man." As such, there is no need to experience any bachelors to know that they are unmarried men. When one considers that the claim "All unicorns are one-horned horses," is *a priori* in precisely this way, Dewey's claim that these conceptions, "…fall, like the rain, upon the just and the unjust; upon error, opinion, and hallucination,"[302] is clear. It is this conception of the *a priori* that allows Kant to thoroughly refute Hume.

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[301] MW, 3, 133-134.
[302] MW, 3, 133.

The synthetic *a priori*, on the other hand, is not immanent in all experiences in the same way. The synthetic *a priori* is most reasonably understood as deriving from rules. For example, the geometrical knowledge of triangles is the rule for their construction. Based on this rule, certain qualities can be discerned that are not part of their concept. The concept of a triangle is “three sided figure.” That concept does not include the quality of having the sum of its interior angles equal 180°. Thus, the claim that “All triangles have interior angles whose sum equals 180°,” is not analytic. Such a claim is still *a priori* because it does not require the experience of any particular triangle to verify. This is the *a priori* in its, “…regulative, directive, and controlling sense, thought as consciously, intentionally, making an experience *different* in a *determinate* sense and manner.”[303]

Simply stating that Dewey accepts the synthetic *a priori* while rejecting the analytic is somewhat misleading. I have already pointed out the role the *a priori* seems to play in Dewey’s conception of knowledge. Based on this role, Dewey’s *a priori* will have one very significant difference from Kant’s synthetic *a priori*: it is alterable. The full explanation of this aspect of the *a priori* will require a closer examination of the details of *a priori* knowledge in Dewey. However, it is possible to say something at this stage. As a means of connecting the present to the absent portions of the knowledge experience, *a priori* knowledge is fixed. Once a signification has been established, circumstance will never completely remove it. However, as Dewey argued in “The Control of Ideas by Facts,” the status of those portions is fluid. We can consider, as a brief example, the difference between Euclidean and non-Euclidean geometry. The

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[303] MW, 3, 133.

connection between “triangle” and “sum of interior angles equal to 180°” is *a priori*, given the state of affairs instituted by the Euclidean system. When the problematic situations faced by people changed, when they began measuring astrological phenomena for example, those restrictions did not hold. Given such facts, there is a similar *a priori* connection between “triangle” and “sum of interior angles greater than 180°.” However, the second *a priori* connection does not eliminate the first. It is necessary, in any given situation, to determine which set of connections holds. The *a priori* will always contribute something to any experience but the determination of that contribution will vary.

Although I recognize the large gaps that remain in my analysis, I hope this chapter has provided adequate *prima facie* evidence for the claim that Dewey maintains some commitment to *a priori* knowledge. On the one hand, if he rejects all aspects of the *a priori*, he becomes, in effect, a Humean skeptic. On the other, he retains a sufficient portion of Empiricist commitments to distinguish him from Kant. It is my belief that the middle path forged by Dewey maintains the commonsensical character I earlier attributed to Empiricism, while, at the same time, avoiding skepticism. To fill the gaps that remain in this argument, I must now turn to an examination of Dewey’s work on instances of *a priori* knowledge, specifically logic and mathematics. This examination will lead to a consideration of the fully mature version of Dewey’s theory of knowledge presented in his later works, especially *Logic: The Theory of Inquiry*.

Chapter 4: Mathematics

I. Introduction

The question of whether anything is known *a priori* is largely motivated by two domains of investigation; mathematics and logic. Those who have attempted to defend the *a priori* have invariably produced examples from these domains. Those who wish to attack the *a priori* have focused their efforts on explaining the empirical sources for them. It is necessary, then, to examine Dewey's discussions of these areas. In the first place, those discussions will determine whether his understanding of them supports their status as *a priori*. In the second place, the details of his presentation will illuminate the more general features of *a priori* knowledge in his work. In the last chapter, I provided an argument that Dewey's general epistemological position could accommodate the *a priori*. In this chapter, I will provide an examination of the specific details of that role.

In the discussion of Kant, the relationship between mathematics and the synthetic *a priori* became clear. In the discussion of Dewey's general epistemology, it became clear that if he could accommodate *a priori* knowledge, it would be synthetic. Therefore, I will begin my examination in this chapter with Dewey's discussion of mathematics. Although this presentation will be limited by the scant textual material, I believe some positive conclusions may be drawn. The questions posed by Dewey's work on logic are slightly different. Logic has been traditionally understood as related to analytic knowledge. The question, given Dewey's commitment to the synthetic, is to determine whether logic retains its *a priori* status, and, if so, how its status is accounted for in Dewey's system. These questions will be treated in my analysis of *Logic: The Theory of Inquiry*.

II. The Psychology of Number

Given Dewey's prolific writing on science and logic, it is interesting that there is only one substantial text, and that co-authored, that takes mathematics as its central focus. It is clear from other writings that Dewey regards mathematical reasoning as significant. Further, several anecdotal reports indicate that Dewey was an able mathematician.[304] These facts make Dewey's lack of attention to mathematics even more difficult to understand. Although there is not a great deal of textual material, I believe that the material available is sufficient support for some limited conclusions.

In the following section I propose to take the material published in *Psychology of Number* as an expression of Dewey's understanding of mathematics. I do not propose to defend that position on textual or historic grounds. Nor do I propose to parse issues of individual authorship within the text. It seems to me that Dewey's acceptance of authorship is sufficient *primia facie* evidence of his acceptance of the views presented. However, I hope to show that the views expressed are harmonious with Dewey's published positions on other topics. In the absence of any individually authored works, *The Psychology of Number* is the only available expression of these views. As such, it merits closer scrutiny than it has heretofore received in the literature.

The Psychology of Number was first published in 1895; during, what may be considered, a transitional period in Dewey's work. Dewey is listed as the second author of the text, behind James A. McLellan. Neither the editor's nor the "author's" prefaces provide any indication of the division of labor. However, it seems reasonable to suppose

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[304] Sidney Ratner, "John Dewey, Empiricism, and Experimentalism in Recent Philosophy of Mathematics," *Journal of the History of Ideas* (1992), 467.

that Dewey, the member of the pair with philosophical credentials, principally, if not exclusively, produced the more theoretical parts of the text. Although McLellan had a mathematical background, I have found no evidence that he had any theoretical interests. Further, his subsequent publication of a textbook based on *The Psychology of Number*[305], seems to suggest that his primary interest was pedagogical. Thus, it seems reasonable to suppose that the theoretical sections of the work express Dewey's views.

The discussion of the nature of mathematical knowledge begins in the second chapter, "The Psychical Nature of Number." The discussion of the nature of number is important in two respects. First, it explains the process of identifying numerical features of experience with psychological processes presented in Dewey's earlier work. Second, several arguments are presented against the belief that numerical properties are either already present in experience or that they are simply applied to experience by the mind. The position that emerges is that numerical properties, and ultimately number itself, are generated by an interaction of psychological processes and sensory materials. Although the language of the text has more in common with Dewey's early work, the specific relationship between the sensory material and psychological processes suggests the more unified account of experience in his middle works.

The chapter begins with an argument against the position that numerical properties can be discerned from sensory experience. The first argument against this position is fairly weak. However, it demonstrates an initial difficulty in an empiricist theory of number. Sensory experience is frequently, if not always, complex without any attendant numerical conception. The claim is first defended with reference to minds

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[305] James A. McLellan, *The Public School Arithmetic*, (New York: The MacMillian Co., 1898).

supposed to have no numerical conceptions, birds and infants.[306] Whether such minds have numerical conceptions or not, it is clear that numerically complex experience often occurs with no consciousness of number even to minds familiar with number. The significant point of this argument is that the experience in question is in no way deficient. It is not the case that the numerical aspect is simply ignored. Dewey says[307], "…there may be clear and adequate percepts of things quite unaccompanied by definite numerical concepts."[308] The advent of genuine numerical concepts requires specific mental activity.

In the *Psychology*, Dewey asserts that knowledge is not primarily concerned with sensation. Sensation provides the raw material for knowledge, but the processes that generate knowledge qualitatively alter those materials. The most important distinction between sensations and knowledge is that knowledge concerns connections among sensations.[309] These connections constitute significance, and it is significant experience that generates knowledge. The important point here is that Dewey identifies several mental activities as the source of these connections. Two of the activities he identifies are association and dissociation. If the processes that generate numerical concepts can be shown to be identical to the most basic properties involved in the generation of knowledge in general, a strong foundation will be laid for the claim that such concepts arise out of the act of knowing. This claim, in turn, will strengthen the claim that they are *a priori*.

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[306] James A. McLellan and John Dewey. *The Psychology of Number and Its Applications to Methods of Teaching Arithmetic*, (New York: D. Appleton and Co., 1905)
[307] As explained above, I do not intend to attribute the quoted passages to Dewey in a strong sense. However, attributing them to Dewey seems stylistically preferable to a locution like "the authors say" or "the text says".
[308] McLellan, *The Psychology of Number*, 24.
[309] EW, 2, 75-76.

One of the most basic mental activities involved in knowing is association. Association is the mental process that connects 'sensuous elements' into larger wholes. That association is a primitive mental function can be discerned by Dewey's description of its conditions. There are, according to Dewey, two conditions for the occurrence of association: "…(1) The presence of sensuous elements; (2) That state of mind which we call being awake."[310] Such conditions certainly support the contention that association is among the most primitive forms of mental activity. Their primitive character is supported by Dewey's claim that they, "…are equally conditions of *any* activity of mind."[311] In addition to these basic positive conditions, Dewey mentions a negative condition of association. These conditions serve to distinguish association from more complex connections among ideas. The negative conditions of association are relative passivity and a simplicity of the sensory constituents. These conditions are met by sensory stimuli when there is no "…striking incongruity or incompatibility between them."[312] Thus, the mind engages in association whenever it is stimulated by sensations that are not radically dissimilar.

It is not surprising, given this level of generality, that association is fundamentally involved in the generation of numerical concepts. One of the basic processes involved in the generation of numerical concepts, like the concept of 'three', is "[t]he recognition of the three objects as forming one connected whole or group…"[313] Such an identification would seem to be clearly identical with the activity of association. The connection is strengthened when the negative conditions of association are compared with the

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[310] EW, 2, 83.
[311] EW, 2, 83.
[312] EW, 2, 84.
[313] McLellan, *The Psychology of Number*, 24.

difficulties identified in the generation of the concept. Dewey says, "The qualitative unlikeness of the objects may be so great as to make it difficult or even impossible for the child's mind to relate them, to view them all from the common standpoint as forming one group."[314] What is important in this comparison is the recognition that once the basic conditions of association have been met, one condition for the formation of numerical concepts has also been met.

The second basic process of knowledge identified by Dewey in *Psychology* is dissociation. Dissociation is a subordinate process of association defined by the unequal emphasis of the associative process. Association does not treat all aspects of sensory stimuli equally; some aspects are emphasized and some are not. Dissociation is distinguished from association by the fact that dissociation "…is more complex and less passive…" and "[it] distinguishes or makes a difference."[315] As in the case of association, Dewey identifies two conditions for the occurrence of dissociation. "(1) Dissociation requires a number of factors in the elements presented so dissimilar as to compete with each other, and requires, therefore, (2) a selecting activity of the mind which shall neglect some and emphasize others at their expense."[316] Further, this selecting activity is projective and interested. The discrimination occurs as the mind considers its ends or goals, and selects those aspects of experience that promote those ends.[317]

The discussion of dissociation represents the introduction of interest. In dissociation the mind begins to consider sensory material in the context of its own

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[314] McLellan, *The Psychology of Number*, 25
[315] EW, 2, 107.
[316] EW, 2, 107.
[317] EW, 2, 107-108.

interests. At this stage, however, the understanding of interest is necessarily primitive. Significantly for my purposes, one of the most basic interests Dewey identifies as intrinsic is quantity. He says, "Other things being equal, stimuli attract the mind in proportion to their quantity."[318] Intrinsic value, however, is limited. Complex psychological life requires the transition to acquired vale. Acquired value is distinguished by its projective character. The value identified in sensations is not immediate, but concerned with some further absent experience. The introduction of such acquired value is, thus, clearly connected to the generation of meaning, as described in the last chapter.

The discrimination of individuals among sensory complexes is also an important stage in the formation of the number concept. In addition to the recognition that several sensory objects form a group, it is also necessary that they not be identified so closely as to lose all individuality. "There must be enough qualitative unlikeness – if only of position in space or sequence in time – to mark off the individual objects, to keep them from fusing or running into one vague whole."[319] At this point, the connection to dissociation is made at the most rudimentary level. It is clear that the objects must maintain some individuality, however, it is not yet clear that the distinction relies on any introduction of value. Further, it is not yet obvious that the recognition of number requires any projective activity of the mind. In one sense, this is an important point. It demonstrates the primitive character of number. The process may occur without the introduction of even the most basic processes presented in the *Psychology*. However, the poverty of these activities might isolate numerical concepts from richer experience. In

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[318] EW, 2, 108.
[319] McLellan, *The Psychology of Number*, 25

order to understand the connection, it is necessary to consider the process of "abstraction" and "generalization".

The process of generating numerical concepts, and the concept of number in general, involves the coordination of "abstraction" and "generalization". These processes may be regarded as the active instances of the processes of recognition described above. Group identity and individual difference are no longer simply presented in sensation, they are now conditioned by some interest. Abstraction involves the intentional subordination of certain features of an experience to some other feature "…considered more important…."[320] Generalization occurs when the quality identified as "more important" is recognized as the differentia of some novel group.[321] The introduction of intention in the generation of numerical concepts coincides with the introduction of intentionality and projection into more general psychological processes. Dewey says, "The manifestation of the conscious tendency in a child to count coincides, then, with the awakening in his mind of conscious power to abstract and generalize."[322]

The connection between mathematical ideas, at least simple numerical concepts, and primitive psychological operations seems to suggest that mathematics is at least coeval with the most basic ideas. As experience arises through the interaction of the mind and sensations, it will necessarily begin to operate in ways that generate numerical concepts. As Dewey points out, the quantitative aspect of sensations provides one of the most basic motivations for mental attention. The connection between numerical concepts and the most basic functions involved in cognitive experience will become significant in

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[320] McLellan, *The Psychology of Number*, 26
[321] McLellan, *The Psychology of Number*, 27.
[322] McLellan, *The Psychology of Number*, 27.

the articulation of the way in which mathematics remains recognizably *a priori*, even though the *a priori* has been substantially reconceived.

Dewey agues, in “Experience and Objective Idealism,” that a reformed empiricism must reject any constitutive sense of the *a priori*. Although the description of the generation of number concepts remains schematic, it is already possible to see that they will meet this negative criterion. Number is not a feature of the objects of sensory experience, it is recognizable as a product of the interaction between the subject and those materials. However, the above account merely suggests that numerical concepts are not simply identified in experience, the question of how they arise through the mental activity remains. In order to definitively show that numerical concepts are not taken as constitutive, it is necessary to consider the account of the generation of numerical concepts.

Dewey makes clear that numerical concepts are the result of activity, and that to assume that they are somehow present prior to all human activity is a mistake. The sense that numerical concepts are somehow “already present” can be explained by the fact that they are so easily identified. The ease with which adults apprehend complex qualities in experience is a result of habituation. The mistake we make is to “…forget that the objects *now* have certain qualities for us *simply because of analyses previously performed*.”[323] The numerical concepts are not the only aspect of simple mathematics that result from activity. Dewey also makes clear that counting, as an activity, is also an instance of a fundamental mental process operating on the material of sensation. He says, “This activity [counting] is simply the normal exercise of what are always the

[323] McLellan, *The Psychology of Number*, 28.

fundamental rational functions…."[324] Dewey summarizes the conception of number and counting presented, saying,

> The idea of number is not impressed upon the mind by objects even when these are presented under the most favorable circumstances. Number is a product of the way in which the mind deals with objects in the operation of making a vague whole definite.[325]

Based on this basic description, certain features of Dewey's conception of basic mathematics become clear. In the first place, mathematical activity, specifically abstraction and generalization, are closely connected to the more general processes of association and dissociation. These coordinate sets of processes involve the most basic interactions of the mind on sensory material. They include the most basic extension of that material beyond itself, through the intentional selection of certain qualities from the totality of the sensation. This selection allows for the most basic structuring and ordering of sensory experience. Finally, this structure is provided, not by simply perceiving an order inherent in the sensations, but by the activity of mental processes. In this way, the numerical concepts described seem to meet the basic negative criteria for *a priori* ideas in a reformed empiricism. The introduction of intention into the process also suggests a basic connection with the processes that generate significance in experience. This connection, in turn, points to the way in which numerical concepts might meet the positive criteria for *a priori* knowledge.

The activity of the mind upon sensation does not immediately produce knowledge. The generation of knowledge requires that the mind structure experience according to some end or goal. It is this directed structure that allows the complex

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[324] McLellan, *The Psychology of Number*, 32.
[325] McLellan, *The Psychology of Number*, 32.

connections among concepts that produce meaning. It is meaning, as the last chapter indicated, that is the object of knowledge. The next question about mathematics that must be answered, then, is how numerical concepts are informed by goals, and how this implicates them in larger structures of significance. This topic is discussed, in *The Psychology of Number*, as the "psychological origin" of number. This origin, according to Dewey, is found in the experience of limitation.[326]

The discussion of the original motive for mathematical investigation begins by considering the possibility of unlimited resources. In such a situation, where, "everything that ministers to human wants could be had by everybody just when wanted…,"[327] mathematical concepts might never arise. The identification of specific and exact quantities, and the relations among quantities, arises out of the fact that this Edenic situation does not occur. He says, "It is because we have to put forth effort, because we have to take trouble to get things, that they are limited for us, and that it becomes worthwhile to determine their limits, to find out the *quantity* of anything with which human energy has to do."[328] It is important to consider carefully the extent of this motivation. In any domain where resistance to the will is encountered, the question of the economy of effort will arise. It is difficult to imagine any situation, no matter how replete with goods, where human beings would never encounter any such impediment. As Dewey says, "…it may be said that quantity enters into all the activities of life…."[329] This difficulty supports the idea that it is not only the mental activities supporting numerical ideas that are primitive. It is also the case that the motivation for the

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[326] McLellan, *The Psychology of Number*, 35.
[327] McLellan, *The Psychology of Number*, 36.
[328] McLellan, *The Psychology of Number*, 36
[329] McLellan, *The Psychology of Number*, 38.

generation of those concepts, and their extension into knowledge, are practically pervasive.

Although the demonstration of the ubiquity of limitation is important, the significance of the connection between mathematical concepts and limitation is not exhausted by it. In the first place, the identification of the origins of mathematical knowledge with human limitation is connected to the issues Parsons identifies in the Kantian account of intuition. There, the concern was that mathematical concepts required the extension of human capacities beyond credibility. Although the connection between mathematics and finitude here does not resolve Parsons' objections, it does suggest that Dewey recognizes the sorts of challenges Parsons identifies.

The connection between mathematics and limited resources will also connect to Dewey's understanding of experimental science. In the next chapter, I will examine his mature understanding of knowledge as involved in the process of efficiently achieving human ends. The understanding of mathematical concepts as arising out of precisely that process must strengthen the claim that some mathematical concepts are implied by any instance of knowledge whatsoever. It is this connection that seems to articulate the sense in which such concepts are *a priori* for Dewey. Before that connection can be fully explained, it is necessary to consider further details of the connection between mathematical concepts and human effort.

Dewey begins his description of the genesis of numerical concepts by pointing out that the achievement of all human ends requires the expenditure of energy. The further limitation of that energy requires that we economize our efforts. This economy, he says, is "…to dispose of it [energy or effort] or distribute it in such ways as will accomplish the best possible results."[330] This requires that energy not be wasted in devoting more resources than strictly necessary to achieve an end, nor devoting too few. In some cases, it may be sufficient for this economy to occur in an imprecise manner. However, "…it is most fruitful of results when the balancing is most accurate."[331] In order to achieve accuracy it is necessary to institute some standard of measurement. The institution of such a standard results in some numerical value.

One value of considering numerical ideas from this perspective is that it allows for a fairly succinct definition of quantity; "Quantity means the *valuation* of a thing with reference to some end; what is its *worth*, *its effectiveness*, compared with *other possible means*."[332] The expansion of this definition, in turn, allows Dewey to explain the generation of more complex mathematical concepts, arithmetic operations for example. Dewey has already pointed out that accuracy is of primary importance in the economical distribution of means. If the requirement of accuracy is extended to ideality, it becomes the idea of equality. That is, if we consider the allocation of limited means to our ends, ideally we would extend just enough and no more than enough energy to accomplish the task at hand. The concept of sufficiency becomes the concept of equality. However, at this level of specificity, vague quantities are no longer useful. Once equations have been introduced, numbers become necessary.[333]

At this point in the presentation, Dewey has provided only a *prima facie* case for understanding mathematical knowledge as a consequence of measurement. In order to fully defend this position it is necessary to provide more details concerning the

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[330] McLellan, *The Psychology of Number*, 36.
[331] McLellan, *The Psychology of Number*, 37.
[332] McLellan, *The Psychology of Number*, 41.
[333] McLellan, *The Psychology of Number*, 41-42.

development of numerical ideas. These details will also provide insight into the question of the *a priority* of those ideas. Finally, a detailed understanding will be important as we consider the role of experiment in Dewey's mature theory of knowledge.

The general trend of the development of mathematical ideas is governed by the precision of the measurement in question. At the earliest stages, in both ontogenetic and phylogenetic development, measurement is relatively vague. A critical point in the development is reached when a unit is introduced to the measuring activity. Dewey says, "The development from the crude guess to the exact statement depends upon the selection and recognition of a *unit*, the repetition of which in space or time makes up and thus measures the whole."[334] Once the unit is introduced, it becomes possible to define number precisely.[335]

Although the establishment of a unit measure is necessary for the development of number, it is not entirely sufficient. Dewey points out that, to the extent that the unit is only defined in terms of other units of the same kind, pounds defined by ounces for example, the system of measurement is limited. A fully developed system of measurement includes the coordination of units of different kinds. In the previous example, a system which is only able to relate pounds to other units of weight does not have a fully realized understanding of the unit. When the understanding of the unit is expanded to include its relation to other kinds of measurement, say volume, the conception of the unit is more fully realized. Described generally, this relation is somewhat obscure. However, if we consider the fact that we may define a gram of water

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[334] McLellan, *The Psychology of Number*, 45.
[335] McLellan, *The Psychology of Number*, 44-45.

in terms of its volume, i.e. one milliliter (at given temperature and pressure), the mutual implication of units becomes clearer.[336]

The insistence that units of measure be mutually related will become more significant when Dewey's account of arithmetic operations is considered. However, it is also significant in the sense that it seems to be an instance of precisely the mutual implication that Dewey has established in his discussion of meaning. The relations among concepts that generate meaning involve precisely the cross-categorical implications described here. If we again consider the way in which a particular odor acquires meaning through the act of picking a flower, it seems clear that the requirement that units be mutually implied is, in fact, the requirement that they have meaning. If we further consider this requirement in the context of the generality of measurement, it seems that this form of mutual implication will be one of the most primitive instances of meaning. This connection between the development of numerical concepts and the development of concepts, generally, will become more vivid as the presentation progresses.

At this point Dewey has provided a very general account of the origin of quantity, however, he has still not presented a full account of the generation of numbers and counting. It is not obvious that measurement can provide a basis for an operation like counting. However, Dewey insists that any distinction drawn between continuous and discrete quantities is ultimately untenable. The apparent difference is explained by the clarity and precision of the definition of the unit, in each case. To the extent that the unit is vaguely defined or measured imperfectly, quantities appear continuous. Once the unit is defined precisely, and is able to be measured accurately, then the quantity becomes

[336] McLellan, *The Psychology of Number*, 46-47

discrete. For example, length seems continuous because perfectly accurate measurement is not possible. On the other hand, the number of books on a shelf seems discrete because the unit, in this case 'book', is clear and it is possible to identify it precisely.[337]

At this point, it seems valuable to reconsider the strictures, imposed by Dewey, on *a priori* knowledge. As we have seen, he is willing to admit such knowledge insofar as it regulates human interaction with experience. The inferences drawn from the fact that a rule has been followed are legitimate without direct empirical scrutiny.[338] In the discussion of Kant, the paradigm of this type of rule following was geometrical construction. In particular, this type of construction was definitive of synthetic *a priori* knowledge. In that discussion there seemed to be some difficulty in extending the constructive account from geometrical to arithmetic or algebraic examples. Given the focus on arithmetic in the presentation, it is necessary to identify the constructive character of these processes, if the contention that they are synthetic *a priori* is to be maintained.

Dewey begins to make the constructive quality of numerical ideas clearer in the summary he provides of the previous material. He provides a relatively succinct definition of quantity that is worth considering in its entirety. He says,

> That which fixes the magnitude or quantity which, in any given case, needs to be measured is some activity or movement, internally continuous, but externally limited. That which measures this whole is some minor or partial activity into which the original continuous activity may be broken up (analysis), and which repeated a certain number of times gives the same result (synthesis) as the original continuous activity.[339]

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[337] McLellan, *The Psychology of Number*, 47-49.
[338] MW, 3, 133.
[339] McLellan, *The Psychology of Number*, 52.

The significant feature of this definition is that it insists on the continuity of the original experience. The division that supports the measurement, and thus the means-ends economy, is imposed on this original continuity. The example offered to illustrate this point is the division of the year into seasons. The passage of time is obviously continuous, but its division into seasons is necessitated by agricultural activity. It might be, and in the absence of general involvement in agriculture often is, divided differently.[340] Thus, there is no sense in which the measuring activity is determined by the reality of experience. Dewey emphasizes this point, here with respect to number, saying, "*Number* is not (psychologically) got *from* things, it is put *into* them."[341] The insistence on the novelty of numerical concepts is important because it makes clear that they are not simply analytic consequences of the various metrics.

In its most basic form, then, the account of quantity and the generation of number seems to meet the requirements for the *a priori*. However, it is not yet clear that the account can adequately explain mathematical activities more complex than counting. The remainder of my examination of *The Psychology of Number* will be occupied in presenting the explanation of those more complex activities. It is worth noting, at the outset, that though I believe this account has merit, it is far from a complete explanation of mathematical activity. As the subtitle of the book indicates, the primary focus on is arithmetic and its instruction. There is little mention of geometry, the frequent references to measuring areas notwithstanding, and no mention of calculus. Although I believe an account of these domains is possible, based on the general perspective defended, its presentation will not be possible here.

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[340] McLellan, *The Psychology of Number*, 52-53.
[341] McLellan, *The Psychology of Number*, 61.

Having discussed the concept of "quantity" in the previous section, Dewey goes on to establish a definition of number. In its most primitive form, number is defined by two factors. First, a unit must be defined that is of the same qualitative type as the indefinite whole to be measured. For example, a foot may be determined by the number of inches that compose it. The second component of a numerical concept is the quantity of units that are necessary to compose the whole. It is this second component that is most commonly identified with specific numbers. Dewey says, the quantity of units required, "express the numerical values of the quantities; they are pure *numbers*, the results of a purely mental process."[342] Number, *per se*, is identified with the activity of repetition. The insistence on its purity seems to derive from the fact that it abstracts from the definition of the unit and the magnitude of the whole, and considers only their relation.[343]

Dewey points out that the definition of number provided above has the advantage of avoiding a linguistic ambiguity concerning arithmetic operations. Arithmetic operations are often said to apply to "numbers." However, this definition clarifies the fact that they apply to the magnitudes of the measured quantities and not the numbers themselves. Dewey makes a point, in explaining this confusion, that seems particularly important for the issue of *a priority*. He says,

> Number *simply* as number always signifies how many times one "so much," the unit of measurement, is taken to make up another "so much," the magnitude to be measured. It is, as already said, due to the fundamental activities of mind, discrimination, and relation, working upon a qualitative whole…[344]

The important aspect of this distinction is that it suggests that number arises out of mental processes operating on any object whatever. In this respect, it seems that Dewey can

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[342] McLellan, *The Psychology of Number*, 69.
[343] McLellan, *The Psychology of Number*, 69-70.
[344] McLellan, *The Psychology of Number*, 70.

identify their properties as regulative, without identifying them as constitutive. This possibility, in turn, seems to satisfy the general criteria for the *a priori* in a reformed empiricism.

As a relation between the unit and the whole to be measured, number may also be defined as a ratio. In this sense, number can be considered as an abstraction from many relations between unit and whole. The number "12" expresses the relation of a year to a month just as much as the relation of a dozen to an egg. The abstract quality of this conception of number leads to the claim that number expresses "possible measurement."[345] The transition to considering number as an expression of possibility will become more important when we consider the issue of experimentation, and its relation to knowledge. The ability to express possible measurement allows the extension of individual experiences, in at least their quantitative aspect, into the future. In addition, this extension of concrete experience into possible experience is closely connected to the phenomenon of meaning.

Having provided a definition of number, Dewey goes on to discuss the stages of its development. The number concept develops in distinct phases. The first of these is the recognition of the quantity to be measured. In the first instance, this quantity is merely continuous; that is, it is a unity with an undefined magnitude. It is important to note the continuity of this original quantity. Continuity is a quality, not only of traditionally continuous objects like time, but also of collections of objects. The continuity of collections is often masked by the fact that their constituent units are identified quickly. However, they are originally continuous. For example, a bushel of apples is clearly a collection of discrete objects, the apples, however there is a moment

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[345] McLellan, *The Psychology of Number*, 71-72.

before the unit is defined, in this case vanishingly small, where the undefined whole is simple. In cases where the units are less easily identified, the number of atoms composing some surface for example, the original continuity is clearer. The second phase involves establishing the unit of measurement, and determining the original magnitude in terms of a ratio between its magnitude and the established unit. This relation defines the magnitude, and its expression is an integer.[346]

The description of this development emphasizes, once again, the fact that numerical qualities are brought to experiences, and not distilled from them. There is no sense, prior to the arbitrary establishment of a unit, in which numbers are found in experience. In this sense, at least, the conception of number advocated here avoids Frege's obvious objection to an empiricist understanding of mathematics. It also makes clear the sense in which arithmetic objects, namely numbers, can be understood as rules. In Kant's defense of the synthetic *a priori* geometry provides the most obvious examples. However, on this definition, number itself can be seen as a rule. The repetitive imposition of the unit on the original whole is described by the ratio between the unit and the ultimately determined magnitude. The specific rule, say of counting eggs in a dozen, can then be generalized by abstracting the particular objects. This abstract rule is expressed in the numerical concept, "12," for example, that also describes possible actions.

The last major task in the explanation of the psychological origin of mathematical knowledge is the explanation of the development of the arithmetic operations, addition, subtraction, multiplication, and division. The beginning of this account is the recognition that arithmetic will arise out of number itself; that is, out of the activity of measurement.

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[346] McLellan, *The Psychology of Number*, 72.

To the extent that number represents a refinement of the act of measuring, arithmetic operations constitute a further specification of the process. He says, "… all of these operations [addition, subtraction, etc.] are intrinsic developments of number; they are the growth, in accuracy and definiteness, of its measuring power."[347] The development of the arithmetic operations in this sense corresponds to the development of the act of measurement, as it becomes more precise. These stages further involve the implication of measurement into a larger context. As we saw above, this development begins with the determination of an indefinite magnitude by an arbitrary unit. In the second stage, the unit is related to another unit of the same qualitative type; when a pound is defined in terms of ounces, for example. Finally, the unit is defined through a relation to a qualitatively different unit; when a pound is defined by a certain volume of water at a given temperature and pressure.[348] The introduction of arithmetic operations, then, will similarly increase the interrelation among numerical ideas, and thus extend their meaning.

Addition and subtraction are, in some sense, the simplest arithmetic operations. When quantitative ideas are first encountered, they are vague, but not necessarily indistinguishable. Even in their indefinite form, ideas of quantity will be comparable. Some quantities will seem greater or lesser, in some respect, than others. At this point in their development, the exact differences between the quantities will be indeterminate. Through the introduction of a unit, the difference between two qualitatively similar quantities can be determined accurately. For example, it is possible to determine how many more inches long a particular board is than another. The definite comparison of

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[347] McLellan, *The Psychology of Number*, 94.
[348] McLellan, *The Psychology of Number*, 94-95.

like quantities to like is sufficient to provide an idea of addition and subtraction. However, these operations do not yet allow the comparison of qualitatively dissimilar quantities.[349]

As we saw above, number, properly understood essentially involves the concept of a ratio. The role of ratio in number, which is connected to the measurement of quantity by a homogeneous scale (one in which the unit is itself composed of a quantity of smaller units), provide the basis for multiplication and division. These operations specify, not only which quantity is more or less, but the degree to which one quantity stands in specific relation to another. Ratio also provides the basis for the more complicated operations of treating proportions and fractions. However, the introduction of these operations does not yet correspond to the most definite, and abstract, sense of "number". Before this highest level of accuracy is achieved, it is necessary to present the measurement of each scale in terms of another. The expression of measurements in reference to novel units requires the consideration of proportion, or fractions.[350]

Although it is natural to consider the integers as the simplest mathematical objects, Dewey argues that their simplicity belies a deeper dependence. He argues that it is ultimately fractions that constitute the most primitive mathematical objects, and ultimately that the integers can be understood as derivative fractions. In his discussion of the origin of "number," Dewey described a process whereby a vague whole became determinate through reference to the unit. In the case of fractions these two aspects of the development are presented explicitly; both in the concept and the notation. Dewey says, "The process of fractions … simply makes *explicit – especially in its notation – both the*

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[349] McLellan, *The Psychology of Number*, 95-96.
[350] McLellan, *The Psychology of Number*, 96-97.

fundamental processes, …, *which are involved in all number*."[351] A simple illustration can make this claim more obvious. If we take a pound weight as the whole, and an ounce as the unit, we can represent the relation between any number of units and the whole by a fraction whose denominator is 16. Since the fraction is able to display the fully realized specification of the original quantity, it is identified with the generation of number itself. On this view, integers simply become the representation of the completion of the measuring process; in which the whole of the indefinite quantity has been identified with a corresponding unit.[352]

The identification of fractions with the fundamental processes of number generation is not exhausted in the definition of integers. As indicated above, fractions are identified with the fully explicit presentation of the process of measurement, and the number concepts that result from that process. In the simplest examples of the determination of indeterminate quantities, counting apples in a barrel for example, the units themselves constitute indefinite quantities. They are only alike. In the case of exact measurement, measuring a distance in feet or inches for example, the units themselves are defined. The definition of the units allows them to be identified as equals, rather than merely similar. The identity of the units is part of the process of abstraction that allows number to indicate possible measurements. In this sense, fractions are the most explicit statement of the processes involved in the generation of numerical concepts.[353] As Dewey says, "…a fraction may be considered as a convenient language (notation) for

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[351] McLellan, *The Psychology of Number*, 126.
[352] McLellan, *The Psychology of Number*, 126-127.
[353] McLellan, *The Psychology of Number*, 128-129.

expressing quantity in terms of the process which measures or defines it – which makes it 'number.'"[354]

Although the topic is not treated in *The Psychology of Number*, it seems that there is an obvious sense in which fractional notation facilitates the integration of units of measurement. In his discussion of the development of the number concept, Dewey identified the definition of measuring units by qualitatively dissimilar units as an essential stage. The mutual implication of standards seems to allow for their specification to an arbitrarily high degree. For example, a gram is perfectly well defined through reference to other units of mass, $1/28^{th}$ of an ounce or $1/100^{th}$ of a kilogram. However, it becomes exact to the degree that it can be determined by qualities other than mass, the volume of water at given temperature for example. The role of fractions in expressing this interconnection among measurements seems elegantly presented in the method for unit conversions taught in elementary science classes. It is possible to convert any measurement into another standard as long as it is possible to construct a chain of fractions such that if the unit to be converted appears in the numerator, the unit into which it will be converted appears in a corresponding denominator, and vice versa. Through this process it is possible to make the interconnections among units of measurement fully explicit, and thus provide an increasingly exact specification of any unit.

The remainder of *The Psychology of Number* is occupied in discussions of pedagogical methods for teaching basic arithmetic based on the conception of number already described. While this material contains some interesting suggestions for further research, it is largely irrelevant to the questions of this dissertation. At this point,

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[354] McLellan, *The Psychology of Number*, 131.

however, it does seem possible to draw some conclusions about the epistemic status of mathematical knowledge based on the material presented. As I have already stated, these conclusions must remain partial and provisional until an account of more complex mathematical objects is generated, either through the examination of further sources or through an extrapolation based on this material.

III. Is Arithmetic *A Priori* Knowledge?

In order to consider the question of the *a priori* status of mathematical knowledge, it is necessary to consider the relation between the specifics presented here and the details of Dewey's broader epistemological position. The most illuminating points of comparison seem to be; first, the conception of experience, advanced in Dewey's early work, and culminating in "The Reflex-Arc Concept in Psychology." The second important piece of context for this material is the discussion of the role of meaning in the construction of knowledge. Finally, the revisions that Dewey imposes on traditional Empiricism can provide insight into the place of mathematics in his larger project.

The first sense in which Dewey's conception of experience, as presented in the early work, is significant here is Dewey's insistence on the fundamentally continuous character of experience. In the most basic sense, there are no inherent distinctions within experience. The presentation in "The Reflex-Arc" goes so far as to suggest that even the distinction between subject and environment is developed through experience. Ultimately, those distinctions depend on the uncertainty of the outcome of certain actions. That is, the distinction depends upon the recognition that the subject's ends and intentions are not immediately translated into the world. Even once the distinction between the subject and environment has been established, experience is further organized by goaloriented activity. Dewey concludes that the apparent distinction between stimulus and response is based on a transformation of a sensory experience into an experience that occasions action; that is, one that is the object of some goal.[355]

The understanding of experience advanced in "The Reflex-Arc Concept" seems closely connected to the discussion of the psychological development of mathematical knowledge. The connection between Dewey's early conception of experience and the discussion of basic arithmetic was already discussed in the connection between the psychological functions of association and discrimination, and the most basic mathematical activities. Here, it is possible to identify some more general connections. Quantity, as we have seen, always arises out of some continuous quantity. In this sense, experience itself could be considered a reasonable starting point for the analytic activity associated with counting. There also seems to be a significant connection between the generation of more complex experiences and mathematics. Both arise out of a confrontation between a limited subject and a recalcitrant environment. As "The Reflex-Arc" essay makes clear, it is through the experience of resistance that the subject comes to distinguish itself from its environment. This resistance also seems to be the motivating factor for considering the world through quantitative concepts. As the subject encounters resistance it must marshal its resources to overcome that resistance and achieve its ends. As resources are expended, their limitation will produce a similar resistance. Taken as a whole, these experiences seem to necessitate the economy of means that generates quantitative concepts.

When the question of the *a priority* of basic mathematical concepts is posed in the context of these connections, several important features emerge. In the first place, there

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[355] EW, 5, 96-109.

is an obvious incompatibility between this presentation and the most basic interpretation of *a priori* knowledge. Clearly in the explanation of the origin of mathematical concepts, there has been extensive reference to experience.[356] However, once we begin to move away from the most basic interpretation, a more plausible case emerges. It seems unlikely that cognitive experience, in the non-technical sense, could possibly emerge without the basic experiences assumed by this account. There seems to be a meaningful sense of *a priori* knowledge that identifies it with the most basic and pervasive aspects of knowledge, rather than being simply disconnected from all experience. In this sense, then, the connection between the origins of mathematical knowledge, and the descriptions of experience in "The Reflex-Arc Concept in Psychology," seem particularly suggestive. Before it is possible to fully evaluate the question of whether these concepts are correctly classed as *a priori*, it is necessary to consider their connection to another important epistemological category in Dewey's work, meaning.

In the first place, it is important to remember that the discussion of teleological activity is closely collected to meaning. Given the fundamentally continuous nature of experience, any distinction introduced will remain somewhat provisional. The primitive continuity of the experiences will remain, and this continuity will allow the connection of those, now discrete, elements of experience so that meaning can arise. In the description of the prototypical "knowledge experience" presented in "The Experimental Theory of Knowledge" experience is already analyzed into components, and these components ordered into a series. Throughout the presentation of the example, it is clear that knowledge, in the fullest sense, occurs when these original elements are transformed

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[356] It is also worth noting that even the most staunch advocates of *a priori* knowledge, like Kant and Leibniz, would almost certainly not assent to the simplistic interpretation assumed in this conflict.

through the application of the completed experience, as a whole, to the original series of discrete elements. In the example, the knowledge that a certain smell is "of a rose" is determined by an expectation of a particular set of experiences, not immediately present in the original sensation. As the earlier discussion made clear, it is the projective aspect of meaning, the indication in the original sensation of the fulfilling experience, that most clearly characterizes knowledge, as such.[357]

Given the conception of the relationship between meaning, as projective experience, and knowledge, it is now necessary to evaluate the epistemic status of central mathematical concepts as basic. In the first place, mathematical knowledge seems to be, at least, coeval with any experience as described in "The Experimental Theory of Knowledge." The fact that the experience of knowledge begins at a point where experience has been subjected to analysis suggests that the criterion for the generation of quantitative concepts has already been met. The analysis of a continuous experience into the component parts of the series extending from the sensory stimulus to the terminating fulfillment is sufficiently accomplished that it must include quantity. This claim does not include that, in every instance of analyzed experience, there is a conscious recognition of quantity. However, it seems that the recognition of the quantitative aspect requires nothing more than attention to bring it into consciousness. It seems reasonable, then, to suggest that in any instance of knowledge, there is already the possibility of quantitative concepts.

Further, there is a clear sense in which the quantitative concepts are simpler than the empirical concepts with which they arise. For example, it seems possible to construct a quantitative concept based solely on the analysis of the original experience, without any

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[357] MW, 3, 107-127.

further stipulation of the quality of the elements. In the generation of any empirical concept, like the smell of a rose, the particular qualities of the elements are necessary. If we were to consider an organization of knowledge based on the empirical resources required, quantitative knowledge would seem to occupy a comparatively primitive place. In any experience sufficiently rich to generate knowledge, there will be sufficient resources to generate mathematical knowledge.

Finally, there seems to be a strong similarity between the development of knowledge from the cognitive to the cognitional, as presented in the last chapter, and the development of properly numerical concepts. Number, in its proper sense, is identified as the ratio between the unit and the measured whole. Once this relation has been identified, it can acquire an abstract status and come to indicate a possible relation between an arbitrary unit and a measured quantity. In this sense, then, number seems to rise to the level of cognitional experience. Number, *per se*, is not merely the outcome of a particular measuring act. It takes on the general character of the possible outcome of a measuring act. In this way it acquires the projective character that is associated with cognitional experience. The fact that mathematical concepts may achieve the most developed stage of knowledge indicates that, though they require minimal resources, they can constitute knowledge in the fullest sense. Number concepts "*mean* to mean" in the same way that empirical concepts do. They indicate the hypothetical completion of some act of measuring; just as a particular smell may indicate the hypothetical completion of the act of picking a flower.

The final point to be considered in the evaluation of mathematical knowledge is its evaluation in the context of Dewey's revised Empiricism. As I have stated several times, one of the most obvious objections to the claim that Dewey can accept some form of *a priori* knowledge is his explicit commitment to Empiricism. However, in the last chapter, I argued that Dewey's Empiricism was considerably revised from the traditional versions advanced by Locke and Hume, as well as from the modern versions, advanced by the Logical Positivists, for example. I argued there, based on Dewey's response to Kant, that his particular position allowed for *a priori* knowledge. The important distinguishing feature is that, for Dewey, the *a priori* must be understood as regulative, rather than constitutive. In particular, this distinction is demonstrated by the fact that the *a priori* will make some discernable difference in experience.[358] The coordinate negative condition is that the *a priori* must be understood as independent from the objects it regulates; that is, it cannot be interpreted as "already present" in them.[359]

I have already suggested that elementary mathematical ideas, as presented in *The Psychology of Number*, meet these criteria. In the first sense, the introduction of quantitative ideas, and ultimately numerical ideas, makes a clear difference to experience. Dewey is insistent that the indefinite wholes out of which number arises are distinctly altered by their accurate quantification. They are further altered as the units used to quantify those wholes are mutually implicated. The experience of a liter of water is clearly altered when we know that it is equal to one thousand cubic centimeters, and it is altered even further when we understand that it is equal to one kilogram. It is important to recognize that none of these specific facts, or even their specific relations, are *a priori*. However, once these relations are instituted, their mutual implications seem to be. In other words, it is the rule that one cubic centimeter of water is equivalent to a gram. The

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[358] MW, 3, 133.
[359] MW, 3, 128-144.

application of this rule makes a discernable difference to our experience. The example also meets the negative criterion, it is clear that the units of measurement are not mysteriously present prior to their institution. However, once their meanings are fixed, we no longer require that their relations be verified.

Dewey identifies several other, subsidiary, aspects of the *a priori* in his discussion. Among these is the insistence that the *a priori*, properly understood has any, "sacrosanct or finally valid and worthful character."[360] This criterion is somewhat difficult to apply to basic arithmetic. The knowledge that "2 + 2 = 4" does seem to possess a level of validity that approaches finality. However, Dewey's account would seem to provide a way of explaining this sense, without precluding revision. As arithmetic knowledge arises out of the act of measurement, the *possibility* of the arithmetic relations are guaranteed, but possibility does not seem to rise to the level of sacrosanctity. Given the poverty of resources required by basic arithmetic propositions, it is possible to construct experiences that would correspond to those propositions, even if practical experience never occasioned those constructions. Consider a world in which a much larger percentage of the matter was liquid. In such a world, two drops plus two drops would simply equal one drop. It is not difficult to image circumstances that would lead to the identification of the standard equality, the consideration of volume for example. However, it does seem likely that the perception of the value of the standard equality would be different.

In the last chapter, I suggested that it was profitable to view Dewey's conception of *a priori* knowledge as a means of responding to Humean skepticism. I believe that the account of mathematical knowledge presented is able to identify why mathematical

[360] MW, 3, 134.

knowledge enjoys a special status, even though it remains closely connected to experience. Mathematical knowledge seems to arise out of the most basic activities the mind engages in when it seeks to know. Further, the material upon which the mind operates in the construction of mathematical knowledge is arguably present in all experience. In this way, the rules that are derived from an examination of these processes enjoy a special status. They are expressions of the consequences of engaging the world in an epistemic way. It is this relationship to the general structure of the knowledge experience that distinguishes the *a priori*. Once we have allowed that we *know* anything at all, we have the resources to know elementary mathematics.

Chapter 5: Knowledge and Experiment

I. Introduction

Dewey's mature work is focused on the problem of experimental science. In the early decades of the Twentieth Century, Dewey realized that experimental science posed a more radical challenge to traditional epistemology than was appreciated; even by those who regarded scientific knowledge as paradigmatic. He believed that recognizing the primacy of scientific knowledge would result in a complete reorientation of philosophy. In epistemology, this reorganization would involve an abandonment of the "Justified True Belief" model of knowledge. In place of that model, a conception of knowledge that did not aspire to absolute certainty, and acknowledged the possibility of revision, was required. This radical reorientation would have consequences for nearly every epistemological category. In the following chapter, I will try to demonstrate the place of *a priori* knowledge in this new epistemic world.

In the first section of this chapter, I will present the broad outline of Dewey's mature epistemology. I believe that the best source for such a presentation is the collection of Gifford Lectures, published as *The Quest for Certainty*. In these lectures, Dewey provides a historical and psychological account of the origins of knowledge in the inherent danger of life. The attempt to mitigate that danger leads to the development of science, as a means to control the environment. This point makes clear the reason for science's, particularly physical science's, preeminent epistemic status. The lectures also contain the broad outlines of the revisions to traditional epistemology that a reorientation toward physical science entail. It is here that Dewey presents his account of the role that mathematics and logic, the traditionally *a priori* domains, will have in this new system.

The latter part of the chapter will consider Dewey's 1938, *Logic: The Theory of Inquiry*. This work is his most sustained and detailed treatment of scientific method and logic. It advances his revolutionary position that logic requires reformation, in the light of scientific method. R.W. Sleeper, in his work on Dewey's logic, points out that the contemporary reception of the work was cool, at best. The mainstream of philosophy was enthusiastic about the symbolic techniques pioneered by Frege, Russell, and Whitehead. However, Sleeper points out that Dewey's avoidance of those techniques was coincident with a through rejection of their philosophical suppositions.[361] My particular interest in the *Logic*, is that it provides the detailed account of positions suggested in *The Quest for Certainty*. More specifically, it will provide an ultimate test for the possibility of a reformed conception of the *a priori*.

II. *The Quest for Certainty*

In the spring of 1929, Dewey gave the Gifford Lectures in Natural Theology, at the University of Edinburgh. The same lecture series that produced James' *The Varieties of Religious Experience* and Royce's *World and the Individual*. In its reception, Dewey's contribution to this tradition has been less prominent. The published version of his lectures, *The Quest for Certainty*, is overshadowed , among his later works, by *Experience and Nature*, *Logic: The Theory of Inquiry*, and *Art and Experience*. However, I argue that *The Quest for Certainty* has reason to stand on equal footing, not only with the greatest products of Dewey's later years, but the works of his prominent predecessors. Although it does not contain the detailed arguments of his mature position, *The Quest for Certainty* lays out the broad structure of a revolutionary position in

[361] R.W. Sleeper, *The Necessity of Pragmatism: John Dewey's Conception of Philosophy* (Urbana: University of Illinois Press, 2001), 134-135.

epistemology. In this sense, it is a better orienting work than the more detailed presentations found in his more prominent works.

Dewey begins his treatment by presenting a version of the history of epistemology. Here, Dewey organizes the historical development through a supposed antagonism between theory and action. The supposed distinction between the two arises out of the natural peril of life. Life, as a stable state, is beset by alterations in its environment which are often inimical to it. In response to this hostility, human beings continually seek refuge. In the earliest stages of development, humans sought this refuge in two ways. The first involved an attempt to satisfy the invisible powers that controlled the changes in the environment. The second was an attempt to control those forces through action.[362] The refuge sought is a position of unassailable stability, which stands in contrast to the continual perilous alteration of the world. As Dewey will argue, this position of permanent security is an unattainable distraction. The *a priori* is, in many ways, the epitome of supposed security; its independence from experience can be construed as the paradigm of theoretical knowledge. If the *a priori* is to be rehabilitated, then, it cannot rely on its supposed security, or its connection to some unchanging domain.

In the early stages of cultural development, the attempts by human beings to control nature were extremely uncertain. Dewey identifies three aspects of such activity that make it inherently uncertain. The first is that actions, although similar, always occur in unique circumstances. This makes past experience, at best, an uncertain guide. Although this statement is similar to Hume's assessment of knowledge, Dewey is not

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[362] John Dewey, *The Later Works, 1925-1953*, vol. 4: 1929, ed. Jo Ann Boydston (Carbondale, Il.; Southern Illinois University Press, 1984), 3. Citations to *The Later Works* will be abbreviated LW, vol., p.

espousing skepticism here. Rather, his point is that the knowledge gained from the past is, at best, probabilistic, and subject to the misidentification of salient similarities between circumstances. This makes all such activity appear inferior to the certainty which attends thought. Second, action cannot be regarded as having any source other than the individual actor. Since most people regard themselves as prone to error, all activity is similarly prone.[363] Finally, action is recognized as requiring the continuing favor of circumstance for success. Even activities that begin successfully can ultimately fail through no fault of the actor. All of these factors combine to produce a deep suspicion of practical activity. This suspicion is only strengthened, and elevated into outright denigration, when activity is compared to thought.[364]

The uncertainty that attends practical activity might, by itself, not suffice to cause its subordination to thought. However, several factors combine to produce a valuation of pure thought that elevates it beyond activity. Dewey describes this process, saying, "With those to whom the process of pure thinking is congenial and who have the leisure and the aptitude to pursue their preference, the happiness attending knowledge is unalloyed; it is not entangled in the risks which overt action cannot escape."[365] The relative security of thought over action is based on the perception that thought is wholly contained in the mind. As such, thought is completely under the individual's control.[366] Given the desire for security, it seems reasonable that those who could would retreat to a domain that seemed completely safe.

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[363] LW, 4, 6.
[364] LW, 4, 7.
[365] LW, 4, 6-7.
[366] LW, 4, 6-7.

The distinction is supported by the cultural tradition. In societies where the development of practical control is primitive, humans pursue the first strategy of attaining security, religion. The cultural forms of religion are often highly secretive. The rites, which are intended to produce favorable outcomes, are performed by a distinct group. To the extent that most members of the society do not participate in these rites, they acquire mystery. This mystery, in turn, leads to the elevation of religion over more familiar practical activities.[367] This cultural background is further supported by the development of philosophy. Although philosophy developed in antagonism to much of religious practice, according to Dewey, it takes over the sense of separation. It replaces the mythological narratives of religion, with 'rational discourse,' which is purported to preserve the special security afforded by religion.[368]

The eventual outcome of this separation is the distinction between knowledge and belief. Knowledge is associated with pure thought. It is treated by philosophy as necessary and certain. Because it possesses these qualities, it is treated as the governor of practical activity. Such activity, by contrast produces only belief, which is identical with mere opinion. In this way, the distinction between thought and activity acquires ethical significance. Though provides the norms which will govern action, but is not itself affected by that action.[369] Dewey's proposal is not to abandon or overturn the distinction between thought and action, but to impose equality in their relation. He says,

> That man has two modes, two dimensions, of belief, cannot be doubted. He has beliefs about actual existences and the course of events, and he has beliefs about ends to be striven for, policies to be adopted, goods to be attained and evils to be averted. The most urgent of all practical problems

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[367] LW, 4, 8-11.
[368] LW, 4, 11-15
[369] LW, 4, 14-15.

> concerns the connection the subject-matter of these two kinds of beliefs sustain to each other.[370]

It is this "practical problem" that the subsequent program is intended to address.

The historical locus of the strong separation Dewey identifies is classical Greek philosophy; Plato and Aristotle in particular. Although the distinction between thought and action, and belief and knowledge, are ancient, they continue to influence the character of philosophical investigation. Dewey identifies three ways in which these distinctions continue to operate. The first is metaphysical: the distinction between knowledge and belief has led to a connection between objects of knowledge and "real" objects. Given the fixed character of knowledge, it is inferred that the ultimate constituents of reality must be similarly fixed.[371] The second continuing influence of this distinction is epistemological. The objects of potential knowledge cannot be consequences of any activity. Objects that are the consequence of activity have already been infected by uncertainty; as such they can never be truly known. Dewey additionally claims that this separation is common to otherwise disparate theories of knowledge. He says, "They all hold that the operation of inquiry excludes any element of practical activity that enters into the construction of the known object."[372]

The consequence of the exclusion of the particular and the practical from the domain of knowledge is that traditional epistemologies share a metaphorical conception of knowing; the "spectator theory." Dewey identifies two criteria, one positive and one negative, for this type of theory. The positive criterion is the inviolability of the real objects. These objects precede the activity of knowledge and they remain unaffected by

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[370] LW, 4, 15.
[371] LW, 4, 17-18.
[372] LW, 4, 18.

it. The negative criterion is that the processes involved in knowing are entirely external to the known objects. These criteria provide a simple analogy to explain knowledge. The objects of vision are entirely external to the organs of vision, and remain completely unaffected by being seen. The objects of knowledge are external to the organs of knowledge, and are unaffected by being known. The insertion of these the organs and processes separates real object from the known object completely. The consequence of this separation is that it becomes impossible to know real objects.[373]

The significance of Dewey's discussion of the "spectator theory" and his general rejection of it, are clear when they are considered in the context of the Kantian discussion of the faculty of intuition. Parsons' account of intuition, in particular, seems to make Kant an adherent to the spectator theory. It seems equally clear that the model of the synthetic *a priori* defended in Shabel's interpretation avoids the most obvious features of the spectator theory. The role of construction, and the apparent introduction of novel conceptual contents, seems to violate both of the criteria Dewey identifies. Certainly, there is some ambiguity in the sequence of construction and observation, but it seems possible to understand those acts as coeval. The negative criterion is more obviously violated. The object of the observation, the triangle for example, is substantially affected by the act of investigation. Prior to the constructive activity, the triangle was merely a three sided figure. After the construction, it is a figure the sum of whose interior angles is equal to 180°. The presence, in Kant's work, of features of the 'spectator theory' along with more revolutionary positions seems explicable by Dewey's own interpretation of Kant as possessing an ambiguous conception of the *a priori*.

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[373] LW, 4, 19.

Dewey's motivation for attacking the 'spectator theory' is not merely its conceptual insufficiency. Dewey also identifies practically detrimental consequences of the theory. The most obvious and important of these is epistemic lethargy. In the attempt to perfect knowledge, independent of practical goals, attention is diverted from the securing of those goals.[374] The passivity inherent in the 'spectator theory' constitutes an avoidance of the pursuit of real goods. The strong separation instituted between theory and practice has a less obvious, and contrary harm. It impedes the perfecting of methods of acting. Dewey concedes that action, per se, is not to be valued over theory. The rejection of the separation of theory and practice is that both are improved. Action, for its part, is improved by methodological guidance. Dewey says, "Regulation of conditions upon which results depend is possible only by doing, yet only by doing which had intelligent direction, which takes cognizance of conditions, observes relations of sequence, and which plans and executes in the light of this knowledge."[375] These coordinate concerns generate Dewey's innovative sense of the general problem of philosophy. The general problem of philosophy, then, "…concerns the *interaction* of our judgments about ends to be sought with knowledge of the means for achieving them."[376]

There is an obvious impediment to the position that the central problem of philosophy is the regulation of means and ends; the belief in transcendent value. In addition to the spectator theory of knowledge, the division between theory and action is manifest in the isolation of the realm of values. Philosophy, in an attempt to both accept the advances of science while maintaining the traditional view of knowledge, has created a spurious issue of the reconciliation of scientific knowledge with "values". The need for

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[374] LW, 4, 28-29.
[375] LW, 4, 29.
[376] LW, 4, 30

reconciliation of the domains is based on the desire to continue to regard values as possessing the certain and inviolable character of traditional knowledge.[377] Although the details of this separation, and its historical development, are not important, one of its consequences is extremely important. Dewey identifies one consequence of the isolation of values as particularly unfortunate, the lack of attention devoted to method. The belief that values constitute a separate domain makes their investigation suspect. When traditional beliefs lose their dogmatic force, there is nothing to take their place.[378] What is needed, then, is "…*methods* congruous with those used in scientific inquiry and adopting their conclusions; methods to be used in directing criticism and in forming the ends and purposes that are acted upon."[379]

Dewey's criticism of the traditional separation between thought and action is not sufficient to reform philosophy. The remainder of the work is a schematic presentation of Dewey's positive position. The basis for that positive position is a close examination of the methods of experimental science, specifically physical science. Dewey offers two justifications for treating the physical sciences as exemplary. The first, involves the role that theories of knowledge played in the separation between thought and action. He says, "If […] it can be shown that the actual procedures by which the most authentic and dependable knowledge is attained have completely surrendered the separation of knowing and doing; if it can be shown that overtly executed operations of interaction are requisite to obtain the knowledge called scientific, the chief fortress of the classical philosophical tradition crumbles into dust."[380] The second reason is the cultural influence of physical

[377] LW, 4, 40-41.
[378] LW, 4, 56-57
[379] LW, 4, 57.
[380] LW, 4, 64.

science. The positive portion of Dewey's project, then, is to generate an epistemic position adequate to the methods and results of physical science.

The first stage in Dewey's positive project is a continuation of his epistemological project during his middle period. There, Dewey described his project as a reformation of empiricism. Here, that reformation is specified through the example of experimental science. In order to understand the distinction between the theory of knowledge generated by experiment and various versions of empiricism, it is important to understand the distinction between experimental and merely empirical experience. Although experience, in traditional empiricism, is subject to mental activity it is not the result of controlled action. Dewey describes this type of experience as, "…accidental – that is, neither [the original sensations nor their combinations] was determined by an understanding of the relations of cause and effect, of means and consequences, involved."[381] Dewey's rejection of traditional philosophy allows the diagnoses of the insufficiency of this type of experience to stand.[382] However, experience is not exhausted by the merely empirical.

Experience, in the sense that it can be used as a foundation for knowledge, is experimental. Experience, as experimental, exhibits three significant features, according to Dewey. The first feature is the explicitly active character of experimental knowledge. Dewey says it involves, "…the making of definite changes in the environment or in our relation to it."[383] The second feature of experience as experimental is that the changes instituted cannot be random. He says the active changes must be, "…directed by ideas which have to meet the conditions set by the need of the problem inducing the active

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[381] LW, 4, 66.
[382] LW, 4, 66.
[383] LW, 4, 70.

inquiry."[384] Finally, experimental experience has, as its consequence, the construction of a new situation in which the relations among the objects have changed. He also offers a preliminary connection of these points with a larger epistemological project. He says, "…the *consequences* of directed operations form the objects that have the property of being *known*."[385]

There are obvious connections between this conception of experience and Dewey's earlier discussions of meaning and knowledge. Although the second condition is not entirely clear, it can be illuminated in the context of that earlier work. Because the termination of the experimental process is that objects become known, it seems reasonable to consider these three criteria in the light of Dewey's earlier discussion of the experience of knowledge. There, the salient distinction between an experience that was cognitive, and not merely cognitional, was that a particular object became a signifier. As the account of experimental knowledge develops, it will become clearer that the second characteristic of experimental knowledge is precisely this acquisition of significance. In that discussion, *a priori* knowledge fulfilled a critical function in those significance relationships. In the further development of the experimental position, the role that such knowledge will play in control and direction will become clearer.

In order to illustrate the distinction between the empirical and the experimental, Dewey provides a brief discussion of the history of natural science. Dewey says, "The trouble [with ancient Greek science] lay not in the substitution of theorizing from the outset for the material of perception, but in that they took the latter 'as is'; they made no

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[384] LW, 4, 70.
[385] LW, 4, 70.

attempt to modify it radically before undertaking thinking and theorizing about it."[386] Dewey later distinguishes Greek science as treating the world as composed of "objects." Objects, in this sense, "are complete, finished; they call for thought only in the way of definition, classification, logical arrangement, subsumption in syllogisms, etc."[387] One quality of such objects is that they are heterogeneous. As complete, they are defined by their individual qualities, and not intrinsically related to other objects.[388]

The transition to modern science, identified with Galileo, "was not a development, but a revolution."[389] Further, the revolution is associated with the preeminent role of mathematics in modern science.[390] Galileo's experiments with falling bodies demonstrated that their motion was not dependent on their weight, as classical physics claimed. Dewey views this result as demonstration that motion was governed by a homogeneous property, later identified as inertia by Newton, and not intrinsic qualities of objects. Galileo's experimental determination of acceleration demonstrated the insufficiency of the classical notion of natural rest.[391] These experiments undermine the view that the behavior of objects is determined by their intrinsic qualities. The experiments of Galileo, according to Dewey, "…opened the way to description and explanation of natural phenomena on the basis of homogeneous space, time, mass, and motion."[392] The homogenizing influence is the key to the revolutionary character of modern science. By demonstrating a common reference for the behavior of objects they lose their final and complete character. In Dewey's terms, they cease being objects, and

386 LW, 4, 71.
387 LW, 4, 80
388 LW, 4, 80.
389 LW, 4, 76.
390 LW, 4, 76.
391 LW, 4, 77-78.
392 LW, 4, 78

become data. The constituents of experience, taken as data, "…are indications, evidence, signs, clues to and of something still to be reached; they are intermediate, not ultimate; means, not finalities."[393]

The consequences of the transition from objects to data, and from ancient to modern science, are far reaching. In the first place, the constituents of experience cease to exert indomitable force; they are now the subjects of potential control.[394] Further, and more significantly, the temporal character of experience is transformed. When experience was populated with objects impenetrable to human purpose, the temporally significant experience was the present. As objects become data, as they become subjects of intelligent control, significance becomes projective; the future becomes more important than the present or the past.[395] This reorientation of the salient features of experience represent a significant development of the revised empiricism that Dewey defended earlier in his career. In that work, it was often difficult to discern the exact character of Dewey's positive program. Here, through the emphasis on experiment, that positive program becomes considerably clearer.

In Dewey's revision of empiricism, one of the most important departures concerned the issue of meaning. The traditional empiricists regarded meaning as the concatenation of prior sensations. Dewey rejected this view, and proposed a new conception of meaning based on projective expectations. He further regarded such meanings, as the objects of cognitive experience, as the proper objects of knowledge. He makes clear that it is precisely these sorts of significance relations that result from the application of experiment. At this point in his presentation, the most important aspect of

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[393] LW, 4, 80.
[394] LW, 4, 80-81.
[395] LW, 4, 81-82.

this development is that abstraction from qualitative aspects of experience is a necessary part of the experimental process.[396] The importance of abstraction to the question of the *a priori* has been broached in the discussion of *The Psychology of Number*. However, here the importance of abstraction is placed in a larger epistemic context. The importance of mathematics in that process will be made clear in the following discussion.

Before considering the specific details of Dewey's discussion of mathematics, it is necessary to consider his discussion of reflective, or inferential, thought in general. Both sensational empiricists and idealists regard such thought as derivative. He says, "The essence of their position is that reflective inquiry is valid as it terminates in apprehension of what already exists."[397] Experimental empiricism requires that experiment be "directed by ideas" in order to transcend mere trial and error. In order to fulfill this role, ideas, in Dewey's system, cannot be derivative in the traditional sense. In experiment concepts are determined, not through comparison with given antecedents, but through operations.[398] Dewey says, "…concepts are recognized by means of the experimental operations by which they are determined; that is, operations define and test the validity of the meanings by which we state natural happenings."[399]

At this point in the presentation, it appears that concepts are completely empirical, and this is, in one sense, true. Dewey is clear that experimental activity both begins and terminates in acts.[400] However, the sensory qualities of those acts are "…intellectually significant only as consequences of acts intentionally performed."[401] The implication of

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[396] LW, 4, 84.
[397] LW, 4, 88.
[398] LW, 4, 89.
[399] LW, 4, 90. n 2.
[400] LW, 4, 91.
[401] LW, 4, 91.

this claim is Dewey's continued criticism of sensory empiricism; that such direction cannot come from the accumulation of sensory experiences. This insistence provides support for the idea that there may be a role in Dewey's system for the *a priori*. However, he also makes clear that the operations which define concepts are "…as much matters of experience as are sensory qualities."[402]

A final important point to note in Dewey's discussion of the operational content of concepts is, what he calls, a "common character of all such scientific operations."[403] This common character is the fact that scientific operations "disclose relationships." The example Dewey uses to illustrate this point is the determination of length. In such a determination one object is "…placed end upon end upon another object so many times." This procedure produces a relation between the two objects that was not present prior to the operation. Further, he say, such an operation also defines the concept of length. The significance of operations that produce such relations is that they allow the production of relationships between objects that have no qualitative similarity. The production of these new relationships has a startling consequence; the production of a new type of experience. Dewey says, "To the original gross experience of things there is superadded another type of experience, the product of deliberate art, of which *relations* rather than qualities are the significant subject-matter."[404] This statement constitutes the generalization of the claim that knowledge represents a particular experience. Here, the claim is that there is an entire realm of experience, meaningful or significant experience, that is constituted by the individual cognitive experiences.

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[402] LW, 4, 92.
[403] LW, 4, 100.
[404] LW, 4, 101.

The insistence on the location of operations, and thus ideas, in experience, seems to foreclose any possibility of *a priori* knowledge. However, the location of all knowledge in experience was also conceded by Kant. It is also worth noting that the force of the *a priori* in Dewey's criticism seems most like the 'constitutive' sense of the *a priori* Dewey criticized earlier in his career. The issue here is that the *a priori* cannot stand as an antecedent point of comparison by which to judge the legitimacy of concepts. Further, the description of the generation of concepts here includes the requirement that the operations be intentional. My earlier analysis of Dewey's discussion of meaning has already suggested how a reconstructed *a priori* might function in intentional operation. Although this presentation provides some additional specification, it does not seem to substantially alter the position articulated in his earlier work. The issue of specifying the nature of the reconstructed *a priori* in the generation of intelligent, or intentionally controlled, action remains.

Dewey devotes considerable attention to mathematical concepts in *The Quest for Certainty*. His focus on mathematics here derives, he says, from two principal motivations. First, the essential role of mathematics in the physical sciences makes it an important focus for any theory of knowledge based on experiment. Second, mathematics has been taken as the paradigm example of the traditional conception of knowledge. On the one hand, mathematics' applicability to physical questions seems to demonstrate the existence of some invariant domain connected to the physical. On the other hand, mathematical knowledge has provided examples of knowledge that seems completely secure and completely self-evident.[405] Dewey's analysis of mathematics, then, will have two primary goals. First, it must provide an account of mathematics within experiment.

[405] LW, 4, 112-113.

Second, it must demonstrate that this positive account is superior to the accounts of traditional epistemology. Although this project is begun here, its full articulation only occurs in *Logic: The Theory of Inquiry*.

The development of the concept of space and time, in the homogenizing project of science, has already been introduced in the discussion of Galileo. However, it is only with Newton that these entities become fully articulated. Newton supposed that time and space had existence independent of the objects which moved through them. Theses independent entities allowed Newton to explain the mathematical and rational properties of objects that were otherwise completely empirical. Further, the independence of space and time supposed by Newton led directly to their elevation to *a priori* forms of experience in Kant.[406] In Dewey's analysis, the institution of space and time as fundamentally invariant allowed him to maintain his empiricism, while he "…got the benefit of the rationalistic system of strict deductive necessity."[407]

The coexistence of the empirical and the rational persisted until the overthrow of the Newtonian system by Einstein. The obvious illustration of this revolution is the distinct understandings of simultaneity in the two physics. For Newton, invariant space and time allowed the simultaneity of events to be determined, even if those events occurred in different fields of observation. Einstein insists that simultaneity can only be determined by experiment, thus restricting the determination of simultaneity to a single field of observation. This reevaluation of the concept, Dewey says, removed the last

[406] LW, 4, 113-115.
[407] LW, 4, 115.

vestige of qualitative science from physics. All physical properties were, in Einstein's system, expressible as operations, and not as qualities of objects.[408]

By revoking the existential status of space and time, Einstein also revokes the claims of the mathematical descriptions of those entities. If space and time are not invariant objects, then claims about their structure cannot be claims about 'inherent properties.' These statements do not simply disappear, however. Their new status is regulative. Dewey says, "…they do the business that all thinking and thought have to effect: they connect, through relevant operations, the discontinuities of individualized observations and experiences into continuity with one another."[409] Further, this alteration determines a new test for the validity of those concepts. They are not valid through correlation with an invariant and antecedent reality, they are valid insofar as they succeed in effecting connections.[410]

Dewey makes the comment that, although this reevaluation pertains directly to mathematical knowledge, it has implications for the status of logic as well. Logic, and the constraints of formal validity, have been taken by traditional philosophy as conclusive evidence of the existence of 'invariant Being.' However, the reevaluation of mathematical knowledge as a means of bringing disparate experiences into continuity can be extended to logical forms as well. He says, "…logical forms are statements of the means by which it is discovered that various inferences may be translated into one another, in the widest and most secure way."[411] It seems significant that the character of formal knowledge as a means of effecting connection is first discerned in mathematics

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[408] LW, 4, 115-117.
[409] LW, 4, 117.
[410] LW, 4, 117.
[411] LW, 4, 117.

and subsequently in logical forms. This view inverts the hierarchy of theses domains in the orthodox tradition; which regarded logical forms as primitive. This inversion will be made clearer in subsequent discussion. It is important to note its introduction, as it represents a heterodox, though not unprecedented, component of Dewey's position.

Although Dewey has provided some discussion of the mathematics involved in physics, mathematics, in general, includes additional material. "Pure" mathematics is particularly important because it is taken by mathematicians to be even less dependent on the physical world. The philosophical 'tendency' in explaining these objects is to identify them with 'pure logic'. The insufficiency of that explanation has already been suggested above. Its rejection will receive further support in the positive account of pure mathematics which Dewey provides. Without recourse to the logicist explanation, then, how can an experimentalist theory of knowledge explain pure mathematics? Dewey's response introduces a distinction between overt and symbolic activity. The introduction of this distinction arises out of the practical hazards of overt action. Dewey says, "When we act overtly, consequences ensue; if we do not like them, they are nevertheless there in existence."[412] In order to regulate our actions, we must anticipate their outcome. However, if those outcomes must be actually produced, the possibilities for action will necessarily be limited. In order to liberate our inquiry from the necessity of actual outcome some alternative is needed. We must, as Dewey says, "act without acting."[413]

The solution to the need to act without actual consequences is symbol. Experiments may be performed using only symbols, and having only symbolic results. The invention of symbolic action, Dewey says,

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[412] LW, 4, 120.
[413] LW, 4, 120.

> …is doubtless by far the single greatest event in the history of man. Without them, no intellectual advance is possible; with them, there is no limit set to intellectual development except inherent stupidity.[414]

It is difficult to image a more emphatic statement of importance. Mathematics is distinguished from the wide variety of symbolic action by the degree of definition and comprehension. Dewey describes the invention of symbols that abstract irrelevant features from their expression as the 'second greatest step forward.'[415] These symbols are not restricted by the social context which restricts most symbols, like words. They are also defined without reference to any external use, but only in terms of other symbols of the same type. This new type of 'technical' symbol, of which mathematical symbols are identified as typical, are identified with the progression from 'common sense' to science.[416]

In the discussion of the innovation of symbolic thought, and the development of technical symbols, Dewey referred to the fact that technical symbols are independent. Their independence is based on the fact that the symbolic acts that they allow produce symbolic consequences. This independence is called 'abstraction.' As Dewey points out, abstraction is commonly acknowledged in discussions of mathematics, but he claims that the significance of abstraction has been generally misconstrued. Abstraction is traditionally understood as a selection of a single quality of some object in experience. However, abstraction, properly understood, indicates precisely the independence that symbolic action makes possible. Ideas become abstract, "…when they were freed from connection with any particular existential application and use."[417] Although Dewey does

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[414] LW, 4, 121.
[415] LW, 4, 121.
[416] LW, 4, 121-122.
[417] LW, 4, 123.

insist on the independence of these ideas from *any* particular application, he is careful to avoid the claim that they are independent from *all* possible applications. They extend the results of experiment beyond present possible applications, but the process of which they are part both originates and ends in actual operations. Specifically, they are operations that deal with means and ends, as such. Mathematical ideas are independent of any particular instance of this economy, but they do require that some mean-ends economy occur. [418]

The abstraction of symbolic operations, specifically mathematic operations, emphasizes the fact that such operations are possible. The focus on the possibilities of operations allows the discovery of novel operations.[419] Abstraction, and consequent focus on possibility, is particularly acute in mathematical operations. Pure numbers, Dewey says, indicate, "…an operative relation applic*able* to anything whatsoever, though not actually applied to any specified object."[420] Further, the pure numbers have clearly defined relationships to all other numbers, including "continuous quantities." The independence that such ideas are able to achieve, while not total, seems as great as possible.[421]

Mathematical operations, then, are the intellectual tools used to identify distinct possibility. However, Dewey's account requires some statement of the nature of the possibility that these operations make clear. The most obvious sense of "possibility," is existential. This sense of possibility is conveyed by the ordinary expected consequences of an action. "Sweetness" is a possible outcome of the act of tasting sugar, before that act

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[418] LW, 4, 123-124.
[419] LW, 4, 124.
[420] LW, 4, 127.
[421] LW, 4, 127.

has taken place. This sense of possibility would maintain a close connection between mathematical ideas and experience. However, Dewey is clear that mathematics deals with a second kind of possibility. Mathematical possibility is best described as 'non-incompatibility.' In one sense, this merely indicates a lack of logical contradiction. However, Dewey claims that this sense does not exhaust the quality in question.[422] He says, "'Non-incompatibility' indicates that all developments are welcome as long as they do not conflict with one another, or as along as restatement of an operation prevents actual conflict."[423] The larger sense of possibility operative in mathematics leads to a unique type of liberation. Mathematics, and by extension formal logic, are characterized by, "…a combination of freedom with rigor – freedom with respect to development of new operations and ideas; rigor with respect to formal compossibilities."[424]

At this point, it is possible to see that this conception of mathematical knowledge adheres closely to the explanation of mathematical concepts in *The Psychology of Arithmetic*. The location of the origin of numerical ideas in means-ends economies, and the eventual independence of mathematical concepts from any particular economy is familiar. The innovation of this discussion is, first, the explicit integration of these explanations in a larger epistemic project. This discussion of mathematical ideas makes clear that they provide the greatest degree of intellectual freedom. Further, Dewey explicitly claims that mathematical ideas are prior to logical ideas. The measurement inherent in mathematical activity, and the independence it achieves from particular instances, "…makes possible a system of conceptions related together *as* conceptions; it

[422] LW, 4, 127-128.
[423] LW, 4, 128.
[424] LW, 4, 128.

thus prepares the way for formal logic."[425] This aspect of Dewey's account cannot be overemphasized. As indicated in the Introduction, this position is orthogonal to the philosophical mainstream, both in Dewey's time and in ours. Further, it makes clear the degree to which Dewey regards mathematical knowledge as prior to logic. Such a position is an important aspect of the defense of the *a priority* of mathematics.

At this point, it seems safe to say that Dewey has provided an account of knowledge that was traditionally taken to be *a priori*. He has provided an explanation of mathematical knowledge and formal logic within a fully explicit, if general, epistemic system. The question of whether or not that knowledge retains sufficient, or any, connection to *a priori* knowledge must be considered. Dewey is clear that his understanding of formal knowledge possesses the same characteristics that it was taken to posses by the tradition. He says, "There is a one to one correspondence between these characters [ideality, universality, immutability, formality, and the subsistence of relations that make deduction possible] and those of objects of thought which are defined in terms of operations that are compossible with respect to one another."[426] An understanding of the way in which Dewey's account of formal knowledge maintains these characteristics will make the relation between his view and the traditional conception of the *a priori* much clearer.

Dewey produces an analogy to illustrate the correspondence between his operational conception of formal knowledge and the traditional. His analogy appeals to a machine. A machine, he says, is known when the parts are considered through their relation to the ultimate purpose of the machine. In this context, the various parts become

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[425] LW, 4, 123.
[426] LW, 4, 129.

means to the end, which is defined by the machine's function. There is no sense in which the parts of the machine, as means, or the products of the machine, as ends, exist except as ideas. Thus, the machine, understood as a relationship of means to ends, is ideal.[427] The second quality, universality, is understood in a similar way. Though the actual operation of the machine may vary according to circumstance, the connection between the means and ends, which define the operation, are universal and invariant. Dewey's statement of the invariance of this relation is particularly revealing. He says, "It [the function of the machine] is eternal … in the sense that an operation as a relation which is grasped in thought is independent of the instances in which it is overtly exemplified, although its meaning is found only in the *possibility* of those actualizations."[428]

In the analogy Dewey has provided a specification of the way in which an operation may achieve both universality and immutability. In that presentation, he made clear that the function of a machine, or indeed any operation, was ideal in the sense that it existed only as an idea. However, functions may be ideal in the teleological sense as well. The function of the machine is the standard against which its actual function is judged. He uses the example of a steam engine to illustrate the point. It is possible to imagine a steam engine that is one hundred percent efficient. Although no such machine could actually exist, it provides a standard against which to judge the efficiency of other machines with the same function.[429] In the course of the discussion of the functional conception of judgment, he makes a claim which is vital for my understanding of his view. He says,

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[427] LW, 4, 130-131.
[428] LW, 4, 131.
[429] LW, 4, 131.

> The ideal relationship of means to ends exists as a formal possibility determined by the nature of the case even thought it be not thought of, much less realized in fact. It subsists as a possibility, and as a possibility it is in its formal structure necessary.[430]

It is this necessity, he says, that allows for formal deduction. As such this point represents the conclusion of his demonstration of the correspondence between the operational and traditional views of formal knowledge.

For the purposes of evaluating Dewey's commitment to *a priori* knowledge, this account of the operational understanding of the traditional qualities of formal knowledge is vital. In his introduction of the *a priori*, Kant lists two general features that all *a priori* knowledge must poses; universality and necessity.[431] In the course of this presentation Dewey clearly allows the possibility of knowledge possessing both of these features. Clearly, these two categories are radically different from their Kantian counterparts. However, this understanding lays the groundwork for the claim that Dewey does present some reformed conception of recognizably *a priori* knowledge.

The conclusion of Dewey's discussion of formal knowledge is to clearly locate it with respect to experimental activity. All general ideas, of which formal ideas are clearly an instance, are valuable in producing hypotheses. Although a great deal of work may be done in elaborating formal structure, that work is not valuable until it has been realized through experiment. Dewey says, "…their [formal ideas] final value is not determined by their internal elaboration and consistency, but by the consequences they effect in existence as that is perceptibly experienced."[432] The contention that formal ideas are

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[430] LW, 4, 131.
[431] Kant, *The Critique of Pure Reason*, 137.
[432] LW, 4, 132.

valuable only through their application distinguishes him from the orthodox tradition. It is also an important component in a possible reformation of the *a priori*. Clearly, the honorific status of *a priori* knowledge will no longer be guaranteed. The value of any particular piece of *a priori* knowledge will have to be vindicated through its application in experiment.

In considering Dewey's complex view of *a priori* knowledge, it is important to consider carefully the commentary he offers on Kant. As in previous works, Dewey considers Kant in the context of a dispute between rationalists and empiricists. In this instance the particular question is, "..whether reason and conception or perception and sense are the source and test of ultimate knowledge…."[433] In one sense, the Kantian scheme is closer to Dewey's own position than either of the others. It allows that both concepts and perception, reason and sense, are equally necessary for genuine knowledge. However, there is a critical difference between the way in which Kant treats this relationship, and the way Dewey has construed it. He says, "In the Kantian scheme, the two [sense and reason] originally exist in independence of each other, and their connection is established by operations that are covert and are performed in the hidden recesses of mind, once and for all."[434] Although this assessment recalls some of the criticisms of Kant already considered, Dewey's presentation of his positive position raises several new issues.

Experimental knowledge differs from the Kantian, not only in the dependence and through interrelation of sensation and reason, but also in the progressive and developmental character of experiment. In experiment, the original problematic

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[433] LW, 4, 136.
[434] LW, 4, 137.

situations, "…are neither sensible, conceptual nor a mixture of the two."[435] The distinction between percept and concept is introduced during the course of the inquiry.[436] They are like the footprints created by the paleontologist's orientation toward particular geological formations. The fact that this division is instituted during inquiry means that neither of the distinguished parts can be regarded as final. Further, both sensible objects and concepts are subject to revision. He says, "Each is subject to revision as we find observational data which supply better evidence, and as the growth of science provides better directive hypotheses to draw upon."[437] Such an understanding of the process of inquiry seems to strongly mitigate against the presence of any *a priori* element in inquiry. As such, it constitutes a strong challenge for the interpretation I am defending.

In defining the *a priori*, the features of universality and necessity stand out as critical. However, both of these qualities are directly contradicted by the claim of universal revisability. There seems, then, to be a tension between the claims Dewey makes about the formal aspects of inquiry, particularly mathematics, and his claims about inquiry in general. However, this tension can be resolved by reiterating the point that formal knowledge concerns *possibility*; that is actions considered only as possible. I have suggested that such operations play a crucial role in inquiry generally, and thus acquire some of the glamour of the traditional *a priori*. As expressions of possibility, they stand further removed from the processes of inquiry described above. Although any concept or percept may be revised, the range of possibility, once specified, cannot. A more complete exposition of this claim must come after the full presentation of Dewey's position.

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[435] LW, 4, 138.
[436] LW, 4, 138.
[437] LW, 4, 138.

The last discussion in *The Quest for Certainty* that illuminates the status of the *a priori* is the introduction of intelligence as a criterion of the value of knowledge. Knowledge, as a category, is expansive. There is no difference between objects of sensation, mathematical claims, or the consequences of experiments as instances of knowledge. Dewey says, "We know whenever we do know; that is whenever our inquiry leads to conclusions which settle the problem out of which it grew."[438] Although all these things are equal, as knowledge, not all knowledge is equal. The means of evaluating things that are known involves the 'intelligence' through which those things become known.[439] Dewey explains, "…the value of any cognitive conclusion depends upon the *method* by which it is reached, so that the perfecting of method, the perfecting of intelligence, is the thing of supreme value."[440] The question of evaluating knowledge, then, becomes the question of identifying intelligence. Dewey defines intelligence as "…associated with *judgment* ; that is with selection and arrangement of means to effect consequences and with choice of what we take as our ends."[441] He goes on to say that intelligence is the ability to consider objects as means or signs. With this understanding, it becomes possible to regulate outcomes.[442]

Given that Dewey began his investigation with the suggestion that the physical sciences represented a paradigm for his reformed view of knowledge. It is now possible to specify the origin of that character. The physical sciences offer opportunities for selection and abstraction that allow a greater degree of control. He says, "The relative perfection of its [physical science's] conclusions is connected with the strict limitation of

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438 LW, 4, 158.
439 LW, 4, 160.
440 LW, 4, 160.
441 LW, 4, 170.
442 LW, 4, 170

the problems it deals with."[443] This limitation, in turn, allows for a greater degree of control; in other words, a greater degree of intelligence. In some sense, this degree of control makes the inquiry less practical. Dewey illustrates this point through a comparison between the processes that are achievable in a laboratory and those that are achievable in industry. Although the laboratory processes cannot be duplicated, they are still valuable. They make clear the connection of variables, which might later be productively, if less accurately, controlled.[444] Dewey describes the role of simplification and abstraction in intelligent processes as, "…a necessary precondition of securing ability to deal with affairs which are complex…."[445]

The conclusion of this evaluation is that there is a correlation between the degree of intelligence in any activity and its abstraction. However, Dewey is careful to point out that this abstraction is not an abandonment of practical engagement. The point of laboratory experiments is that they be applied to practical problems. However, abstraction provides invaluable tools in treating those practical problems. It is through the superior control and intelligence of the abstract inquiry that more complex inquiry can be made more intelligent. Dewey mentions mathematics as a particular example of the benefits of abstraction. Although it is necessary to avoid the reverential hypostatization that characterizes the traditional response to abstract thought, the contribution of abstractions is a defining component of intelligent practice.[446]

The benefits of abstraction are not limited to making practices more intelligent. It also provides sociological benefits. Individuals are defined by the uniqueness of their

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[443] LW, 4, 173.
[444] LW, 4, 173
[445] LW, 4, 173
[446] LW, 4, 173-174.

experiences. However, this idiosyncrasy can become an impediment to social interaction. In order to engage socially, it is necessary to distance oneself from that unique experience; that is, it is necessary to abstract from specifically individual experiences. The terminations of the process of abstraction are the abstractions of mathematics and physics.[447] Dewey's statement of this process seems particularly illuminating. He says,

> In arriving at statements which hold for all possible experiencers and observers under all possible varying individual circumstances we arrive at that which is most remote from any one concrete experience. In this sense, the abstractions of mathematics and physics represent the common denominators of all things experienceable.[448]

It seems clear, then, that abstract thought, in general, and mathematics, in particular play an important role in the intelligent regulation of action. They amount to a medium, through which the objects and situations of ordinary experience acquire significance. If such abstraction were simply useful in this way, it would be incredibly valuable. Dewey goes farther , however. Abstract thought is not merely useful, it is uniquely useful. He says, "Reflective knowledge is the *only* means of regulation."[449] This unique function in cognitive experience does not, however, justify the excesses of traditional philosophy. They are not, for all their value, more real than ordinary experience. Knowledge, as intelligent experience, occupies a position of *primus inter pares*. Its function is unique, but it is only valuable to the extent that it enlarges, rather than dominates, the objects of ordinary experience.[450]

The discussion of intelligence seems vital to any consideration of the *a priori*. Here, Dewey has provided a vital insight into both the source of traditional

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[447] LW, 4, 174.
[448] LW, 4, 174.
[449] LW, 4, 175.
[450] LW, 4, 175-177.

misconceptions of the status of *a priori* knowledge, and to its future. Traditionally *a priori* knowledge is unique among the objects of experience. There really *is* a difference between our belief that "2 + 2 = 4" and that "The statue in Trafalgar Square is Admiral Nelson." However, Dewey has also made clear that this distinction is not one of nobility. The value of this type of knowledge lies in its particular ability to enrich and expand the possibilities of ordinary practical experience. It does not disclose the structure of some rational heaven. It merely represents the residuum, the substrate, of experience shared by all 'experiencers'. By utilizing this resource, we acquire a qualified independence from ordinary experience, that allows us to exploit the enriched possibilities of that experience.

III. *Logic: The Theory of Inquiry*

In the general theory outlined in *The Quest for Certainty*, Dewey assigned an important and unique role to mathematical thought. However, that role was not fully detailed, nor was it clear how mathematical thought was related to the concrete inquiry involved in science; the examples from mathematical physics notwithstanding. In the *Logic*, Dewey provides a fully detailed view. This view includes an account of the development of mathematics from inquiry, the nature of its independence from experience, and the grounds for its subsequent application to that experience. In this section of the chapter, I will provide a close examination of that account. However, that examination is not sufficient to evaluate Dewey's position on traditional *a priori* knowledge. It will also be necessary to consider his discussions of logic, specifically deductive logic. The consideration of the deductive phase of logic is important, additionally, because it provides a contrast which emphasizes the *a priori* character of mathematics.

In addition to the specific discussions of logic and mathematics, *Logic* includes a more substantial discussion of several important concepts identified, but not fully explained, in *The Quest for Certainty*. The first of these concepts is 'judgment'. Here Dewey provides an extensive and detailed discussion of the status of judgment, and its relation to inquiry. Further, he identifies the nature of general concepts, which arise from the activity of abstraction. General concepts, in turn, are integrated into systems of connections which are connected to meaning and the intelligent direction of action. Finally, these systems of connection are used to explain the unique status of mathematical knowledge. The combination of these discussions is an account of the integration of mathematics within the structure of experimental knowledge, and the unique status it possesses within that structure.

Logic, Dewey says in the first chapter, involves "guiding principles" that are "…conditions to be satisfied such that knowledge of them provides a principle of direction and of testing."[451] He is clear that these principles are derived from previous successful inquiry, and later identified as necessary. As such, they are clearly grounded in experience. However, he says, "… they are *operationally a priori* with respect to further inquiry."[452] The sense of 'operational' *a priority* is not entirely clear. The discussion of which this statement is the conclusion might support the interpretation that such principles are features of previous inquiry, that are accepted premises of subsequent inquiry. Such an interpretation, as we will see, is supported by the fact that some principles meet this description. It is significant that Dewey uses this terminology, and it seems to echo his remarks earlier in his career about the necessity of a regulative *a*

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[451] LW, 12, 21.
[452] LW, 12, 21.

priori. The question is whether, among the 'operationally *a priori*' principles, there are any that acquire further distinction? The discussion of mathematics in *The Quest for Certainty* suggests that there are.

In the remainder of his introduction, Dewey identifies, what he calls, '…certain implications of the position for the theory of logic."[453] Among these implications is the claim that, "*Logical forms are postulational.*"[454] The description of postulates corresponds to the description, provided above, of 'guiding principles.'[455] However, they are further specified as "…a generalization of the nature of the means that must be employed if assertibility is to be attained as an end."[456] They also correspond to the stipulations of a contract. It imposes responsibility on any inquiry. Although such stipulations are not "externally *a priori*," they are "…empirically and temporally *a priori*…," in the sense that they regulate current inquiry.[457] Again, this description seems consistent with the prior account of the regulative *a priori*.

Dewey makes one final important point in his introduction. He provides a succinct description of the relation between inquiry and the guiding principles, with a prospective addition. He says, "While it [the rule] is derived from what is involved in inquiries that have been successful in the past, it imposes a condition to be satisfied in future inquiries, *until the results of such inquiries show reason for modifying it*."[458] The possibility of revision, here ascribed to guiding principles generally, will be a central concern for the status of the *a priori*. Although a certain domain might achieve an

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[453] LW, 12, 21.
[454] LW, 12, 23.
[455] LW, 12, 23-24.
[456] LW, 12, 24.
[457] LW, 12, 24-25.
[458] LW, 12, 25; italics mine.

independence from experience, the possibility that it is revisable in the light of subsequent experience would seem to represent a categorical departure from any conception of the *a priori*. Although this description emphasizes the issue of revisability, it does not decide it. The question that will require attention is whether mathematical knowledge is susceptible to revision. It might be the case that we can determine that there are no results which could provide reason for revising mathematical knowledge. It may also be that mathematical knowledge is subject to modification that does not constitute revision.

Dewey treats "mathematical discourse" as a part of his more general discussion of scientific method, in the concluding section of the *Logic*. Dewey points out that there is an irony in the order of his discussion. He points out that the preceding discussion, the bulk of the work, are antecedent to the current discussions in generality. He says, "…the special logical interpretations which have been advanced represent the conclusions of analysis of the logical conditions and implications of scientific method…." The subsequent presentation of that method, therefore, functions "…as an explicit formulation of the ultimate foundation of the views previously expressed, and as a test of their validity."[459] Given the orientation expressed, it seems reasonable to consider the discussions of mathematics and scientific method as primary, and refer to the more general discussions as necessary to understand their contents.

Dewey identifies mathematics as a particularly important test for his logical theory. This importance is due, in part, to the necessity of explaining mathematics in relation to inquiry. The criteria that such an account must meet are twofold. The interpretation of mathematics must, he says, "…account for the form of discourse which

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[459] LW, 12, 390.

is intrinsically free from the *necessity* of existential reference while at the same time it provides the *possibility* of indefinitely extensive existential reference…."[460] It is this twofold character of mathematics that both identifies it as *a priori*, and distinguishes its manner of independence from experience from the Kantian. On the one hand, as Kant recognized, mathematical knowledge is completely independent of any necessary reference to experience. However, as Dewey has suggested in earlier works, Kant misconstrued that independence. He supposed that it derived from the activity of a mind completely independent of the physical world. It is this second conception that Dewey will reform.

In the earliest chapters of the *Logic*, Dewey presents an account of inquiry consistent with the account in *The Quest for Certainty*. The goal of inquiry is the existential transformation of problematic situations into stable situations. As this transformation becomes more controlled, inquiry is develops from common sense to science.[461] The critical point of this characterization is the central role of transformation in inquiry. In order to understand the exact role of transformation in the conduct of inquiry, it is necessary to understand several critical terms introduced in the Logic. The first set of terms center on Dewey's understanding of judgments. They include the concepts of 'subject-matter,' 'data,' and 'meaning.' In addition, it is necessary to understand the way in which judgments are controlled through the institution of propositional form, and serial connection. The outcome of the control upon judgment is that they form an ordered totality, that Dewey calls 'discourse.'[462] Once the content of

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[460] LW, 12, 391.
[461] LW, 12, 71-72.
[462] LW, 12, 391-392.

these basic concepts has been presented, it will be possible to understand their relation to mathematical knowledge.

Dewey devotes a substantial portion of the *Logic* to the discussion of judgments. Judgments, in Dewey's sense, are the end of inquiry. He says, "It [judgment] is concerned with the concluding objects that emerge from inquiry in their status as being conclusive."[463] Inquiry begins with problematic situations, and is resolved through the action of the inquirer. However, That action is determined by a proposition which is "…a decisive directive…,"[464] which are identified as 'assertions.'[465] It is that proposition, and the ancillary propositions leading to it, that constitute the propositional content of inquiry. These propositions are necessary intermediaries. As Dewey says, "It is only by means of symbolization that action may be deferred until inquiry into conditions and procedures has been instituted."[466] Propositions, then, allow the "acting without action" that Dewey associated with intelligence in *The Quest for Certainty*. The question of logical significance, then, is how those intermediate propositions are constructed, and how they combine to produce assertions.

The pattern of inquiry determines the structure of judgment, now understood as propositions leading to action, to be, "…the conjugate distinction and relation of subject-predicate."[467] He goes on to define the constitution of the two relata,

> Observed facts of the case in their dual function of brining the problem to light and of providing evidential material with respect to its solution constitute … the *subject*. The conceptual contents

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[463] LW, 12, 123.
[464] LW, 12, 124.
[465] LW, 12, 123.
[466] LW, 12, 283.
[467] LW, 12, 127.

> which anticipate a possible solution and which direct observational operations constitute … the *predicate*.[468]

Both the 'observed facts' and the 'conceptual contents' constitute the 'subject-matter' of an inquiry.[469] Although there is nothing revolutionary about the conception of a proposition as a conjunction of observation and concept, the implication of understanding all of these categories through inquiry produce revolutionary consequences. These consequences begin to appear in Dewey's detailed accounts of subjects and predicates, or facts and concepts.

Dewey begins his discussion of logical subjects by distinguishing his conception from traditional views. He rejects the claim that subjects can be identified ontologically; that is, there is no class of beings that are subjects by nature. Science, he says, has refuted the idea that there are either fixed substances, or natural kinds, which might serve in this capacity. His problem, then, is how to characterize the subjects of judgments. The first positive characterization is that the subject is 'existential.' It is, he says, "…either a singular *this*, or a set of singulars."[470] These must also fulfill the logical conditions that the subject identify the problem of any situation, and it must be possible to generate 'a coherent whole' based on new observations guided by the 'provisional predicate'.[471] The description, as presented, is somewhat obscure.

It is clarified, somewhat, by Dewey's illustration of his description. In the proposition, "This is sweet," the subject is indicated by the demonstrative. The demonstrative identifies a salient feature of a situation. The situation, in the sense of the problematic occasion of inquiry, allows the selection of some aspect of that situation to

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468 LW, 12, 127-128.
469 LW, 12, 122.
470 LW, 12, 130.
471 LW, 12, 130-131.

be discriminated from the totality. In this sense the demonstrative 'takes' its object, rather than identifying one which is 'given'. In this sense, it satisfies the first criterion established above. The subject identifies the particular component of the situation which will be the focus of inquiry.[472]

The sense in which the object of the demonstrative directs subsequent observation is more complicated. As Dewey said in the statement of the criterion, the subject fulfills this function through its association with 'a provisional predicate.' So, the subject, *per se*, does not direct inquiry in the manner described, but it must be a part of that direction. In the case of the example, the predicate 'sweet' indicates, in one sense, a set of possibilities. It indicates that, if certain operations are performed, then certain perceptible consequences will occur. In the example, the operations might involve mixing the object in water and tasting it, and the perceptible consequences would be that the water has changed its taste. The significance of the subject, in this procedure, is that it allows the association of several provisional predicates with the same demonstrated object. This association makes possible the identification of a substance, pending the outcome of inquiry. In the example, the establishment of 'sweetness' might be accompanied by 'whiteness,' 'grittiness,' etc., and allow the object to be identified as sugar. This final identification is the 'coherent whole' that the criterion requires.[473]

The second pole of the subject-predicate coordination is associated with conceptual content. The predicate of a proposition contains a possible solution to the problem determined by the subject. The general features of the predicate have been anticipated in the discussion of the subject, as a necessary component in the construction

[472] LW, 12, 127.
[473] LW, 12, 131.

of a ‘coherent whole.’ Predicates, Dewey says, indicate possibility. He says, “The meanings which are suggested as possible solutions of a problem, which are then used to direct further operations of experimental observation, form the predicational content of judgments.”[474] The predicates of judgments, either as final or provisional, are identified with the projective meaning Dewey identified in his earlier work. In the context of a reformed logic, guided by the example of experimental science, these contents can be further identified as hypotheses. In this sense, predicate content achieves a level of abstraction from direct application, although it clearly retains a strong connection to existential material.[475] The abstraction of predicate content from direct existential application has several particular benefits that will be considered in subsequent discussions. The beginning of that additional specification is the identification of predicate contents with general propositions.

Dewey’s discussion of the category and subtypes of general propositions is essential to understanding his view of mathematics and formal logic. Dewey begins his discussion of general propositions by reasserting the continuity of experience. This continuity is, in the first place, temporal. This continuity is supported by enduring organic structures, which, “...hold the different pulses of experience together so that the latter form a history in which every pulse looks to the past and affects the future.”[476] It is also clear that the continuity of experience is not simply repetition, it is modified by activity. Action changes the environment of the organism, and leaves a material residue in the structure of the organism; in its nervous system, for example. Biological continuity is supported by cultural forms which preserve, symbolically, the experiences of previous

[474] LW, 12, 134.
[475] LW, 12, 134-135.
[476] LW, 12, 244.

organisms.[477] These conditions combine such that, "Some sort of sequential connection is seen to be as inherent a quality of experience as are the distinctive pulses of experience that are bound together."[478]

The continuity of experience is also manifest in inquiry. In the most obvious sense, inquiry, like experience, is temporally continuous. Dewey is clear that this temporal continuity is not the simply the assertion that judgment 'takes time.' Rather, the significant fact is that inquiries are reorganizations of present conditions based on projective prediction. In this sense, inquiry is inherently temporally extended. However, this temporal extension is not confined to individual instances of inquiry. The most significant aspect of inquiry's continuity is in the connection between any inquiry and the conclusions of previous inquiries. He says, "In this extension [from past to present inquiry], definite characteristic forms are involved."[479] Dewey acknowledges that the continuity described is uncontroversial. It would, he says, not be worth mentioning, except that it, "…is the only principle by which certain fundamentally important logical forms can be understood…."[480] The logical forms to which Dewey refers in the quotation are the forms associated with generality.[481]

The importance of generality, as a logical form, has been anticipated in the discussion of the subject-predicate structure of propositions. In the most simple sort of proposition, like, "This is sweet," there is an association of some singular, indicated by the demonstrative, and a predicate term that indicates a kind. In the example, the kind

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[477] LW, 12, 244.
[478] LW, 12, 244.
[479] LW, 12, 245.
[480] LW, 12, 246.
[481] LW, 12, 245-246.

indicated is sweet things.[482] Traditionally, kinds are explained by recurrence of a common quality across individual objects. However, such an explanation seems circular, in the sense that in order to identify a quality as recurring it must already be identified as 'of the same kind.'[483] Dewey's account of the content of the common and recurrent qualities associated with kinds is based on significance. Here the significance of the continuity of inquiry is clear. The qualities, which as existential are completely unique, acquire 'functional force,' which allows their identification across instances.[484]

Although the continuity of experience and inquiry is a necessary condition for the recognition of generality, they are not sufficient. Generality is also a consequence of activity. Propositions which describe activities, Dewey says, are not subject to the same distinction between singularity and generality. His description of propositions concerning activity make their connection of the singular and general clear. He says,

> A way, manner, mode, of change and activity is constant or uniform. It persists, although the singular deed done or the change taking place is unique.[485]

The activity, or operation, involved in inquiry provides the connection between individual instances necessary for the construction of general terms. The outcome of the activities of inquiry generate connections among individual experiences, and those connections recur. In terms of the example of the sweet object, it is the persistence and recurrence of the *activity* of tasting that produces the general term.[486]

The predicate terms of propositions are connected to activity as predictive outcomes. The qualities described by predicate terms are, Dewey says, "…not primary,

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[482] LW, 12, 246.
[483] LW, 12, 246-247
[484] LW, 12, 248-249.
[485] LW, 12, 249.
[486] LW, 12, 250.

but express the consequences, actual or anticipated, of execution of operations."[487] The predicate terms, understood as outcomes, determine 'kinds'. However, the description of the dependent nature of such terms necessitates a further distinction. Dewey has been clear that kinds acquire their generality from the general character of operations in continuous experience. However, such terms are descriptions of the outcomes of those activities, not the activities themselves. The importance of the outcomes of action in resolving problems has provided such terms with an apparent importance that has obscured a second type of logical generality. By understanding the role of activity and operation in generality, it becomes possible to identify a second type of general term. Dewey introduces the distinction between 'generic' terms, associated with kinds, and 'universal' terms, associated with the activity producing generic terms.[488] Dewey defines 'universals' as, "…propositions whose subject-matter is provided by the operation by means of which a set of traits is determined to describe a kind…."[489] It is this second type of general term that is critical in Dewey's account of mathematics.

In order to clarify the nature of universals, it is first necessary to clarify an apparent ambiguity. The status of universal propositions, as distinct from generic propositions, is obscured by linguistic ambiguity. Both types of propositions are commonly expressed as conditionals, often including a universal quantifier. The similarity of form leads to an apparent connection between the two types. Dewey points out that generic propositions are often understood to refer to relations among traits, and not the individuals that compose the kind. For example, the claim that "All whales are mammals," does not seem to require any knowledge about individual whales. However,

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[487] LW, 12, 252.
[488] LW, 12, 253
[489] LW, 12, 253.

the lack of specific reference does not necessarily eliminate reference to individuals. Universal propositions, properly understood, do not refer to individuals at all.[490] Dewey contrasts the propositions about whales, with the proposition, "If an animal is cetacean, it is mammalian." In the first proposition, there is a reference to a set of individuals; to "…each and every *existence* marked by a certain set of traits."[491] In the second proposition, there is no reference to any 'existence'.[492] It is only the latter proposition that is universal, the former is simply generic.

Although universal propositions do not refer to objects, either singularly or collectively, they do have existential reference. Universal propositions refer to "modes of action." More specifically, however, universal propositions formulate modes of action that serve to order existential material so that it can function as evidence. Dewey is clear, however, that the logical status of these propositions depends, not on their reference, but on their status as possibilities.[493] As statements of possible actions, universal propositions satisfy the need to 'act without acting' that Dewey identified as necessary for intelligent behavior. In order to understand the function of universal propositions in controlling action, it is necessary to understand their role in inquiry. The presentation of this role will make clear, both, how universal propositions maintain their connection to the concrete problems treated by inquiry, and acquire the independence that distinguishes them from other types of propositions.

Universal propositions function as rules in inquiry. These rules are stipulated in conditional propositions. However, the linguistic ambiguity of conditionals means that,

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[490] LW, 12, 255-256.
[491] LW, 12, 256.
[492] LW, 12, 256.
[493] LW, 12, 269-270.

though all universal propositions are conditional, not all conditional propositions are universal. The two components of the conditional, the antecedent and the consequent, refer to a conception and its contents. Dewey describes the content of the conditional clauses as, "…the analysis of a single conception into its complete and exclusive interrelated logical constituents."[494] In this sense, the conditional stipulates requirements that must be met for any object to be included into a particular class. It is important to note that the objects referred to need not be singular objects, universal propositions may also stipulate the inclusion of a kind with a larger kind. These stipulations provide hypothetical guidance for action. They are tested by the performance of the specified action, and verified by the occurrence of the stipulated consequence. However, the individual verification of a universal proposition is not sufficient for full warrant. In order for a universal to be fully warranted, it must be included in a system of interrelated universals, such that the connection asserted in the conditional is shown to be unique.[495] Linguistically, the transition indicated is marked by the replacement of the conditional with the bi-conditional; 'if…then' replaced by 'if and only if'.

In order to explain the continuous transition from an unwarranted to a fully warranted universal proposition Dewey introduces a further specification of the relation between universal and generic propositions. The relation Dewey identifies between universal and generic propositions is conjugate; that is, the relation between the two types is one of mutual necessity. Universal propositions operationally determine the data in problematic situations. This data, then, becomes a test of the operation performed.[496] Universal propositions are necessary to ground generic propositions. Dewey offers the

[494] LW, 12, 270.
[495] LW, 12, 270-271.
[496] LW, 12, 273.

development of the scientific conception of 'metal' as an example of this grounding. The identification of some particular substance as a metal depends upon the identification of qualities. Originally, these qualities were the observable qualities of substances already determined to be metallic; luster and malleability, for example. As the definition was refined through experiment, new qualities that were not directly observable, became definitive. These qualities include reactivity and electric capacity. In this way, the universal propositions generated, "If a substance is metallic, it will react with oxygen," for example, provide a basis for the generic propositions.[497]

The second aspect of the conjugate relation between universal and generic propositions is the dependence of universal on generic. Universal propositions, like the example above, depend upon generic propositions in a more straightforward sense. Universal propositions, Dewey says, are 'suggested' by the basic grouping that occurs in basic inquiry. The conceptions that are defined by universal propositions, like being metallic, are not arbitrarily determined. Rather, they arise out of the resolution of problems that occurs without the application of controlled inquiry. He then describes the coordinate development of these propositions.[498] He says, "The conversion of the suggestion into a proposition prescribed further operations, which yielded new matters-of-fact, and hence new ideas in the continuum of inquiry, until, on one side, the present conceptions and definitions were arrived at, and, on the other side, the present set of differential description and kinds."[499]

The final piece of background necessary to consider Dewey's view of mathematics in the Logic is a consequence of the interconnection among general

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[497] LW, 12, 274-275.
[498] LW, 12, 275.
[499] LW, 12, 275.

propositions. The conjugate relation between universal and generic propositions, as well as the continuity of experience and inquiry, support additional significant connections among and between the types of propositions. These connections support, in the first place, connections among propositions of the respective types; inferential relations between generic propositions, and discursive relations between universal propositions. The relations that constitute inference are existential involvements. Dewey says, "The problems of inference have to do with discovery of *what* conditions are involved with one another and *how* they are involved."[500] The relations that constitute discourse are implications.[501] The specific details of discursive relations will be the subject of the remainder of our discussion. Here it is sufficient to know that they are non-existential and are instruments for inferential movement between generic propositions.[502] Although the conjugate relation between the types of general propositions is an essential feature of Dewey's position, and will distinguish it from the traditional understanding of the *a priori*, the most significant aspect of his position is the analysis of universal propositions and discourse. Although it will be necessary to refer to the analysis of generic propositions and inference in the subsequent presentation, I will not be focusing on the details of that analysis.

In addition to the relations between propositions of each type, there are relations between these conspecific relational structures. Dewey provides a succinct description of this complex set of relations. He says,

> Reasoning and calculation are necessary *instruments* for determining definite involvements. But the relations of terms and propositions within reasoning and calculation (discourse) is

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[500] LW, 12, 276.
[501] LW, 12, 276-277.
[502] LW, 12, 276.

> implicatory and non-existential while description of kinds is a matter of involvement. Because the universal hypothetical propositions which constitute ordered discourse arise from analyses of single meanings or conceptions, their constituents sustain a necessary relation to each other. But propositions about objects and traits which are involved *with* one another *in* some interaction have reference to the contingencies of existence and hence are of some order of probability.[503]

The passage makes clear that the relations among universal propositions are necessary, while the relations among generic propositions are merely probable. It also makes clear that, although they are necessary, the relations that constitute discourse are instrumental, rather than foundational. The instrumental character of discourse also specifies its relationship to implication. The definitions that determine universal propositions, and by extension, discourse, are suggested by the existential connections. However, these relations, when specified in discourse, determine the presence of traits in subsequent implications. Thus, the relation between inference and discourse mirrors the conjugate relation between universal and generic propositions.[504]

Dewey expands his presentation of these types of propositions and their systems of relations in a section of the *Logic*, called "Propositions and Terms." The introduction to this section includes a more detailed analysis of the types of propositions. This section reiterates several of the points already made about the relations between propositions and judgments, and the distinctions of propositional types. The most important of these presentations, for the purposes of understanding Dewey's understanding of the *a priori*, is the discussion of universal propositions. Dewey reiterates the association between predication and activity, as well as the importance of symbolization for the consideration of possible operations. As the contents of universal propositions are subjected to inquiry,

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[503] LW, 12, 277.
[504] LW, 12, 277-278

they are resolved into necessary relations, rather than suggested connections. At this point, Dewey makes clear that the necessity of universal propositions is based on the tautological relation between a conception and its constituents.[505]

The relationships that are established between the conception and its constituents, which transforms the conception into a proper definition, are implicated in the further relations of discourse. Since definitions are understood as necessary relations of the meaning of the analyzed conception and the meaning of its constituents, the propositions themselves become implicated in series. The meaning of the proposition, is a consequence of its membership in this system. The sequences of meanings generated by the interrelation of universal propositions constitutes discourse.[506] Dewey says, "The relation of implication is an expression of this fact [that universal propositions have meaning only as constituents of discourse], so that the development of an expanded meaning of hypothetic universal in terms of implied propositions, is the determination of *what* that meaning is."[507] It is important that the sequence of implications that constitute discourse determine the meaning of the universals. Dewey points out that these sequences are not "…a communication of something already possessed."[508] This stipulation seems significant because it makes clear that the tautological character of the definitions is a consequence of a non-tautological relationship. The content of definitions, in this sense, are consequences of discourse not constituents of it.

The general discussion of universal propositions made clear that they were associated with possibility; in the sense implied by Dewey's connection of intelligence

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[505] LW, 12, 300-301.
[506] LW, 12, 301.
[507] LW, 12, 301.
[508] LW, 12, 301.

with 'action without acting.' As possible actions, it may seem that their terms have existential significance. Dewey clarifies this point through an analysis of the proposition, "Only if men are free, are they justly blamed." This proposition might seem to assert the existence of several objects, both concrete and abstract. Dewey acknowledges that the proposition refers to entities, but he denies that it affirms their existence. Rather, he says, the entities are postulated.[509] The relation is the object of significance. He says, "The relation affirmed between freedom and just blame, if it is valid at all, will still be valid if all human beings are wiped out of existence."[510] The postulation of entities, as distinct from their affirmation, will be important to distinguish mathematical discourse from discourse in general; as that distinction will depend on the absence of even postulated existence.

Dewey points out that the interpretation of hypothetical universals as postulational, rather than assertive, also clarifies the status of contrary to fact conditionals. Such conditionals are extremely important in scientific research. For example, 'frangibility,' which is captured in the contrary to fact conditional "If the substance were struck with sufficient force, it would break," is a component of the definition of many substances. However, as a potential, the existential status of the quality is unclear. Theories which seek to ground such qualities existentially, in the way that concrete qualities like color are grounded, lead to paradox. However, Dewey's position, that they do not refer to objects at all, but to possible operations in inquiry, resolves the paradox.[511] He also points out that 'contrary-to-factness,' rather than being a troubling exception, is common to definitions. Definitions, he says' are 'ideal' in the

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[509] LW, 12, 302.
[510] LW, 12, 302.
[511] LW, 12, 302-303.

sense that, "…they are not intended to be themselves realized but are meant to direct our course to realization of potentialities in existent conditions…."[512] The importance of this quotation is that it emphasizes the separation of definitions, and hypothetical universal propositions, from the objects of experience. It is this separation that emphasizes their regulative, as opposed to descriptive, character. It is in their role as rules that universal propositions will support *a priori* knowledge.

In addition to hypothetical universal propositions, Dewey identifies a second important class, disjunctive universal propositions. In describing this class of propositions, Dewey first distinguishes it from its generic counterpart, the class of contingent disjunctive propositions. The generic disjunctions are a stage in the development of fully specified kinds. For example, the generic proposition, "Iron is a metal," is justified, Dewey says, not only by the characteristics of iron. It is also justified by the exclusion of characteristics found in other metals, like copper or lead. Without such exclusion, the proposition would fail to eliminate the possibility that iron was an alloy, for example. He says, "That a kind is *warrantably* included in another kind is thus dependent in logical ideal upon the formation of a set of exhaustive disjunctive propositions…."[513] Such disjunctive sets will always remain contingent, because, given the unsurveyable extension of the universe of objects, the exhaustion of the set can never be guaranteed.[514]

The first point of distinction between generic and universal disjunctives involves the scope of the totality over which the disjunction ranges. In the case of generic disjunctions, the range included the totality of objects, in the broadest spatio-temporal

[512] LW, 12, 303.
[513] LW, 12, 299.
[514] LW, 12, 299-300.

sense. The breadth of this totality precluded the possibility of a demonstrably exhaustive disjunction, and thus determined the contingency of the proposition. These totalities, in a more restricted sense, are referred to as classes, and are composed of the objects they include. Universal disjunctions, the proposition that "Triangles are equilateral, scalene, or isosceles," for example, are not contingent. The distinction is that, in the universal proposition, there is no sense in which the totality over which the disjunction ranges is indefinite. As has already been pointed out, universal propositions refer to modes of action, not to objects. Dewey says, "In the case of universals, to 'include' means to be an integral part of an operative rule, which when applied determines what falls within the domain of operation."[515] Since the mode of operation determines the domain, there can be no subsequent exception. The universe over which the disjunction ranges can be completely surveyed, the exhaustive character of the disjunction can be guaranteed, and the proposition is, therefore, necessary.[516]

The necessary character of universal propositions depends upon their inclusion in a system.[517] The systems of relations in which general propositions acquire their characters have already been identified as systems of inference, in the case of generic propositions, and discourse, in the case of universals. In the introduction to the detailed presentation of inference and discourse, Dewey makes clear that these relations are intrinsic to propositions. There are no isolated propositions, on Dewey's view.[518] The first significant consequence of the interrelation of propositions is to the internal structure of the related propositions. In traditional logical theory, the number of terms in a

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[515] LW, 12, 306.
[516] LW, 12, 306-307.
[517] LW, 12, 307.
[518] LW, 12, 310.

proposition is significant to its function. However, tradition also regards this property as a consequence of the linguistic structure of propositions. Dewey, on the contrary, regards the structure of propositions as a consequence of their integration into their respective systems of relations. Universal propositions, on his view, are always dyadic. Universal propositions can always be understood as containing a definition and a hypothesis. The fact that universal propositions are not existentially significant implies that the relation asserted between the antecedent definition and consequent hypothesis is exhaustive.[519]

Dewey's illustration of this point is particularly significant. He uses a mathematical equation as an illustration of the dyadic quality of all universal propositions.[520] He says, "A mathematical equation of statement of a mathematical function may contain many symbols but they all fall on one side or the other of the function which is formulated."[521] On the one hand, this illustration makes clear the systemic, rather than structural, origin of propositional structure. The relationship, which in mathematical propositions is symbolized by the equal sign, determines the structure of the proposition. The number of terms under that relation are subsumed. It is also significant that a mathematical function or equation is invoked as a prototypical instance of a universal proposition. This use already suggests that mathematical propositions will posses a special status. However, until the details of Dewey's understanding of mathematical discourse are presented, however, this significance is only suggested.

Dewey begins his detailed discussion of discourse by reiterating its development in inquiry. He reiterates that problematic situations, which always have existential significance, 'suggest' meanings. This relationship is specified when he points out that,

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[519] LW, 12, 312.
[520] LW, 12, 311-312
[521] LW, 12, 312.

in some primitive cases, the suggested definition is simply accepted, and inquiry ceases. However, it is clear that these cases constitute deficient forms of inquiry. The conclusions of these inquiries, he says, are "premature and ungrounded."[522] In order to remedy this deficiency, the meanings suggested in problematic situations must be specified, and subjected to inquiry themselves. This requires their inclusion in 'constellations' of meanings. Dewey describes this inclusion, saying, "The meaning has to be developed in terms of a set of other propositions which formulate other meanings that are also members of the system to which it belongs."[523] These systems, then, constitute discourse. It is important to note the connection between the systemic connection among meanings and the conceptual developments identified in Dewey's earlier discussion of meaning, and his discussion of the development of mathematics in *The Psychology of Number*.

The first important feature of discourse Dewey identifies is that it has direction. It necessarily begins with the original problem that suggested meaning. The *terminus ad quem* of discourse is the development of some connection which will resolve the problematic situation. This orientation specifies the relation that the particular proposition has to the other members of the system. He says, "Apart from reference to the use or application to be made of the meaning, a given proposition can be related to other propositions in the system of meanings to which it belongs in an indefinite or indeterminate variety of ways."[524] Particular meanings, therefore, require a connection, albeit mediate, to existential problems.[525]

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[522] LW, 12, 312.
[523] LW, 12, 312.
[524] LW, 12, 313
[525] LW, 12, 312-313.

The fact that discourse, and by extension reasoning, has definite direction is, Dewey says, obvious. It is the application of the orientation of discourse that Dewey regards as most significant. The direction of discourse from a problem toward a solution provides the means for satisfying 'logical conditions.' The conditions Dewey claims must be met by discourse are rigor and productivity. In addition, he claims that these conditions must be met conjointly; that is, "The order must be productively rigorous and rigorously productive."[526] The requirement of rigor demands that each proposition in the series be 'equivalent' to the preceding proposition. He is explicit that propositional equivalence is not tautology. This is the sense in which rigor must be connected with production. He says, "The *conceptions* or meanings found in subsequent propositions in the order of rational discourse are identical with those of antecedent propositions in operational force not in *content* and hence lead rigorously to meanings having *another* content." The directionality of discourse allows for the satisfaction of these conditions by allowing the application of a definition to a situation that was not possible for the original.[527]

It is important to note the significance of this understanding of logical structure. Traditionally, logic was understood to be rigorous in inverse proportion to its productivity. Tautological inference, in the sense of synonymy or substitution *salva veritate*, is prototypical. In this sense, deductive inference is not productive. Ampliative inference, in which new significance is discerned, is regarded as less 'logical' than tautological inference. Dewey here explicitly breaks with this tradition. By locating discourse in the structure of inquiry, Dewey is able to stipulate a condition of rigor that

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[526] LW, 12, 313.
[527] LW, 12, 313.

does not preclude innovation. The new condition is a consequence of the reorientation of meaning, traditionally understood as reference, around possible operations. By understanding logic as a consequence of active interaction, Dewey has resolved the traditional tension. The benefit of this resolution is a strong argument in favor of Dewey's position. However, it must still be shown that this position is able to adequately explain the range of phenomena explained by the traditional view.

In the reoriented understanding of deduction, it is no longer surprising that scientific inferences are both deductive and ampliative. The success of science does not lie in the particular conclusions it draws, but in the structure of equivalence it creates. The criteria that the continuity of inquiry imposes on the development of discourse is the expansion of the domain of equivalence. The more substitutions one is able to perform, the more productive the discourse. The extension of these productive relations, restricted by the condition of rigor, is the progress of science. This expansion is identified by Dewey as an increase in freedom. He says, "When hypotheses are formed so comprehensively in scope that they are applicable to the facts of temperature, electricity, light and mechanical motion, the degree of freedom enjoyed in the institution of equivalences, and therefore in reasoning, is enormously increased."[528] The expansion of discourse, and the conjugate expansion of freedom, provide an additional orienting principle to discourse.[529]

As important as Dewey's reinterpretation of logical rigor and productivity are, he is clear that they are not actually instantiated in any given discourse. He does not assert that any discourse, including the most comprehensively scientific, satisfies the criteria

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[528] LW, 12, 315.
[529] LW, 12, 315.

completely. He says, rather, that the criteria are better understood as 'leading principles,' "…which state the *intent* of any proposition of predicative content."[530] In this sense, a system that allowed complete freedom conjoined with complete rigor constitutes an ideal against which particular systems of discourse can by compared. However, such a comparison would be difficult if the ideals could only be stated in abstraction. The solution of the difficulty is the attempt to produce such a system, in abstraction from the demands of any particular inquiry.[531] The outcome of that attempt is mathematical discourse. Dewey says,

> The deliberate attempt to satisfy the formal conditions prescribed by rigor-productivity in abstraction from material subject-matter constitutes mathematics. This statement does not mean that there is some domain marked off in advance to which mathematical propositions and reasoning apply. The meaning is the contrary: the regulated attempt to satisfy these conditions *is* mathematics.[532]

The quotation concludes the presentation of the general structure of the *Logic*. In *The Quest for Certainty*, mathematics seemed to posses a special status within the more general structure of Dewey's experimental epistemology. At this point, that special status has been made clear. Mathematics constitutes the implementation of the criteria that are used to evaluate discourse. Dewey's understanding is that mathematics is the result of a project that abandons all specific restrictions on inquiry, save those of rigor and productivity. Since these criteria are the guiding principles of inquiry, mathematics constitutes the conduct of inquiry in its most adequate form. In some sense, this description accords mathematics a position above ordinary inquiry. However, it is important to remember that, although it is used as a standard of inquiry, it is ultimately

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[530] LW, 12, 316.
[531] LW, 12, 316.
[532] LW, 12, 316.

subordinate to inquiry. As Dewey's detailed discussion of mathematics will show, if it is taken to be completely independent from inquiry, it may retain its specific character, but at the cost of total irrelevance. It is only as a tool of inquiry that mathematics is anything more than a game.

Dewey clarifies his understanding of the status of mathematical discourse as an introduction to its specific analysis. He says, "When…discourse is conducted exclusively with reference to satisfaction of its *own* logical conditions, or, as we say, for its own sake, the subject-matter is not only non-existential in immediate reference but is itself formed on the ground of freedom from existential reference of even the most indirect, delayed, and ulterior kind. It is then mathematical."[533] Dewey is clear that the freedom from existential reference is not the complete independence of mathematical discourse from inquiry. The connection developed between mathematics and the general structure of discourse, and the necessity of discourse for the generation of warranted propositions, connects the two. This connection is illustrated in the developmental process that produces genuine mathematical discourse.[534] The brief description of this development corresponds with the presentation in *The Psychology of Number*. Number arises from the exigencies of economical deployment of means. Through a process of abstraction, those original numerical ideas achieved complete independence.[535]

Although the independence of mathematics is its defining feature, it does not violate the principle of the continuity of inquiry. Dewey is clear that mathematics is formally connected to inquiry, through the category of transformation. Transformation is an essential feature of all inquiry. In existential inquiry, transformation of material

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[533] LW, 12, 393.
[534] LW, 12, 393-394.
[535] LW, 12, 393-394.

circumstances resolve problematic situations. Conceptual subjects, the subject-matter of discourse, are transformed among themselves to facilitate the resolution of material problems. Discourse, as discussed above, concerns possibility, and is, therefore, necessarily symbolic. The symbols of discourse, and the possibilities they represent, acquire a status analogous to the material of existential judgments. This transformation allows the operations performed upon symbols to be refined, in a manner analogous to the refinement of definitions in scientific discourse. This process, in turn, constitutes the content of mathematics.[536]

The independence of mathematical discourse from existential reference is important, not only as it differentiates mathematics from other discourses, but also as it is a defining feature of *a priori* knowledge. Dewey points out that further specification of this quality is necessary, given the relative independence from existential reference of discourse in general. Universal propositions maintain a certain level of independence from direct reference, but they retain some connection. In the first place, the definitions are suggested by the existential constituents of the problematic situation. In the second place, they are connected in discourse for the purpose of subsequent application. In mathematical discourse, the connection to objects is further diminished. The process of abstraction is identical with liberation. Although these processes can be described as differences of degree, Dewey is clear that the freedom acquired differentiates mathematics from discourse qualitatively.[537]

When considered coordinately, the continuity of mathematical discourse with inquiry and its independence from existential reference distinguish two sub-types.

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[536] LW, 12, 391-392.
[537] LW, 12, 393.

Universal hypothetical propositions, which express necessary relations among definitions, lack existential reference. However, they are constructed with the intent of future application. This category includes statements of physical laws, for example. These propositions are not exhaustive in specifying the range of application that they may have. A consequence of this openness is the possibility for revision. The example Dewey provides of this feature of the class is the transition from Newtonian to Einsteinian formulations of the law of gravitation. Although both constitute necessary propositions, their interpretation in application distinguishes their value.[538] The force of the example is that, although Einstein's understanding of gravity proves more generally applicable, Newton's is not, therefore, false. The transition simply specifies the implicit conditions of Newton's formulation.

The second sub-type of hypothetical universal proposition is exemplified by mathematical equations, such as "2 + 2 = 4". Hypothetical universal propositions of the first type, even when stated mathematically, have a privileged existential interpretation. Properly mathematical propositions are distinguished by lacking any such limitation. In one sense, this renders mathematical propositions meaningless. However, Dewey points out that in a wider sense, the meaning of mathematical propositions is constituted by their relations. The construction of meaning out of relations makes properly mathematical propositions unique. It generates a connection between the meaningful content of the propositions and their certification.[539] Dewey says, "This type of universal hypothetical proposition is therefore logically certifiable by formal relations, because formal relations determine also the terms or contents, the 'material,' as they cannot do in any universal

[538] LW, 12, 395.
[539] LW, 12, 395-396.

proposition having ultimate existential application..”[540] The complex connection between the content, structure, and certification of mathematical propositions provides the basis for their special status.

Mathematical propositions differ from all other propositions, including other universal hypothetical propositions, through the consequences of their unique subject matter. When the relations of meanings, which constitute discourse, are “…abstracted and symbolized, they provide a new order of material in which transformation becomes transform*ability* in the abstract.”[541] The emphasis on transformability, in the quotation, indicates the significance of possibility in the generation of mathematical propositions. The relation between mathematics and possibility has been noted several times. However, at this point, Dewey provides a more detailed discussion of the relationship between the two. To emphasize the distinct character of his conception of the relation, he draws a contrast between his conception and a conception based on a “Realm of Possibility”. The philosophical conception of this ‘Realm’ involves the postulation of an ontological domain including all possible existences. This realm, which is obviously broader than the domain of actual existences, includes the latter. Mathematics and logic are understood to identify the structure of the realm of possibility, their application to actual objects is explained through the inclusive relation of the possible to the actual.[542]

Dewey’s own understanding of the relation between possibility and mathematics is first presented through an analogy with maps. Although maps refer to existent geography, and are thus not directly analogous to mathematical propositions, the isomorphic nature of the relations between objects on the map and objects in the

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[540] LW, 12, 396.
[541] LW, 12, 396.
[542] LW, 12, 396.

geography is significant. Dewey points out that maps do not operate by establishing direct relationships to geographical objects. He offers the relationship between vertical orientation on a map and north-south orientation as an example of this character. The significant fact is that there is no direct relationship between up and north. Rather there is an isomorphism between an object that is above another on the map, and a geographical object that is north of another. The isomorphic relation, he says, is between relations, and not objects. The relationship between mathematics and possibility, understood not metaphysically but operationally, is explained through the elaboration of the map metaphor.[543]

The first important point of distinction between Dewey's understanding of the relation between mathematics and possibility and the metaphysical understanding concerns the generation of the isomorphic relationship. In the case of maps, he says, the isomorphism of the relation of map objects to geographical objects results, "…because both are *instituted by one and the same set of operations*."[544] In this sense, the relations among possible objects do not justify the relations of mathematical propositions. Rather, both sets of relations are instituted by an identical set of operations. Thus, the 'Realm of Possibility" is coeval with mathematical relations. The identity of the operations, in the case of map making, is illustrated by the activity of surveying. The geographical objects certainly stand in determinate relation to one another. However, those relations are indeterminate until the survey is made. The survey also, if only implicitly, generates a map. The supposition that the quality of a map is justified by its relation to the geography is the result of considering only finished maps, and ignoring the circumstances

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[543] LW, 12, 397-398.
[544] LW, 12, 398.

of their creation. The suggestion is that the metaphysical interpretation of the relation between mathematics and possibility is the result of a similar omission.[545] Mathematics and possibility are, in Dewey's understanding, coeval and mutually constituting.

The second significant feature of the relationship between possibility and mathematics illustrated by the map analogy is the functional nature of justification. The relationship between a map and geography is justified by subsequent activity. A good map is one which will promote successful travel. Although, again, mathematics does not provide existential material against which it may be judged, the functional relation does provide an explanation of mathematical development. The functional character of justification allows Dewey to explain the possibility of differing, and equally 'true' mathematical propositions. Maps constructed through different projective systems produce various, specific distortions in the relations they depict. For example, in Mercator projections, land masses closer to the poles will appear larger in relation to land masses closer to the equator. If a metaphysical understanding of the relationship between the map and geography is adopted, the consequence is that there can be no 'true' map. However, if the functional understanding is adopted, all the projection systems are equally true, because of the isomorphism they maintain to the geographical relations they depict.[546] For example, the Mercator projection maintains isomorphism with the relations of latitude and longitude, if not relations of scale.

The understanding of mathematics as operationally and functionally isomorphic to the set of possible transformations in discourse does not disprove the metaphysical interpretation. Dewey concedes that an ontological reference for mathematical

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[545] LW, 12, 398.
[546] LW, 12, 398-399.

propositions might be found. However, his argument is that the supposition of such a reference is not necessary to understand the logical status of mathematics. If an ontological reference, whether a 'Realm of Possibility' or some other entity, for mathematical propositions is to be established, then it must be justified on ontological grounds.[547] This final point is important for the question of the *a priori* status of mathematics. Although independence from all ontological commitment is not necessary to justify the *a priority* of mathematics, it is a significant component. The understanding of mathematics as independent of experience is clearly supported by a lack of ontological commitment. Experience, whatever the final determination of that concept may be, seems to include some ontological commitment. If mathematics can be conducted without recourse to any such commitment, its independence from experience is supported.

The discussion of the relationship between mathematics and possibility is intended, Dewey says, to indicate the way in which mathematics is an instance of the general pattern of inquiry. The abstraction necessary to allow the construction of transformative relations is itself abstracted. This process generates the isomorphic relations between mathematics and possibility. The remainder of Dewey's discussion of mathematics is an examination of the details of this relation between mathematics and inquiry. This presentation includes the account of the 'postulational method' of mathematics.[548] The first, and least significant, aspect of mathematics as an instance of inquiry is its occasion by problematic situations. Historically, mathematics was first

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[547] LW, 12, 401.
[548] LW, 12, 401.

occasioned by problems of existential material.[549] This is the development that Dewey has discussed in *The Psychology of Arithmetic*. As mathematics developed, as a discipline, it acquired its own set of problems. The state of mathematical practice, at any given historical point provides a set of problems which, when solved, alter the settled practice. Although the state of mathematical practice is itself an existential object, the problems themselves retain completely non-existential.[550]

In the discussion of the general pattern of inquiry, Dewey made clear that material and procedural means operate in conjunction. The understanding of mathematics as completely lacking any existential reference might suggest that it has no material. However, it has already been suggested that mathematics acquires an analog of material means, although of a different order. The most obvious 'entities' in mathematical inquiry are numbers. Dewey uses the equation "2 + 3 = 5," as an example. In that equation, the numbers fulfill the function of material, while the operation symbols "+" and "=" are the operation analogs. The numbers in this case are not entities in the sense of material entities, but they serve the same logical function that material does in general inquiry. They supply the data of the inquiry. The distinction between mathematical data and material data is not exhausted by their ontological status. The two are also distinguished by the manner of their determination as data.[551]

As previously discussed, qualities of existential problems are selected as data based on the specific nature of the problem. Although these qualities are selected and formulated to allow the most possible transformations, they remain influenced by their ultimate reapplication. The connection to existent objects entails that the concepts

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[549] LW, 12, 401.
[550] LW, 12, 401-402.
[551] LW, 12, 402.

generated cannot be exhaustively determined. As discussed above, such a determination requires an exhaustive disjunction of the possibilities. The indefinite extension of time and physical space make any such existential disjunction impossible.[552] Mathematical data, on the other hand, are selected by, what Dewey calls, the 'postulational method.' The postulational method of mathematics is continuous with other forms of inquiry in the sense that all scientific systems include postulates. Postulates, Dewey says, "… state *demands* to be satisfied by the derived propositions of the system."[553] In this sense, postulates are synonymous with primitive propositions. In experimental science, postulates determine the data by requiring control of concepts by experimental observation and operations capable of execution. Mathematical postulates are not similarly restricted, but governed exclusively by the requirements of transformability.[554]

Mathematical postulates are distinct from more general scientific postulates by their freedom from existential limitation. This freedom manifests itself in the relation between the postulates and the objects they define. Dewey says, "The postulates of a mathematical system, in other words, state elements and ways of operating with them in strict conjugate relation each to the other."[555] This conjugate relation entails that mathematical postulates define the elements operated upon and the operations at the same time. Dewey offers as an example of this quality, the postulate "If *a* and *b* are elements of the field *K*, then *ab* (*a* x *b*) are elements of *K*." The postulate defines the operation of multiplication, as well as the elements '*a*' and '*b*' reciprocally. Thus, any operation is an instance of multiplication so long as it maintains the stipulated relation between elements

[552] LW, 12, 402-403.
[553] LW, 12, 403.
[554] LW, 12, 403.
[555] LW, 12, 403.

and products. Further, anything whatever is an element so long as, when subjected to the operation, it maintains the stipulated relationship.[556]

The consequence of the conjugate relationship in mathematical postulates is the collapse of two distinct aspects of postulates of scientific systems. In scientific systems, definition and description are distinct. In the discussion of judgments, description identified the subject of judgments, the particular objects indicated by demonstratives. Definitions identify the predicate of judgments, the hypothetical operations that may be performed. In mathematical postulates description and definition collapse. Elements, as discussed above, are what they are defined to be, and nothing more. Operations are not hypothetical, in the same sense that scientific definitions are. Dewey says that mathematical definitions are, rather, 'resolutions,' in the sense of commitments. He says, "The resolution concerns methods of procedure to be strictly adhered to…." The conjugate relation between the operations and the elements then produce the transformations that constitute the theorems of the system.[557]

Dewey makes an important qualification in his discussion of the conjugate relation between elements and operations. He points out that the postulates of mathematical discourse are not to be confused with traditional axioms. In the sense that they are primitive propositions, the postulates are axiomatic. However, they are not axioms in the sense of self-evident truth. The distinction between axioms and postulates, in Dewey's view, is based on the lack of reference in mathematical discourse.[558] The independence of the system determines the character of the postulates, rather than the nature of the objects to which the system refers. This distinction, and the account

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[556] LW, 12, 403-404
[557] LW, 12, 404.
[558] LW, 12, 404.

supporting it, represents an important departure from the traditional understanding of the *a priori*. In most traditional accounts, and in Kant's account in particular, the *a priori* has an important connection to objects. In Kant's account, those objects are the structuring processes of the mind, but those structures have ontological status. Dewey has distinguished mathematics by an independence from any ontological reference, and this more thoroughgoing independence constitutes a significant innovation. The exact details of that innovation will be considered in the conclusion.

Although mathematics constitutes a unique instance of discourse, it is an instance nonetheless. As such, it shares the features of discourse, in general. The first of these is the systemic character of discourse. Discourse requires sets of postulates, which combine to generate significant transformations of meaning. The combinations of postulates produce several significant results. In the first place, the combination allows for the possibility of multiple systems of primitive propositions. It also allows for the possibility that the postulates of one system may be theorems in another.[559] The second important consequence involves the iterability of operations within the system. Dewey points out that, without inclusion in a system of operations, all operations are indefinitely iterable. Operations only terminate, he says, when they are, "…intercepted by an operation of an opposite direction."[560] This consequence supports an explanation of mathematical induction, which Dewey points out is difficult to justify in traditional systems.[561]

The systemic character of mathematical discourse also produces number. The fact that numbers may be defined as the result of various operations, and at the same time become the object of further operations is a necessary condition of mathematical subject-

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[559] LW, 12, 404.
[560] LW, 12, 405.
[561] LW, 12, 405.

matter. Given the completely abstract character of mathematical subject-matter, some specification is necessary to allow further operations. The integration of numbers within the system of operators allows them to be, at once, completely defined by those operations and treatable without necessary reference to them. Dewey takes the operational construction of the number "1" as an example. It is the result of the operation of multiplication, in "1 x 1," exponentiation, in "1^1," and the sum of the infinite series $1/2^n$. However, the number may be taken as the object of further operations without necessary reference to any of those operations. The ability of numbers to represent the result of an indefinite set of operations is the basis for the further operations of simplification and expansion of mathematical propositions.[562]

The final important consequence of the connection between mathematics and possibility is the coordinate concepts of equivalence and translatability. According to Dewey, the 'end-in-view' of any mathematical system is equivalence. Specifically, mathematical equivalence is expressed in equations. This expression further distinguishes mathematical inquiry from existential. In existential inquiry, the end-in-view is substitution conditioned by the resolution of the problematic situation. Mathematical propositions are only conditioned by the necessity of being taken as elements of further transformation. Equivalence is the expression of that possibility. As in the example of the number "1" above, the requirement of treating any of the operational expressions as constructions of the number is the construction of an equation, "$1^1=1$," for example.[563]

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[562] LW, 12, 406.
[563] LW, 12, 406-407.

In addition to con-systemic equivalence, mathematical propositions are also able to be translated between postulate systems. The orienting principle of transformability in mathematical discourse demands that propositions be transformable into expressions of other postulate systems. Dewey identifies the means for this transformation as another instance of isomorphism. Systems of mathematical postulates are isomorphic in the same sense that maps of different projections are isomorphic. The fact of isomorphism is only sufficient to guarantee the possibility of inter-systemic translation, however. Actual translation requires, additionally, the institution of some intermediate system of postulates. The example of this sort of translation that Dewey offers is the institution of the postulates and symbols of algebraic geometry as an intermediary between algebra and geometry. This property is, according to Dewey, a distinguishing feature of mathematical discourse.[564] He says, "It is characteristic of the abstract universality of the transformability category in defining mathematical subject-matter that the institution of any given mathematical system sooner or later sets the problem of instituting a further branch of mathematics by means of which its characteristic theorems are translatable into those of other systems – a consideration that helps to explain the indefinite fertility of mathematical developments."[565]

Dewey's affirmation of inter-systemic translation makes clear that, on his view, mathematics retains its irrevisable character. The first, and most obvious, sense in which mathematics is not subject to revision is that it does not refer to any object. Without any existential reference, it is unclear what could enter experience an subject mathematical propositions to revision. Dewey's account also explains the phenomena of apparent

[564] LW, 12, 407.
[565] LW, 12, 407.

revision in mathematics; the example of non-Euclidean geometries, for example. These alternative systems, although contrary to the Euclidean, do not compel the rejection of Euclidean geometry. There is a further sense in which mathematics is not revisable, which is a consequence of its connection to possibility. Mathematics has been explained as a statement of the unrestricted transformative possibility of discourse. There is a sense in which a possibility, once identified, cannot cease to be possible, in a formal sense. This argument will be considered in greater detail in the Conclusion.

Dewey's discussion of mathematical discourse also includes discussion of the development of significant mathematical concepts; set formation, zero, and infinity, among others. Although these discussions are extremely interesting, they are not directly relevant to the epistemic character of mathematics, in general. They are important to recognize, however, given that their presence is directly relevant to the explanatory sufficiency of Dewey's account. Among these specific discussions, there is one that does have direct bearing on the epistemic status of mathematics, the discussion of the existential application of mathematical propositions. Although the discussion has been most concerned to articulate Dewey's sense of the independence of mathematics, in order to support the claim of its *a priority*, some attention must be paid to the relation between mathematics and objects. The ability of mathematics to describe the physical universe is one of its most compelling features, if an account of the *a priority* of mathematics diminishes that capacity, it must count as a deficiency of the explanation.

Dewey describes the problem of this explanation in the quotation presented above, "…that a logical theory of mathematics must account both for that absence of *necessity* of existential reference which renders mathematical propositions capable of formal certification, and for the generalized *possibility* of such reference."[566] Dewey's first response to this requirement is to point out that the general possibility of application is a consequence of mathematics' complete independence. He points out that the development of geometry, from Euclidean to non-Euclidean, expanded the range of the applicability of geometry. Significantly, he points out that this development indicates the lack of reference to both ordinary physical existence and to Kantian forms. The importance of such developments is that they allow for transformations, in the physical world, that might not be immediately possible. Abstraction increases the range of possible operations, although actualizing those possibilities may require an expansion of physical knowledge.[567] His second point in explaining the range of mathematical application is to point out that the application is indirect. In many cases, mathematical results require physical interpretation in order to be applied. He points out that irrational numbers are not the result of any existential act of measurement. However, their institution, by purely formal operations, introduce new possibilities for ordering experimental results.[568] In this sense, the general possibility of the application of mathematical discourse is supported by its function. As a tool of experiment, it may be used in ways other than those for which it was originally intended.

In the foregoing section, I have tried to demonstrate the place that mathematical knowledge occupies within the larger system instituted by Dewey. Specifically, I have tried to demonstrate that mathematical knowledge is understood as continuous with inquiry, but possessing a unique independence. These two features, along with the results of the specific discussion, form a strong *prima facie* argument for treating this account as

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[566] LW, 12, 412.
[567] LW, 12, 412-413.
[568] LW, 12, 413-414.

an account of *a priori* knowledge. Clearly, it is a revolutionary innovation on the traditional Kantian understanding. The *a priority* is no longer based on a unique set of objects of reference. Mathematics is independent because it is an expression of conceptual freedom. It is ultimately this association, between freedom and *a priority*, that I believe makes Dewey's account of great, and unrealized, value.

Before concluding the discussion of the Logic, it is necessary to further consider the second instance of traditional *a priori* knowledge. In the Twentieth Century, formal logic, and not mathematics, was taken to be the prototype of *a priori* knowledge. The attempt to reduce mathematics to formal tautology has, in a strong sense, defined much of contemporary philosophy. Given this preeminent position, it seems important to understand how Dewey accounts for formal logic, and whether it retains its position in his reformation of logic. It is indicative of his ultimate estimation that Dewey includes formal logic, here specified as deductive, after his discussion of mathematical discourse. It is also significant that it is treated as a subsidiary of scientific method, along with induction.[569] Both of these facts suggest that the status of deduction, in the reformed system, will be substantially diminished.

Scientific method is an attempt to discern characteristics of the world that can be employed to further the resolution of problematic situations. Toward this end, generalizations have been shown to be particularly valuable. A substantial component of scientific method, then, must be involved in the generation and manipulation of generalizations. Dewey identifies two logical processes as respectively associated with these two goals. Induction is defined as the set of techniques by which generalizations are produced. Deduction is defined as the set of techniques, "…by which already

[569] LW, 12, 415.

existing generalizations are employed…."[570] In this sense, deductive techniques have already been reevaluated. Rather than occupying a principal position, deduction is subordinate to the induction.[571]

The traditional relationship between deduction and induction has its origin in the Aristotelian system. The relative values assigned to the two methods are based on metaphysical, rather than logical, arguments. As Dewey has argued previously, the basis for the elevation of deduction is its supposed connection to a special realm of invariant Being. In the present context, this reference justifies a preference from demonstrative, deductive, syllogisms.[572] However, as Dewey has argued several times, the majority of the Aristotelian system has been abandoned by modern science. In order to indicate the distinct position he takes on the status of deductive inference, Dewey makes several important points. He first points out that mathematical discourse is "… the outstanding exemplar of deductive demonstration…."[573] Further, the reduction of a mathematical demonstration to syllogistic form would add nothing to the force of the mathematical demonstration. Finally, he points out that universal propositions cannot produce existential propositions directly.[574] All of these points suggest that deductive logic, while performing an important role in the guidance of experiment, no longer posses a preeminent epistemic status.

In the final analyses, deductive relationships between concepts retain an important, if not primary, position in inquiry. Clearly, deductive relationships stand between universal propositions in the construction of discourse. However, those

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[570] LW, 12, 415.
[571] LW, 12, 415.
[572] LW, 12, 416-417.
[573] LW, 12, 417.
[574] LW, 12, 417

propositions occupy an intermediate position. On the one hand they are dependent upon existential generic propositions to provide their subject matter, and conditioned by requirement of eventual existential application. On the other hand, they do not attain the level of freedom possessed by mathematical propositions. It seems that the structure of mathematical propositions provide examples for deductive logic. Therefore, it is mathematical propositions, which are not tautological, that support the formal structures of deduction. The importance of this suggestion cannot be overstated. In Twentieth Century philosophy, arising from the rejection of the Kantian synthetic *a priori*, the tautological relations that obtain between concepts were generally accepted as prototypical. At this point in Dewey's career, it seems clear that he not only rejects that relationship, he insists on its contradiction.

IV. Conclusion

In the foregoing chapter, several important aspects of Dewey's mature epistemology that suggest a revised conception of the *a priori*. In this conclusion, I wish to draw together the main strands of my presentation, in order to highlight the significant implications for *a priori* knowledge. Although I believe that the material presented here constitutes a strong argument for the presence of the *a priori* in Dewey's system, my ultimate argument for that position will be the subject of the next chapter. Here, I simply wish to emphasize the structural implications of the later work. Those implications have both a positive and a negative moment.

In a negative sense, Dewey's later work demonstrates what his conception of the *a priori* avoids. The most obvious instance of this negative moment is the thoroughgoing distinction Dewey draws between his own position and the position of traditional philosophy. Epistemically, Dewey diverges from the tradition in his insistence on the conjoint character of thought and action, or theory and practice. In *The Quest for Certainty*, he made clear that traditional philosophy relies on contingent historical factors to justify its elevation of thought over action. As the techniques of experimental science have improved, those factors have largely disappeared. To the extent that philosophy's valorization of thought is justified, in the sense that thought is in fact more secure than action could possibly be, it is counter productive. The continued insistence that thought is superior to action because it is not subject to the same hazards impedes the development of techniques that might mitigate the very hazards that justify the distinction.

This divergence has important bearing on the status of the *a priori*. Historically speaking, *a priori* knowledge is the principal example of the superiority of thought over practice. It seems to exemplify thought's greater security, and freedom from the flux of empirical knowledge. If any concept of the *a priori* appears in Dewey's work, it cannot maintain its honorific status. The *a priori* cannot represent a retreat for the mind from the uncertainty and danger of interaction with the physical world. On the contrary, if the *a priori* is to be maintained it must demonstrate some essential function in the construction or deployment of solutions to real problems. It need not be solely concerned with immediate practical problems. Dewey's pragmatism is not so stringent. However, it cannot defer its responsibility to meliorate practical circumstances indefinitely.

Dewey also abandons the metaphysical or ontological suppositions of traditional philosophy. His description of the 'Spectator Theory' supposes a strong commitment to a metaphysics which divides the objects of perception and action from the agent. Objects, as he argues in the Logic, lose their complete and atomic quality. They are transformed into data, which are only distinguished by the exigencies of the activity of inquiry. As data, their possibilities become more significant determinants than their qualities. In fact, their qualities are reconceived as consequences of those possibilities. The revision of the traditional understanding of both objects and their qualities seems to leave no domain from which *a priori* knowledge might be drawn. The universe which is the subject of inquiry is thoroughly provisional and transitory.

Any revised conception of the *a priori*, then, will have to provide different metaphysical credentials. The lack of ontological reference means that any conception of the *a priori* in Dewey will be thoroughly epistemological. On the one hand, the *a priori* status of knowledge cannot be attributed to the special ontological status of any domain; no such special domain is acknowledged. On the other hand, the *a priori* status of propositions cannot be taken to directly imply the existence of any such special domain. The revised *a priori* will be exclusively associated with propositions. In some sense, this negative requirement inverts the honorific status the *a priori* was accorded by tradition. The revised *a priori* may still have a special status, but it will never provide direct knowledge of real objects. To the extent that it applies to entities at all, it will apply to all of them indifferently.

In addition to these negative aspects of Dewey's mature thought, he also provides some positive specification of the nature of the *a priori*. The first, and I believe the most, significant positive determination of the *a priori* is its association with possibility. Traditionally, the special epistemic and metaphysical status connected the *a priori* most strongly with necessity. In Dewey's account, this relationship is reversed. *A priori* knowledge, in the examples of mathematics and deduction, is associated with the specification and articulation of the possibilities presented by any object of inquiry. Mathematics is distinguished by a complete dependence on possibility; as Dewey has presented it as an articulation of possibility, as such. I believe that this reconfiguration of the relation between the alethic modalities is a significant result of Dewey's reformation of the *a priori*. This topic will be a central focus of my conclusion.

The second positive specification of *a priori* knowledge in Dewey's mature system is its integration into the structures of meaning and intelligence. Experimental action, as a particular method of addressing problematic situations, requires both the construction and utilization of a system of connections among objects. In the most primitive sense, this system of relations is exemplified in the causal connections that exist between certain entities, as means, and others, as ends. To the extent that a given problem would be resolved by the production of the terminal object, that situation can be resolved by the expenditure of means. These relations are, in their first instances, haphazard and poorly understood. Experiment introduces an element of explicit control. The means are, in an experimental context, expended *because* they are means to a *particular* end. In order to direct actions in this way, Dewey argues that some antecedent understanding of the possibilities inherent in a situation must be obtained. Further, these antecedent connections are valuable according to their extension. The more consequences that can be anticipated, the more can be explicitly controlled. These structures of possible consequences produce meaning. On Dewey's view, an object means what it can do.

If the entirety of inquiry were reliant upon the actual objects presented in the problematic situation, it would be impossible to progress from the empirical to the experimental. That is, it would be impossible to anticipate the consequences of action, to 'act without acting.' In order to introduce the element of intelligence that distinguishes the experimental from the empirical, a certain independence from experience is necessary. This independence is provided by the abstraction of symbols. Abstraction, and the symbols it produces, allow actions to be taken without any existential consequences. They retain the active character of all inquiry, but they preclude all risk. Thus, they allow the establishment of connections of meaning beyond what resources or prudence would allow. It is these independent structures, so vital for the development of genuinely intelligent activity, that I believe are the pragmatic analogues of traditional *a priori* knowledge.

Conclusion

If a viable conception of the *a priori* is to be found in Dewey's work, two criteria must be met. First, there must be a significant connection to the traditional conception of the *a priori*. Second, there must be some development of the Kantian position that avoids its most obvious problems. Specifically, Dewey's conception of the *a priori* must avoid the dualism that he finds so objectionable in Kant. The *a priori* must be understood as a development from experience, that nonetheless achieves a level of independence. In this way, Dewey's conception would resolve the tension in Kant's epistemic position between finding the origin of all knowledge in experience, and maintaining that some knowledge is independent of that experience.

The connections between Kant and Dewey can be discerned in the analyses of Kant's work by Friedman and Shabel. Friedman's analysis of Kant's philosophy of mathematics identifies the generality of algebra and arithmetic as fundamentally connected to their active character. He also makes the connection between the regulative content of the *a priori* and its synthetic character. Such a connection suggests that Dewey's pursuit of a conception of the *a priori* that is fundamentally regulative will avoid the problems encountered by the reduction of the categories "analytic" and "*a priori*." Shabel extends this connection, making the connection between the synthetic and regulative aspects of *a priori* knowledge more clear.

Although there are connections between Kant's view and Dewey's, there are also strong distinctions. The differences are first indicated through the dispute between Parsons and Hinitkka. Parsons' reading of Kant seems faithful to the Kantian text, but exposes difficulties inherent in Kant's position. Hinitkka, on the other hand, presents a more compelling position, but in some cases must stretch the Kantian text. The interpretation he pursues pushes the Kantian position in a pragmatist direction. Dewey develops the position articulated by Hinitkka, but unrestricted by any commitment to Kant's other doctrines.

If Dewey's epistemology can accommodate a recognizable version of the *a priori*, its value depends upon its ability to avoid the difficulties of the traditional conception. The fundamental innovation of Dewey's position is his connection of *a priority* with possibility. The traditional conception of the *a priori* relies on the necessity of *a priori* knowledge. For Kant, it is the necessity of *a priori* knowledge that supports its universality. Dewey abandons that view, and its implied transcendental perspective, in favor of an *a priori* grounded in possibility. This reorientation allows Dewey to provide an account of *a priori* knowledge that is based in experience, but acquires its independence. The introduction of such knowledge allows Dewey to develop an epistemology that is both thoroughly humanist and objective.

Dewey's epistemology also includes reinterpretation of the nature of experience, and the process of acquiring knowledge. His understanding of experience as fundamentally continuous, and his view that all knowledge is acquired through experiment, make possible his reinterpretation of the *a priori*. The combination of these positions allows Dewey's epistemology to account for the development of knowledge, without conceding to the strongest versions of subjectivism or relativism. Ultimately, it is this combination of features that makes Dewey's epistemology particularly promising. It is also this combination of features that allows Dewey's late epistemology to be read as the achievement of his early interests. The mature position provides a non-subjective basis for epistemology, without compromising his criticisms of traditional philosophy.

I. Beginning from Kant

If the argument that Dewey's epistemology provides a promising development of the *a priori* is to succeed, the relationship between his position and the Kantian position must be made clear. There seem to be sufficient connections between Dewey's work and Kant's to support the use of Kantian terminology to describe Dewey's work. However, there also seem to be sufficient distinctions to support the conclusion that, while Dewey may be pursuing aspects of the Kantian project, he rejects substantial portions of it. The latter conclusion is particularly important, given Dewey's explicit criticisms of Kant. However, the contrasts exposed by the limitations of the Kantian project provide insight into the substance of Dewey's innovation.

Dewey's strongest criticism of the Kantian *a priori* is the argument that Kant's *a priori* includes two inconsistent aspects, constitutive and regulative. He rejects the former as a relic, but validates the latter as, "…a definite contribution to the logic of science."[575] Although Dewey's analysis is plausible, it seems insufficient as a comment on Kant. It is possible, however, to discern the source of Dewey's concern in Kant scholarship. In particular, the debate between Hinitkka and Parsons concerning the relation between intuition and *a priori* knowledge seems to capture an important element of Dewey's criticism.

Parson's view of Kantian intuitions connects them closely with sensation. He understands intuitions as a consequence of an object's effect on the mind, generally

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[575] MW, 3, 134.

through sensation.[576] Based on this sensory interpretation of intuition, mathematics is a statement of the possibilities of sensory experience. According to Parsons, the connection between sensations, intuition, and mathematics result in a critical problem for Kant's philosophy of mathematics. Mathematics, even relatively simple mathematics, requires reference to quantities that seem to exceed the limits of even possible sensory experience. Such features cannot be explained in Kant's system, as Parsons interprets it.[577]

Parsons' interpretation of Kant's position makes clear that, to the extent that intuitions are connected to sensation, determining the character of possible experience, the position is fatally flawed. It is this connection that seems to capture Dewey's criticism of the constitutive moment of the *a priori*. The connection between intuition and sensation is a necessary element in Kant's response to Hume. In his analysis of the Kantian *a priori*, Dewey is clear that Kant must identify an external source for *a priori* knowledge to effectively respond to Hume's skepticism. However, the concepts arising from the *a priori*, as immanent, "… fall, like the rain, upon the just and the unjust; upon error, opinion, and hallucination."[578] It is this conception of the *a priori* that Dewey emphatically rejects.

By rejecting the constitutive conception of the *a priori*, Dewey is not bound to understand the relationship between possible experience and sensation in the way that Parsons does. In *Logic: The Theory of Inquiry*, Dewey articulates a connection between formal knowledge and possible experience that is not subject to the difficulties discerned by Parsons. By reconceiving the nature of experience and possibility, Dewey is able to

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[576] Parsons, "Kant's Philosophy of Arithmetic," 114.
[577] Parsons, "Infinity and Kant's Conception of the 'Possibility of Experience,'" 96.
[578] MW, 3, 133.

articulate a view of formal knowledge that is based on possible experience, but not restricted to the possibilities of merely sensory experience.

While Parsons' interpretation of Kant exposes the differences between Kant's position and Dewey's, Hintikka's exposes some of the connections. In the first place, Hintikka's emphasis on Kant as a proponent of "maker's knowledge" seems broadly consistent with Dewey's view that the content of experience is the result of an interaction between the subject and her environment. Further, Hintikka argues that the connection between intuition and sensation, which he concedes Parsons correctly finds in Kant, is not an integral part of Kant's system. The latter position is the more illustrative. However, to the extent that Hinitkka's view is consistent with Dewey's, it requires a very liberal reading of the Kantian texts.

Hintikka's interpretation of intuition differs from Parsons' in a single respect. Where Parsons understands intuitions to be representations that are both immediate and singular, Hintikka understands them to be merely singular. Hinitkka allows that there is a connection between intuition and sensation in Kant, but he argues that there is a second "unintuitive" sense of intuition. Intuition must include a non-sensory element, given that it can be understood as logically prior to the arguments of the Transcendental Aesthetic.[579] He also argues that his understanding of intuition as singular representation is supported by the central position of Euclidean geometry in Kant's philosophy. He discerns a connection between the features of Euclidean construction and singular intuition which supports the synthetic character of mathematical demonstrations.[580]

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[579] Hintikka, "Kant on the Mathematical Method," 164-165.
[580] Hintikka, "Kant on the Mathematical Method," 168-170.

Hintikka's interpretation of intuition as singular representation provides a means to connect his view of Kant with Dewey. Dewey's view of experience, as fundamentally continuous, might provide the basis for such intuition. Hinitkka is explicit in his concession that Kant accepted, at least to some extent, Aristotle's passive understanding of sensation.[581] He takes the position that such acceptance is ultimately inconsistent with Kant's more general commitment to 'maker's knowledge.' Dewey's position can be seen as a resolution of the inconsistency discerned by Hinitkka. Dewey, unencumbered by Kant's suppositions concerning sensation, provides an epistemic position that vindicates the commitment to 'maker's knowledge.'

The connections between Kant's philosophy of mathematics and Dewey's epistemology are most clearly exposed in the work of Friedman and Shabel. Both scholars focus on the active and synthetic aspects of the Kantian *a priori*, and expose the connections between these specific features and mathematical knowledge. Both seem to provide a detailed account of what Dewey refers to as the 'regulative' sense of the Kantian *a priori*. In this sense, they provide an analysis of those aspects of the Kantian program Dewey regards as valuable.

Friedman's analysis provides an explanation of the role of intuition that seems to avoid the problems exposed by the debate between Hintikka and Parsons, and supports Dewey's analysis that the Kantian *a priori* includes both constitutive and regulative moments. Friedman identifies the act of measurement with the intuitive content of algebra and arithmetic.[582] However, it is through the schema of the particular

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[581] Hintikka, "Kant's 'New Method of Thought' and his Theory of Mathematics," 131-132.
[582] Friedman, *Kant and the Exact Sciences*, 101-110.

constructions that mathematics acquires it's distinct synthetic *a priori* character.[583] Friedman's analysis of Kant emphasizes the connection between intuition and construction, and the importance of that connection for the distinct character of mathematical knowledge. These connections all foreshadow the structures of Dewey's position. The development of mathematical knowledge out of the structure of inquiry, specifically its origin in transformability, is similar to the connections described by Friedman. However, it is in Shabel's work that the connection between Kantian schemata and the regulative sense of the Kantian *a priori* is made most clearly.

Shabel complicates the debate concerning the nature of intuition by introducing a distinction between 'pure' and 'empirical' intuition. Pure intuition is closely associated with mathematical construction. Empirical intuition is associated with *a posteriori* sensation. Pure intuition, in her view takes the act of construction as its object; including both the constructed object and the consciousness of the act. Pure intuitions are further distinguished by the fact that they reveal that the constructive activity is rule governed, and that this regulation produces general knowledge.[584] The constructive activity supports the synthetic aspect of mathematical demonstrations, and the purity of the intuitions supports their *a priority*. Ultimately, the *a priority* of pure intuitions depends on the necessary connection between the rule and the features of the demonstration.[585] Finally, she explains the universality of mathematical knowledge by the fact that the constructed figure, "…has the capacity to represent 'triangle' universally insofar as its

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[583] Friedman, *Kant and the Exact Sciences*, 126-127.
[584] Shabel, *Mathematics in Kant's Critical Philosophy*, 94-95.
[585] Shabel, *Mathematics in Kant's Critical Philosophy*, 105.

central feature is its accord with the rule of construction specified by the schema for the concept triangle."[586]

Shabel's interpretation provides a strong reading of the regulative moment of the Kantian *a priori*. The synthetic *a priori* character of mathematics is a consequence of the conscious recognition of the regulation involved in mathematical construction. To the extent that her position exposes that connection, it demonstrates the connection between Kant's position and Dewey's. Additionally, her discussion of the abstraction involved in the transition from the geometrical consideration of magnitudes ('*quanta*') and mere magnitude ('*quantitas*') connects Kant's position with Dewey's account of the development of mathematics.

Although Shabel's and Friedman's interpretations of Kant demonstrate that there are close connections between his philosophy of mathematics, and the position Dewey ultimately defends, they do not resolve the fundamental tension in Kant's epistemology. To the extent that Kant's larger epistemic project depends upon the constitutive function of the *a priori*, there is a necessary tension between his philosophy of mathematics and his epistemology as a whole. By constructing a new epistemological position, Dewey is better able to accommodate Kant's philosophy of mathematics than Kant.

II. The importance of possibility

The most revolutionary aspect of Dewey's understanding of the *a priori* is his reorientation of the relationship between *a priori* knowledge and the categories of necessity and possibility. In Kant's view, necessity was a definitive feature of the *a priori*. In the Introduction to the B-Edition of the *Critique of Pure Reason*, Kant explicitly connects *a priori* knowledge with necessity. He says, "…if a proposition is

[586] Shabel, *Mathematics in Kant's Critical Philosophy*, 113.

thought along with its **necessity**, it is an *a priori* judgment; if it is, moreover, also not derived from any proposition except one that in turn is valid as a necessary proposition, then it is absolutely *a priori*."[587] In a general sense, a connection between knowledge independent of experience and necessity is natural. Only propositions and judgments not susceptible to falsity could be known without reference to experience. From this connection, and the development of formal logic, it is natural to associate *a priori* knowledge with tautology. This connection, in turn, seems to be the basis for the development of the view of *a priori* knowledge in the Twentieth Century.

The natural association between necessity, tautology, and the *a priori* is challenged in the coordinate failure of the Hilbert Program and Logicism. The failure of those programs shows that this connection is insufficient to explain the most obvious candidate for *a priority*, mathematics. Dewey's view of the *a priori* is revolutionary because it avoids the original association, and thus suggests that the limitations of the traditional position might be avoided. However, before any such potential could be realized, Dewey's position would have to be developed further. As Dewey recognizes in his Preface to *Logic: The Theory of Inquiry*, "…the presentation does not have and could not have the finish and completeness that are theoretically possible."[588]

If Dewey's mature position is taken to be suggestive, rather than definitive, it seems important to consider how that development might proceed. One development of Dewey's position that seems promising is the development of a grounding, if not a traditional foundation, of formal knowledge. The traditional Analytic method of commencing epistemology with tautology, can be abandoned. In Dewey's view, there

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[587] Kant, *The Critique of Pure Reason*, 137.
[588] LW, 12, 5.

are more primitive propositions than the tautologies. The historical development of knowledge always begins with the interaction between a subject and her environment. In this sense, Dewey's view is accords with Kant's statement that, "...all cognition begins with experience…."[589] However, when the products of inquiry are themselves subject to inquiry, an intentional structure can be discerned. The goal of inquiry, in the most general sense, is the creation of a system that achieves complete freedom while maintaining complete rigor. The evaluation of partially realized inquiries requires the elaboration of the full realization of the goal. The elaboration of a system which combines complete freedom and complete rigor is mathematics.[590]

Dewey understands mathematics as an expression of possible transformations, which is meaningful through its isomorphic relation with the range of possible transformations. In that sense, mathematical propositions are statements of possibility. They are not statements that some particular state of affairs is possible, but their content is connected to such statements. It seems that this connection could be investigated to provide a more complete account of the traditional features of *a priori* knowledge. Although a full investigation is impossible here, some preliminary statements can be made.

If Dewey's understanding of mathematics is accepted, and possibility replaces necessity as the characteristic modality of *a priori* knowledge, the apparent necessity of mathematical and logical propositions requires explanation. If mathematical propositions are rooted in possibility, why has the view that they are necessary been accepted throughout the history of philosophy? The answer to this question, it seems, might be

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[589] Kant, *The Critique of Pure Reason*, 136.
[590] LW, 12, 316.

provided by noting that mathematical propositions are, in some sense, statements about possibility. If this content can be developed, it may be possible to provide a straightforward account of their apparent necessity.

In traditional modal logic, it is relatively simple to demonstrate that any proposition about possibility is necessarily possible. John Nolt provides an example of such a proof in his textbook on formal logic.[591] The potential connection is most clearly illustrated in the context of Leibnizian modal semantics. Leibnizian semantics understands the modal operators, necessity and possibility, as reference to a set of "worlds" in which the atomic propositions are either true or false. A proposition, *P*, is necessary when it is true on every "world" defined in the model. It is possible when it is true on at least one world. Given these definitions of the operators, the inference from a proposition's possibility to the necessity of its possibility is valid.

Given the formal rules articulated by Nolt, it is possible to construct a formal proof of the validity of the inference from the modal proposition, "*P* is possible," to "It is necessary that *P* is possible." In the present context, an informal description of that proof should suffice. The statement that "*P* is possible," means that there is some world, *w*, described in the semantic model on which *P* is true. Since all worlds in the model have access to each other, on all worlds in the model there is some world, namely *w*, on which *P* is true. Thus, on all worlds in the model, the modal proposition "*P* is possible" is true. Therefore, the modal proposition, "It is necessary that *P* is possible," is true.

The proof described above may be taken to show that any true proposition concerning possibility implies a true necessary proposition. This connection might be exploited by a defender of Dewey's view of the *a priori* to explain the apparent necessity

[591] John Nolt, *Logics* (Belmont, CA: Wadsoworth Publishing Co., 1997), 332.

of mathematical propositions. If mathematics ultimately involves statements concerning possible transformations, but the modal of those propositions is not manifest, it would be the case that they would appear necessary. The claim that mathematical propositions do not have the same relation to their semantic content as explicitly modal propositions is supported by Dewey's view that do not refer to possibility, but are isomorphic with it. One difficulty that would have to be solved before any account of necessity like the one sketched could be vindicated is whether the isomorphic relationship between the propositional structure of mathematics and possibility was sufficiently similar to the relationship between the modal operator and proposition to allow an analogue of the proof.

In addition to an explanation of the nature of the isomorphic relationship between mathematics and possibility, there is a second potential difficulty in using the argument sketched to explain the necessity of mathematical propositions. Although the inference from "*P* is possible," to "It is necessary that *P* is possible," is valid on a Leibnizian semantic model, it is not valid on the more complex Kripkean model. The Kripkean model, as articulated by Nolt, introduces the additional complexity of accessibility relations among the worlds in the semantic model. The inference from "*P* is possible," to "It is necessary that *P* is possible," is invalid on a Kripkean model because there may be worlds in the model which cannot "access" the worlds on which "*P* is possible" is true.[592]

[592] Although Nolt does not present such a proof the a sketch is relatively straightforward. Suppose the semantic model contains four worlds, w_1, w_2, and w_3, and w_1 has access to w_2, and w_3 but they do not have access to each other. Proposition *P* is true only on w_3. Therefore the proposition "*P* is possible" is true on w_1. However, the proposition "P is possible" will not be true on w_2. Therefore, there will be a world, accessible to w_1, namely w_2, on which the proposition, "*P* is possible" is not true." Therefore, the proposition "It is necessary that *P* is possible," will not be true on w_1.

Although the more complex Kripkean view of modality must be considered in any full vindication of the account suggested, its outcome may not be dispositive. As Nolt points out, "There is among modal logicians a modest consensus that Leibnizian semantics accurately characterizes logical possibility, in both its formal and informal varieties."[593] The Kripkean complexities are introduced to model the more complicated semantics involved in more limited modality; physical or metaphysical possibility and necessity, for example. If Dewey's view of mathematics is accepted, and mathematical propositions are isomorphic to possibility in its broadest sense, then Leibnizian semantics may be the preferred description of their modal relations.

The connection between possibility and the *a priori* also suggests a potential account of innovation in *a priori* domains. One of the most pervasive criticisms of Kant is that he proved that Euclidean geometry was a necessary feature of experience, at the same time that mathematicians were developing alternative systems of geometry. Although there are several possible responses to such criticisms, a conception of the *a priori* based on possibility is easily able to explain the phenomenon. The difficulty posed by alternative mathematical systems, like the multiple systems of geometry, is that if any one of those systems is understood as expressing necessary propositions, the alternatives create antinomies. However, if the statements of a mathematical system can be understood as expressing claims about possibility, then the alternatives pose no consistency problem. It also becomes possible to understand how the alternatives can each acquire apparent necessity. The argument sketched above suggests that such apparent necessity can be understood as a consequence of the propositions inherent possibility.

[593] Nolt, *Logics*, 334.

Although Dewey's understanding of the *a priori* as connected to possibility, rather than necessity, might allow the arguments sketched above, such arguments would require additional explanation of the connection. Dewey is clear that the relation between the *a priori* and possibility is not an application of a modal operator to propositional content. The isomorphic connection between mathematics, as prototypically *a priori*, and possibility is more complicated. In order to fully realize the potential of Dewey's reorientation, the nature of the isomorphic relationship must be explored. If the relationship is sufficiently similar to the relationship between the modal operator and propositional content supposed in modern modal logic, the arguments sketched seem to offer possible solutions to several difficulties discerned in the traditional conception of the *a priori*. Unfortunately, such exploration is beyond the scope of this project.

III. Experience and Meaning

In addition to the connection between possibility and the *a priori*, Dewey's view introduces several other important innovations. Among these innovations, the most significant are his reinterpretation of the nature of experience and the connection between meaning and the *a priori*. In order to recognize *a priori* knowledge as independent of experience, it is important to consider the nature of that experience.

In his criticism of Kant, Dewey emphatically rejects the notion of the *a priori* as a constituent of experience. He states that a regulative notion of the *a priori* is an important part of a reformed empiricism.[594] Experience, as Dewey understands it, is not made possible by the imposition of *a priori* structure on sensory material, nor is the *a priori* a substrate of all experience. The *a priori* arises in the course of experience, but acquires its independence through meaning's projection into the future. In this sense, the

[594] MW, 3, 133-134.

a priori is not constitutive of experience, in the way that it is for Kant, but it is constitutive of meaningful experience. It makes it possible to escape the limitations of the purely empirical, and, in so doing, creates a new order of experience, which is associated in Dewey's later works with intelligence and experiment.

Dewey's conception of experience begins with his rejection of subjectivism. He is committed to the view that experience must be considered through the subject, but not exhausted by subjective experience. In his early work, this commitment is expressed through the concept of universal consciousness. However, he abandons that language in favor of an enlarged conception of experience itself. As early as the Psychology, Dewey recognizes that sensations are inherently meaningful. Sensations become meaningful through their connection, which is supported by the continuity of experience. These two moments of the analysis combine to constitute the full understanding of experience.

In "The Reflex-Arc Concept in Psychology," Dewey argues for a conception of experience as fundamentally connected. The distinctions among sensory experiences into stimuli and responses is *ex post facto*. The distinctions arise because the of the uncertain character of some sensations. In thoroughly habitual actions, like walking, there is no distinction between the stimuli and responses. A habitual walker does not consciously alter her muscular response to an increased incline, for example. There is simply a continuous experience of walking.[595] The commitment to a conception of experience as continuous is emphasized in Dewey's favorable analysis of Leibniz. In his work on *New Essays Concerning Human Understanding*, Dewey identifies Leibniz's characterization of the universe as an "organic unity" among his most valuable contributions.[596]

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[595] EW, 5, 105-107.
[596] EW, 1, 415-417.

As he develops his epistemological position, Dewey identifies the individual components of experience, the "states of consciousness," as consequences of psychological analysis. His analogy between these "states of consciousness" and prehistoric footprints identified by paleontologists emphasizes the connection between his conception of experience and the development of significance. The description of the development of knowledge in "The Experimental Theory of Knowledge," begins from the undifferentiated series of sensations that was identified in "The Reflex-Arc Concept." The culmination of this development, fully cognitional experience, is identified with knowledge.[597] The distinguishing character of such experience is that it, "…something which *means* to mean something…"[598] The connections which support the cognitional experiences are abstracted from prior sequences of expectation-fulfillments.

To the extent that the relations constituting cognitional experience are derived from past sequences of sensation, they are *a posteriori*. However, Dewey makes clear that these significant relationships are present in all experience, though they may not be explicitly recognized. In "The Control of Ideas by Facts," ideas are revealed to be practical plans of action, which are evaluated by the extent to which they produce desired outcomes.[599] In this sense all experience includes an element of projective significance. The regulation of the connections governing that projection are associated with *a priori* knowledge. However, this development makes clear that even such connections are not fully *a priori*. They are not fully independent of experience.

In *The Quest for Certainty*, Dewey identifies the instability of the physical world as a definitive feature of human experience. The fear of the consequences of instability,

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[597] MW, 3, 107-113.
[598] MW, 3, 113.
[599] MW, 4, 83-85.

and the attempt to escape it, provide a structure with which Dewey is able to explain a substantial portion of the history of epistemology. He rejects the "spectator theory" of knowledge which is the result of this history, and argues that it should be replaced by an epistemology which takes experimental science as its paradigm. In order to achieve this replacement merely empirical knowledge must be replaced by experimental knowledge.

The distinction between the empirical and the experimental experience is a function of the degree of control exercised in each. Merely empirical experience involves meaning which derives from merely accidental expectation-fulfillments. Although this type of experience supports knowledge through the process explained in "The Experimental Theory of Knowledge," it is now recognized as more limited than the knowledge derived from experiment. Experimental experience, as explained in *The Quest for Certainty*, requires a higher degree of projective control. Knowledge derived from such experience will be inherently limited if the expectation-fulfillments must actually occur. In order to fully achieve the promise of experimental knowledge, the practical limitations of action must be escaped. He says.

> …unless we can have ends-in-view without experiencing them in concrete fact, no regulation of action is possible. The question might be put thus: How can we act without acting, without doing something?[600]

In order to "act without acting," the possibilities of experience must be identified prior to their "concrete fact." The means for identifying and articulating those possibilities is symbolic thought, especially mathematics. In *The Psychology of Number*, the development of mathematical knowledge is connected with means-ends relationships. The limitations inherent in human experience, specifically the experience that some ends require more means than are available, motivates a focus on the quantitative aspect of the

[600] LW, 4, 120.

means ends relationship.[601] The definition of "quantity" presented makes the relationship between numerical ideas and means-ends relationships clear. Dewey says, "Quantity means the *valuation* of a thing with reference to some end; what is its *worth*, *its effectiveness*, compared with *other possible means*."[602] The connection between this definition of "quantity," the projective character of meaning, and the need to "act without acting," establishes the structure of Dewey's epistemological innovation.

The introduction of symbolic thought, and the possibility of action without acting, is that greater control may be exercised in the development of meaning. The consequences of the development are expressed in Dewey's comparison of ancient science to modern science. Ancient science, especially as practiced by the Greeks, took objects as static and heterogeneous. The 'revolution' of modern science involved the elevation of the status mathematics within empirical science. By expressing experimental results mathematically, Renaissance scientists were able to reduce the heterogeneity among objects. The epistemic consequence of homogenization of the objects of science is the expansion of significance. New connections between objects of experience become possible. The expansion of significance, in turn, supports the practical possibility of increased control over those objects.[603]

Although Dewey takes an ecumenical view of knowledge, he is not egalitarian. He says, "…the value of any cognitive conclusion depends upon the *method* by which it is reached, so that the perfecting of method, the perfecting of intelligence, is the thing of supreme value."[604] Intelligence, he later states, concerns the relationship of means to

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601 McLellan, *The Psychology of Number*, 35-36.
602 McLellan, *The Psychology of Number*, 41.
603 LW, 4, 71-81.
604 LW, 4, 160.

ends. Knowledge, then, is valuable to the extent to which it allows the effective allocation of means to ends.[605] *The Psychology of Number* established the connection between mathematics and this relationship. Thus, mathematics can be seen as a condition of the possibility of intelligence.

The process of 'perfecting' the method of inquiry is associated with abstraction. Dewey offers the physical sciences as an example of the process of perfection. He notes that the physical sciences are able to increase the degree of control they exercise over their objects by limiting the problems they attempt to address. Through limited focus and the interconnections among objects discernible through symbolization, the physical sciences are able to increase the range of controllable circumstances.[606] In this sense, they achieve the outcome that was originally desired by the attempt to establish certainty through escape from the world of activity.

The connection between mathematics, meaning, and intelligence supports the conclusion that mathematical knowledge, while it does not achieve the fully universal character of traditional *a priori* knowledge, achieves a level of generality that achieves the goal of escaping subjectivity. Kant established that *a priori* knowledge was defined by the qualities of universality and necessity. Necessity has been replaced in Dewey's system by possibility, universality is similarly replaced by the generality. The outcome of the process of abstraction which supports intelligence is knowledge that does not depend on any particular individual's experience. Dewey says,

> In arriving at statements which hold for all possible experiencers and observers under all possible varying individual circumstances we arrive at that which is most remote from any one concrete experience. In this sense, the abstractions of mathematics and

[605] LW, 4, 170.
[606] LW, 4, 173.

> physics represent the common denominators of all things experienceable.[607]

These domains of knowledge, then, vindicate the rejection of subjectivism that characterized Dewey's early writings.

IV. Conclusion

The question of whether Dewey accepts *a priori* knowledge is, in the end, merely semantic. To the extent that Dewey articulates an epistemological position that accommodates knowledge that does not depend on experience, he does accept *a priori* knowledge. However, his presentation of the character of that knowledge is substantially different from the traditional position. Defenders of the tradition would almost certainly not accept Dewey's *a priori* as genuine. However, it may represent the strongest hope for the vindication of the values that motivated the development of the traditional *a priori*.

I would suggest that the function of the *a priori* in traditional philosophy is to provide a bulwark against the strongest versions of skepticism and to provide an explanation of the common, fundamentally human, aspects of knowledge. The danger inherent in such functions is the excesses of transcendental philosophy. The rejection of skepticism becomes an invitation to dogmatism, and the search for common ground becomes a process of exclusion. Dewey's view seems to serve the functions of the traditional *a priori* without succumbing to its dangers. Whether it is ultimately successful or not, the possibility that it offers warrants its continued examination and development.

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[607] LW, 4, 174.

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