First Philosophical Publications


ii/Purpose of Whitehead’s Pre-speculative Epistemology, 1915-17; preliminaries to Volume IV of *Principia Mathematica*. Progress of the work on Geometry between 1905 and 1914.


iv/Whitehead’s analyses of scientific ideas. Method of solving fundamental question of scientific philosophy.
In his “Autobiographical Notes” Whitehead writes: “My philosophic writings started in London, at the latter end of the war. The London Aristotelian Society was a pleasant centre of discussion, and close friendships were formed.” Actually Whitehead had already delivered two philosophical papers to the British Association for the Advancement of Science and re-read them to the Aristotelian Society, published these papers along with his educational essays in *The Organisation of Thought*, and was well under way with *An Enquiry Concerning the Principles of Natural Knowledge* by the end of the First World War. If Whitehead himself considered his Enquiry, published in 1919, to mark the onset of his philosophical career he might have had in mind the cumulation of his views during the war years. But in the period 1915–17 one finds a quite distinct period in which Whitehead’s philosophical ideas began to take shape.

The London Aristotelian Society for the Systematic Study of Philosophy was founded in 1880 with the ideal of “studying philosophy not as an academic subject, but as the story of the development of human thinking.” Although the forum of discussion was centered in London, the Society also merged once a year with the Mind Association and the British Psychological Society for the Joint Session at some specified location in the United Kingdom.

When Whitehead joined the Aristotelian Society in 1915, Russell and G. E. Moore had already been active members since 1896. Other prominent members during Whitehead’s time included T. P. Nunn, C. Lloyd Morgan, H. Wildon Carr, C. D. Broad, D’Arcy Thompson, Lord Haldane, Norman Kemp Smith, and Samuel Alexander. The Synoptic Index to the Minutes of the Proceedings* from 1915 to 1924 shows Whitehead as a frequent participant, and holding the chair on numerous occasions. Although Whitehead was still a professional mathematician, judging from the variety of philosophical topics listed

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*The actual minutes of the Society from this time did not survive the German bombings of London during the Second World War.
in the Index, the Aristotelian Society would have been appealing to Whitehead the Apostle. During this time Whitehead read seven papers on the philosophical presuppositions of natural science. These papers, along with later papers on science and metaphysics, were republished as *The Interpretation of Science* on the occasion of the hundredth anniversary of Whitehead’s birth.2

Some of the younger members of the Society remember Whitehead’s response to their papers as gentle and encouraging. He always spoke warmly of their efforts, but with the same gentle enthusiasm rebuked what he thought was in error. When Whitehead read a paper I suppose he expected the same courteous treatment, but different philosophic temperaments are bound to clash.

In one quite famous and somewhat amusing incident in a Joint Session, held in Manchester in 1922, Whitehead was the attempted target of one of Moore’s rages. Whitehead was reading a paper entitled “The Philosophical Aspect of the Principle of Relativity.” In the discussion which ensued, Moore became furious at what he took to be an evasion in Whitehead’s answer to the old question of what is bent when the stick in water looks bent. Moore advanced excitedly from his seat to the front of the speaker’s desk and shook his fists practically in Whitehead’s face. But Whitehead simply repeated his answer “the pattern of the molecules,”* and, unperturbed by Moore’s raving, continued with his account.3 Finally, with a gesture of despair, Moore stood with his head in his hands and retreated to his seat.

Although some members present thought Whitehead’s behavior a bit mischievous, this seems in perfect keeping with his way of handling heated polemic. In his later philosophical works this becomes evident in that he never thought the progress of thought depended so much on polemic as on the elucidation of premises. In fact Whitehead saw that polemic was in danger of becoming the chief occupation of philosophers. Professor L. J. Russell’s memory of the episode with Moore was 

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*A plausible explanation of Whitehead’s reply to Moore is contained in his 1917 paper, “The Anatomy of Some Scientific Ideas.” In developing his theory of sense-objects of perception, Whitehead says that the thought-objects of perception are “the rock upon which the whole structure of commonsense thought is erected.” “But when we consider the limits of its application,” he continued, “the evidence is confused” (AE, p. 197)—sticks appear bent half in and half out of water. The pattern of molecules is bent—namely, the difference between the stick half in and half out of water. Since common sense is deceived we must rely on the disintegration of perception into smaller thought-objects for an adequate explanation.
that even though Whitehead had left quite a few present in the dark, he emerged with “a seraphic smile of triumph.”

Moore’s obsession with being exactly right, regardless of how tedious the process of getting there, sometimes resulted in a tendency to show outright anger for what he thought to be obscurity or intellectual error. At least this was true insofar as the notion under consideration did not cohere with his common-sense realism. I suspect that another part of the story is the difference between Moore’s Edwardian character and Whitehead’s thoroughly Victorian manner. Later in this chapter, we shall see that the difference between Whitehead and the Moore-Russell line of thought is more than just one of temperament.

The second phase of Whitehead’s work begins with his investigations in the philosophy of natural science. The papers of 1915, 1916, and 1917—entitled, respectively, “Space, Time, and Relativity,” “The Organisation of Thought,” and “The Anatomy of Some Scientific Ideas”—are the first pieces of writings that would ordinarily be called “philosophical.” They are published in *The Organisation of Thought*, *Educational and Scientific* (1917), and republished with slight omissions* in *The Aims of Education and Other Essays* (1929). In these papers, he has come to questions that are immediately of interest to scientists as a group and to philosophers, not only to mathematicians and logicians.

The early philosophical writings can be characterized generally in terms of the attempt to formulate a pre-speculative epistemology. Pre-speculative is a key term here. It signifies a thoroughly empirically based inquiry. Whitehead’s central concern is to give an answer to the question of how the evident model of clear and precise knowledge of the world of mathematical physics is arrived at. The resulting epistemological study is one in which logical construction, and physical and psychological knowledge, are all relevant.

Although tempting, it would be a fundamental error to view these works as epistemological preparation undertaken for the construction of Whitehead’s later metaphysical system. Reflecting back on his early philosophical writings, he said to me that his works on the foundations of physics were all preliminaries to Volume IV of *Principia Mathe-

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*Upon republishing these essays, Whitehead eliminated some technical detail for the non-specialist in mathematics.*
His philosophical interests thus grew out of initial motives to provide a logical analysis of space for *Principia*.

Whitehead never completed the *Principia* Geometry, even though he had intended to do so even after he went to Harvard. Six of his letters to Russell, written between 1905 and 1914, document his progress on Volume IV. The completed parts, however, must be presumed to have been destroyed along with the other manuscripts and correspondence after his death. The letters written on April 27, 29, and 30, 1905, show considerable progress in Whitehead’s attempt to set out the mathematical foundations of the principles of Geometry, despite some disagreement between him and Russell over how to proceed. Published works by Veblen and Pieri are discussed, and it appears that while Whitehead and Russell were developing the *Principia Mathematica* treatment of relations, they had in mind its application to space. Whitehead has proposed to adopt Veblen’s view of Geometry as the study of a single many-termed relation; his immediate task is to develop a notation for triadic, tetradic, and beyond that to n-adic relations.

Over five years later, in a letter of September 22, 1910, Whitehead wrote to Russell: “The beginning of Geometry is going beautifully,” and reported work on sections *500* (“Associated Symmetrical and Permutative Triadic Functions”), *502* (“Associated Relation of a Triadic Function”), *504* (“Axioms of Permutation and Diversity”), and *505* (“Axioms of Connection”). Although we cannot discover, from the content of this letter, just exactly how the Geometry developed proposition by proposition, it is likely, given the procedure of the earlier three volumes, that Volume IV began with a Prolegomena to Geometry at *400*.

As late as October 1913, Whitehead’s work on the *Principia* Geometry was still proceeding at a steady pace, and in a letter to Russell on October 13th he claimed to have found out what the science is about:

The whole [subject] depends on the discussion of the connective properties of multiple relations. This is a grand subject. It merges into the discussion of Cl _,* where _ is a cardinal number, preferably inductive. I call such things “multifolds.”

Whitehead’s reference to “a grand subject” might signal that his conception of the Geometry was becoming very ambitious. In fact, the task

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*[Victor Lowe’s drawing of a mathematical symbol here and after “where” was illegible.—Ed.]
that he set for himself enlarged in a few years well beyond logical foundations to include investigations of the necessary mathematical relations between space, time, and matter.

As far as I know, the last extant letter concerning *Principia* Geometry is dated January 10, 1914, when Whitehead proposed to include his paper “La Théorie Relationniste de l’Espace” in Volume IV.* At this point there is no indication of his plan of an excursion into the philosophy of physics, but quite clearly the whole conception of Geometry as the logical analysis of space required rethinking in light of the Special Theory of Relativity. Whitehead was greatly affected by the revolution in physics that had taken place in the first decade of the twentieth century, but for him the physicist’s conception of the interrelations of space, time, and matter that emerged was far too narrow. So, I take it, nothing was more natural than to postpone the completion of the *Principia* in order to “lay the basis of a natural philosophy which is the necessary presupposition of a reorganized speculative physics.” For the time, the more interesting and challenging question was, What are the foundations of geometry, considered not as a purely mathematical, but as a physical science?

Whitehead had long held the conviction that mathematics is about the world of things and events. For him, the truth sought in pure mathematics is necessary truth about the world, though we are compelled to express it hypothetically. Russell, on the other hand, dropped a youthful Victorian belief that applied mathematics was superior to pure mathematics because it could make the world better, in favor of the view that the devotee of pure mathematics escapes from the sordid actual world to “a pluralistic, timeless world of Platonic ideas.” He held this view, with more or less intensity of feeling, throughout his collaboration with Whitehead. But there is no hint of it in any of Whitehead’s writings of that time, and much against it later. His persistent interest was in mathematical theory as applicable to the world, and as the *Principia* Geometry developed he seems to have been pursuing this conviction.

We can be sure that the convulsion of the war was no help to Whitehead’s work on the Geometry. In 1959, Russell wrote: “after [Whitehead] had done a lot of the preliminary work, his interest flagged and he abandoned the enterprise for philosophy.” But to a group of Harvard students in April 1931, Whitehead attributed his failure to complete the

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*See Chapter I, Section iv, this volume.*
fourth volume in the post-war years to his participation in administra­
tive affairs at the University of London. Even after he had completed Process and Reality with its own theory of extension in Part IV, he had hoped, vainly, to return to the fourth volume of Principia. But his thought was always pushing on to breaking new ground; he would have had little patience with what would have amounted to backtracking.

The customary division between Whitehead’s first mathematical
phase and his second phase devoted to the philosophy of natural science
is linked by his aim of understanding the nature of mathematics as the
most general science of the physical world. Rudiments of this develop­
ning position go back as far as his unpublished study of Maxwell’s Electricity and Magnetism in 1884 and his carefully worked out views in “On Mathematical Concepts of the Material World.” But to the large scheme of mathematical work, Whitehead now adds the question of the empirical basis of our knowledge of space, time, and matter. Thus begins the expansion of his enterprise into philosophy. His point of departure concerns the desirability of conducting discussions of relativity on a broad basis, in which the points of view of psychology and of axiomatic foundations of mathematics should be joined to the physical point of view.

While the lengthy paper “The Anatomy of Some Scientific Ideas” appears in The Organisation of Thought for the first time, the other two philosophical papers, “Space, Time, and Relativity” and “The Organisation of Thought” were each read to the British Association and the Aristotelian Society. Taken separately these papers reveal slightly different aims. Following the line of thought developed in “La Théorie Relationniste de l’Espace,” “Space, Time, and Relativity” at­
ttempts to defend the merits of a Leibnizian relational theory of space over a Newtonian or Kantian position, but now brings together prob­lems of space and time. “The Organisation of Thought,” on the other hand, attempts to analyze scientific propositions in terms of the general­izations of logical theory; it contains a masterful summary of Principia Mathematica. And in “The Anatomy of Some Scientific Ideas,” White­
head is mainly concerned to develop the “fundamental principles of mental construction according to which our conception of the external physical world is constructed.”13 It is particularly noteworthy for its short exposition of the method of extensive abstraction.
Each of these papers is important, but since it would be tedious to analyze each in turn, I shall discuss these works in terms of their common philosophical viewpoint, that is, what I have called “the pre-speculative epistemology.”

The central problem with which Whitehead began his epistemological study focuses on the foundations of geometry grounded in our perception of things extended in space. How do we arrive at the precise definitions of geometrical entities—“points,” “lines,” and “planes,” or their temporal analogues “instants” and “intervals of time”—those deceptively simple concepts of space and time in terms of which all exact natural science is expressed? This problem had occupied Whitehead for quite some time before. For instance, on December 10, 1908, he wrote to Russell, “I find that I cannot move a step in Metrical Geometry, until I have clearly settled in my mind the fundamental nature of Geometrical entities.”

In “Organisation of Thought” his procedure involved filling the gap between the rough world of our fragmentary individual experiences and the smooth world of science by what he calls an “inferential construction.” As he develops the nerve of the epistemological thought, he writes:

I insist on the radically untidy, ill-adjusted character of the fields of actual experience from which science starts. To grasp this fundamental truth is the first step in wisdom, when constructing a philosophy of science. This fact is concealed by the influence of language, moulded by science, which foists on us exact concepts as though they represented the immediate deliverances of experience. The result is, that we imagine that we have immediate experience of a world of perfectly defined objects implicated in perfectly defined events, which as known to us by the direct deliverance of our senses, happen at exact instants of time, in a space formed by exact points, without parts and without magnitude: the neat, trim, tidy exact world which is the goal of scientific thought.

My contention is, that this world is a world of ideas, and that its internal relations are relations between abstract concepts, and that the elucidation of the precise connection between this world and the feelings of actual experience is the fundamental question of scientific philosophy.\(^{14}\)

In the same way that we “construct” the things of everyday experience from perceptual data, Whitehead suggests that by a process of refinement, the properties of extension in time and space are narrowed down to the abstractions of scientific thought. Once the analytic knife begins
work on the rough, fragmentary perceptual data given to us in immediate experience, the smooth, exact world of science is cut and shaped into "points" and "instants." Such abstractions are the archetypes of the mind's own making; yet they are derived from certain types of relatedness discerned in the perceptual flux.

For all those who concern themselves with the relation of experience to scientific concepts, Whitehead's doctrine of "the rough world and the smooth world" is of utmost importance. It shows how his position is connected, on the one hand, with his examination of geometry and a physical science, and on the other hand, with the criticism of abstractions—what his critics call his "anti-intellectualism"—which dominates *Science and the Modern World*. Notice that there is nothing here that the author of *Process and Reality* need reject. In fact, it does not take much to see the doctrine of the rough world and the smooth world as an early formulation of his later notion of the "Fallacy of Misplaced Concreteness," that is, the error of mistaking the abstract for the concrete, or in the present case, the error of assuming that the smooth properties of geometrical entities are the starting point of science.

In Volume I, I briefly mentioned Russell's recollection of an argument with Whitehead over their different views of the nature of reality.* Russell's rejection of the Hegelian world-view resulted in his seeing the world as a "heap of shot"; each separate shot was as hard and precise a boundary as a Hegelian Absolute, but *externally related* to every other shot in the universe. This was the doctrine that liberated Russell and Moore from the Monistic Idealism that was thought to shackle the advance of science. But Whitehead, says Russell, was the "serpent in this paradise of Mediterranean clarity." Whitehead was all too aware of the vague, ill-adjusted character of our experience of the actual world. It is, he says, more like what one experiences "in the early morning when one first wakes from deep sleep" than "fine weather at noon day." Russell thought this remark horrid until Whitehead showed him

how to apply the technique of mathematical logic to his vague and higgledy-piggledy world, and dress it up in Sunday clothes that the mathematician could view without being shocked.15

Before this encounter, Russell said that his revolt into pluralism led him to believe "that points of space and instants of time were actually existing entities, and that matter might very well be composed of actual

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elements such as physics found convenient." But after 1910 Russell says that he followed Whitehead's lead with new applications of Occam's razor whereby "one could do physics without supposing points and instants to be part of the stuff of the world." Since points and instants could be seen as routes of approximation constructed on the basis of perceptual experience, one need not assume the smooth world to be the world of our perceptual experience. Whitehead makes this abundantly clear when he says that fragmentary individual experiences are all that we know, and that all speculation must start from these disjecta membra as its sole datum. It is not true that we are directly aware of a smooth running world, which in our speculation we are to conceive as given. In my view the creation of the world is the first unconscious act of speculative thought; and the first task of a self-conscious philosophy is to explain how it has been done.

By calling attention to this problem Whitehead did not mean to imply that our intellectual constructions correspond to no facts. On the contrary, our concepts of geometrical entities are the indispensable subject matter of theoretical physics. But he is quite insistent that we must not make the mistake of "assuming that we are comparing a given world with given perceptions of it." "The physical world," he writes, "is in some general sense of the term, a deduced concept." To pursue Whitehead's procedure for bridging the gap between our perceptual experience and scientific concepts, between the rough world and the smooth world, takes us well into his method of extensive abstraction. Although the full treatment of this procedure must be reserved for the following chapter, where discussion of The Principles of Natural Knowledge will be taken up, we should take note of his early formulation expounded in "The Anatomy of Some Scientific Ideas." Here the discussion of the definition of a point will serve as the representative of all "ideal entities" of space and time.

Instead of viewing points as existing in their own right, as entities radically different from anything known in experience (such as defined by Euclid as without parts or magnitude), Whitehead replaces this notion with the definition of a point as an ideal simplicity of converging series of extensive regions. In our sense-perception we may observe lampposts converging to a vanishing point in some crude linear order. But to arrive at the concept of the mathematical point requires considerable abstraction from the given data.

Whitehead begins his procedure by defining "things" in terms of perceptual data, then space in terms of whole-part relations between
things. This method is significantly modified in his later works. Whitehead here takes the sense-object as the particular existent doing the work of both “object” and “event” in *The Principles of Natural Knowledge* and *The Concept of Nature*. A thought-object of perception, on the other hand, is the “thing” built up on the basis of sense-objects. For example, an orange is constructed out of certain associated sense-objects such as shape, color, and scent. This is an actual thought-object of perception. But he proceeds to hypothetical thought-objects of perception which are further constructed by disintegration into smaller parts. These are the thought-objects of science, that is, molecules, atoms, and electrons.

Further abstraction is now required to reach finally the concept of points. Whitehead distinguishes between sense-time and sense-space, and thought-time of perception and thought-space of perception. The former are actually observed time-relations and space-relations between sense-objects. They are discontinuous, fragmentary, and have no points other than a “few sparse instances, sufficient to suggest the logical idea.” The latter are the time and space relations which hold between thought-objects of perception. They are continuous rather than fragmentary. With this distinction in mind he now defines the point in terms of thought-objects of perception related together by whole-and-part relations, that is, enclosure, considered as either a time-relation or a space-relation. From the observed fragmentary relations we proceed in thought through a series of successively contained parts toward an ideal simplicity by the law of convergence. A first crude thought-object of perception (i.e., one conceived as in the present of a short duration) takes on the space-relations of its component sense-objects. And it is from this first crude thought-object of perception that Whitehead conceives his method of extensive abstraction to start, but derivatively from the sense-objects.

Proceeding through a series of successively contained parts to an ideal simplicity is at best a route of approximation. But with regard to points, all that is needed is a universal definition of this at-a-point-ness, or punctuality, which stands for an ideal exactness in the determination of spatial position. This gives meaning to the physicist’s use of such concepts as “force at a point” or “configuration at an instant.”

When Whitehead read “Space, Time, and Relativity” to the Aristotelian Society in 1916 he referred to himself as “an amateur” in the
science of philosophy, and said that there was no reason to ascribe to his summary of the problems of space and time "any importance except that of a modest reminder." In this first address to professional philosophers, Whitehead seems well aware of his venturing into a new territory where the likes of Carr, Alexander, Russell, and Moore had been reading papers for over twenty years. And from this point of view, it seems natural that his suggestions as to solutions to philosophical problems were made with some reservation. But I doubt whether he lacked confidence in his work. His excessive modesty was more likely to have been a matter of professional courtesy.

What is most interesting about the philosophical views Whitehead developed between 1915 and 1917 (and beyond) is that he seems to have arrived at them independently of the current orthodoxy. This is not to say that he was not influenced by some of the outstanding leaders in the contemporary thought of his time. His anti-Idealist views were in much accord with the dominant neo-Realists, who rejected Idealism as an adequate foundation for the special sciences. But Whitehead's background in mathematics gave him his own line to develop in philosophy. Not only did he have a technical advantage in his approach to certain philosophical problems; he was also spared from being ensnared by the current philosophical language.

Some of the more salient characteristics of his early philosophy now call for attention. As noted above, Whitehead claimed that the elucidation of the precise connection between the world of exact thought and the feelings of actual experience is "the fundamental question of scientific philosophy." My exposition of Whitehead's method of solving this problem will take account of both his affinities and contrasts with some of his contemporary milieu. This is particularly important with regard to his differences with Russell, since the latter had taken up the same problem in Our Knowledge of the External World. Of course Russell's language is not quite the same, but his ideas are better known than Whitehead's, even though it was Whitehead who pioneered the techniques Russell used in this work.

Whitehead's method is built around five central ideas.

1. His point of departure for a discussion of the data of science is an acceptance of the characteristic starting point of British empiricism. In fact he contends that the actual world is none other than the relations which exist within that flux of perceptions, sensations, and emotions which forms our experience of life. The panorama yielded by sight, sound, taste, smell, touch, and by more inchoate sensible feelings, is the sole field of activity.
Individual experiences are all that we know. Both science and metaphysics must start from this same given groundwork, even though they "proceed in opposite directions on their diverse tasks." For the purpose of science, however, Whitehead is especially interested that the formulation of basic concepts (such as life, heredity, matter, molecule, energy, space, time, and number), and the laws which state the relations connecting the various parts of the universe, have their origin in sense-experience.

As already noted in this chapter, Whitehead emphasized the fragmentary, vague, and somewhat disorderly character of our experience of the actual world. This is what we referred to as the "rough world." But by making such a claim about the nature of experience he was not committing himself to an atomistic ontology; nor was he expounding an epistemological theory in the fashion of Hume. For the moment he is excluding the broader metaphysical considerations and asking only about the observational basis of science.

The most fundamental units of his empiricism are the sense-objects. This much of his theory does have an affinity to Hume. For example, Whitehead views percepts such as objects of redness, or the mewing of the cat, to combine in various ways to form our perceptions of the thought-objects. He says sense-objects are distinguished as separate by recognition of either: (i) differences of sense-content, or (ii) time-relations between them other than simultaneity, or (iii) space-relations between them other than coincidence. They arise essentially from recognition of contrast in one way or other within our complete stream of sense-presentation. We must, however, keep in mind that the sense-objects and the thought-objects of perception have a practical function in Whitehead's epistemology, namely, as elements necessary in defining the scientific and geometrical entities of the world of exact thought.

Even though we discern individual sense-objects and thought-objects in our perceptual field, Whitehead makes it clear that there is nothing in isolation. In fact, as he puts the point,

The perception of red is of a red object in its relations to the whole content of the perceiving consciousness. . . . What we perceive is redness related to other apparents. Our object is the analysis of the relations.

The role of relations in nature occupies a prominent place in all of Whitehead's later thinking. The crucial difference for his metaphysics, however, turns on the distinction between relations and their terms and the "relatedness" of nature in terms of the process of events. On this
issue he was never in much sympathy with the type of empiricism espoused by Hume or by Russell and Moore.

(2) Whitehead, conscious of his empiricism, is now committed to a relational theory of space and time. The full treatment of space as the expression of certain properties of the interaction of bodies was worked out in his 1914 paper.* Points are never encountered in perceptual experience. All that we observe are various properties of things in space. But to this he now adds: “It needs very little reflection to convince us that a point in time is no direct deliverance of experience. We live in durations, and not in points.”27 Points of space and time are both deductions from experience, and are definable in terms of relations between material bodies. Like the point, the instant is no longer assumed as a primitive and undefined concept.†

(3) His third idea proposes an independence of science and metaphysics, and it is on this score that his method approaches the narrow “scientific empiricism” of the positivists. This idea will come as something of a surprise to readers of Whitehead’s later works, but it is not altogether different from the claim put forth in The Concept of Nature that “nature is closed to mind.” The central concern of science is the nature of the external world quite apart from the peculiar standpoint of the individual psychology. It is purely matter-of-fact and must by necessity exclude values. Of course this is, in itself, an implicit acknowledgment of the merits of a realist metaphysic, and indeed Whitehead’s views here accord quite well with those of Nunn, Lloyd Morgan, and Alexander, but his reasons for excluding all judgments of value, and ontology generally, have a heuristic motive.

Whitehead contends that science cannot wait for the end of the metaphysical debate to determine its own subject matter. It must get on with the data at its immediate disposal, that is, “the facts which form the field of scientific activity,”28 and not inquire as to how our perceptions relate to some true reality. All that is required is that science gather up these perceptions into a determinate class and add to them “ideal perceptions of an analogous sort, which under assignable circumstances would be obtained.”29 Once this has been satisfied and debated in due course, we can come to some agreement, whereas in metaphysics debate has hith-

*See Chapter 1, Section iv, for a full account of “La Théorie Relationniste de l’Espace.”
†The treatment of time as “exactly on four legs with that of space” had been a topic of keen interest to Whitehead since 1911, when he was working on the Geometry. See Volume I, page 299.
erto accentuated disagreement. Whitehead imagines that if in some distant generation men arrive at unanimous conclusions on ontological questions, the roles of science and metaphysics may be reversed; but for the present "we must take the case as we find it."  

(4) The fourth idea is that of inferential constructions, which, in many respects, is a fresh development of Hume's principle that the connected world we take for granted is in reality a product of the habits of the imagination. Whitehead holds, as we have seen, that the world is constructed by an unconscious act of thought of which philosophy is to make us aware. He adds:

uniformity does not belong to the immediate relations of the crude data of experience. . . . the uniformity which must be ascribed to experience is of a much more abstract attenuated character than is usually allowed.

The mind supplies the smooth uniformity of the world by an unconscious application of various principles of mental construction. Their origination and their present automatic operation are viewed as due to long ages of historical evolution. We take ourselves to be immediately acquainted with such uniformity in experience, but it is rather inferred from the given fragmentary data. Aside from the sense-objects and various types of relations discerned within the act of experience, everything else is a construction. This is Whitehead's application of Occam's razor admirably referred to by Russell as: "Whenever possible, substitute constructions out of known entities for inferences to unknown entities." This notion combines with his fifth idea to complete his procedure for defining the ideal limits of geometrical entities.

(5) Finally, with mathematical logic, which can precisely specify the conditions required for membership in a class if the class is to have certain formal properties, we can hope to exhibit all the concepts of science as concepts of classes of percepts. The process begins with concepts that are directly exhibited (e.g., the whole-part relation as exhibited in space-perception), and proceeds to concepts of classification and order which apply to these primary concepts, and so on, until conceptions are reached

whose logical relations have a peculiar smoothness. For example, conceptions of mathematical time, of mathematical space, are such smooth conceptions. . . . The problem is to exhibit the concepts of mathematical space and time as the necessary outcome of these fragments by a process of logical building up.
There is little doubt that Whitehead held high hopes for the class theory at this time. It would have been most unnatural to confine the exploration of its possibilities to the concepts of space and time alone.

Having now set out the ideas central to Whitehead’s method of solving the fundamental question of scientific philosophy, let us focus on five more characteristics of his thought which anticipate some of his later ideas. Again, these characteristics are helpful to the extent that they define his position in contrast to that of Hume, Russell, and the logical positivists.

(1) Whitehead’s attitude toward metaphysics in these early writings is not one of condemnation. Initially the plea for the independence of science and metaphysics has the goal of allowing scientific investigations to proceed without interference from larger ontological and axiological issues. But this is not a suggestion that we do away with metaphysics altogether or that metaphysical thought is merely an impoverished form of poetic expression. Instead, Whitehead recognizes that “Science only renders the metaphysical need more urgent,” for quite clearly the manner in which a scientist approaches his subject matter reflects his implicit metaphysical view. One misinterpretation of these early papers is the supposition that his pre-speculative epistemology is anti-metaphysical. Development of thought in a certain region does not ultimately preclude the importance of larger questions concerning the nature of reality. Whitehead later generalized that all achievement necessitates exclusion. This is what I think he had in mind for the analysis of the perceptual basis of scientific concepts.

(2) In his epistemological study, Whitehead has not entertained any serious doubts about the ability to know the external world. In fact he seems to have completely side-stepped the issue of skepticism; it simply does not interest him. Whitehead is rather concerned with discovering just exactly how exact thought applies to the fragmentary continua of experience, that is, with how the correspondence is effected. He is concerned with a method which will ultimately satisfy common sense, not contradict it.

(3) As opposed to the methods of Hume, Russell, and the Carnap of Der logische Auffbau der Welt, Whitehead does not attempt to construct the concepts of common sense and of science from the building up of a public world from private experiences. His theory of sense-objects and thought-objects of perception might easily lead one to believe he was working from inside out. But this is not the case. The construction of both actual and hypothetical thought-objects has the aim of the attainment of accuracy, logical smoothness, and completeness of detail. In a
few more years he will denounce the problem of building up publicity from privacy as a false one; now he seems to agree that there is a problem, and he enumerates “universal logical truths, moral and aesthetic truths, and truths embodied in hypothetical propositions” as being “the immediate objects of perception which are other than the mere affections of the perceiving subject.” Since his epistemological inquiry does not revolve around the antithesis between the private and the public, his subsequent move into realism will require no revolution in his ideas.

(4) Whitehead’s view of the field of perception closely approximates the Jamesian concept of the specious present, and to some extent his later concept of the actual occasion. We must recall that even though the units of his empiricism—the sense-objects—are fundamental to his procedure, they occur as elements within the whole content of the perceiving consciousness. In one place Whitehead refers to the present as a duration which “includes directly perceived time-relations between events contained within it.” Our concept of past events is built up by means of repeated applications of a “Principle of Aggregation.” Furthermore, with the rejection of the instant as the fundamental temporal unit, he anticipates his doctrine of immanence when he says,

the present essentially occupies a stretch of time, the distinction between memory and immediate presentation cannot be quite fundamental; for always we have with us the fading present as it becomes the immediate past.

Whitehead was probably acquainted with James’s *Psychology* and perhaps heard much of the ingenuity of the concept of the specious present from McTaggart and others. And from this point of view it is clear that his early empiricism is more radical than atomistic; but he was developing his own theory of nature as perceived in “durations.”

(5) This leads us to the last aspect of Whitehead’s divergence from the standard “scientific” empiricism of his time, namely, his view regarding the texture of immediate experience. By texture we must understand him to mean not some sort of tactile sensation, but rather the web of uniform relatedness underlying experience. After describing the manner in which he proposes to arrive at “that connected infinite world in which in our thoughts we live,” he comments:

The fact that immediate experience is capable of this deductive superstructure must mean that it itself has a certain uniformity of texture.
As Whitehead had maintained, uniformity does not belong to the “immediate relations of the crude data of experience”; it is rather a result of the process of inferential construction, where refined logical entities are substituted. But now he suggests that the very fact that this is possible provides evidence to believe that there must be some structure of uniform relatedness realized in the very texture of experience.

Whitehead’s first philosophical publications are by no means polished works. But in these early papers there is clearly a first effort toward systematization. Aside from the absolute theory of space and time, he seems to have little interest in refuting any particular doctrine or philosopher; he is, however, concerned that any scientific or philosophic endeavor should fit the world to our perceptions, and not the other way around. If we followed the latter procedure, we would be deceived by a false neatness of abstract intellectualism.

The philosophy of natural science propounded in the three important books of the 1920s is an attempt to set out these early ideas in a more precise system. But the foundations had been laid here in this attempt to grapple with the basis of scientific thought and to systematize philosophy afresh.