Introduction

Bertrand Russell is generally acknowledged to be one of the most important philosophers of the twentieth century, and many regard him as the most important. He is the chief architect of *Principia Mathematica* (1910–13), the three-volume masterpiece that established symbolic, or mathematical, logic; and he is one of the founders—if not the principal founder—of analytic philosophy, which applies the methods of logical analysis to philosophical projects and problems. And yet a large part of his metaphysics and epistemology, especially what we here call the "later philosophy," has been neglected and undervalued.

One aim of this volume is to direct attention to Russell's later metaphysics and epistemology, by which we mean the logic, ontology, theory of knowledge, and philosophy of science of his later writing. However, the later work cannot be properly understood except as a development of the earlier, and so we have prepared a volume that deals with Russell's metaphysics and epistemology in all its phases, early and late, with the exception of the preanalytic work.

The general aim of the volume is to emphasize the unity (if not the continuity) and integrity of Russell's metaphysical and epistemological writings. In a well-known barb, C. D. Broad said: "Mr. Bertrand Russell produces a new system of philosophy each year or so, and Mr. G. E. Moore none at all" (Broad, p. 79). Wittgenstein implied that the trouble with Russell's work after *PM* was that he had run out of problems to solve (Wittgenstein, 1967, p. 82). Both remarks are, at best, extreme exaggerations, and are seen to be so when the entire body of Russell's writing is examined and its development is studied. We accept Russell's own mature characterization in *My Philosophical Development* (1959, p. 11):

> There is one major division in my philosophical work: in the years 1899–1900 I adopted the philosophy of logical atomism and the technique of Peano in mathematical logic. This was so great a revolution as to make my previous work, except such as was purely mathematical, irrelevant to everything that I did later. The change in these years was a revolution; subsequent changes have been of the nature of an evolution.

It is true that his views evolved, for example, from phenomenalism to neutral monism to structural realism. But the development is orderly and well motivated. The changes of mind, contrary to Broad's suggestion, are neither capricious nor frivolous. It is probably true that – as with most philosophers – Russell's later philosophy was less creative than the earlier. But the reason was not that he ran out of problems or solutions, and merely recycled earlier solutions to the same problems, as Wittgenstein's remark implies. Problems set and not solved during the early period were addressed and sometimes solved during later periods. For example, changes in his early views regarding sensation (acquaintance) and sense-data required a new account of the way in which knowledge is based on experience, and such an account is offered in *An Inquiry into Meaning and Truth* (1940). Perhaps the most notable example is the problem of induction, which was first addressed in *The Problems of Philosophy* (1912), but not solved to Russell's satisfaction until the last two parts of *Human Knowledge: Its Scope and Limits* (1948) were completed.

We will provide an outline of Russell's most important work in metaphysics and epistemology, and then briefly speculate on the reasons for failure to appreciate its unity and for neglect of the later phase. It is convenient for our purposes to divide this work into five historical periods.

I. The preanalytic period (1893–99), during which Russell was under the sway of Kantian and German idealist philosophy, as interpreted by various of his teachers and former teachers at Cambridge University. The most important works during this period were *A Critical Exposition of the Philosophy of Leibniz* (1900), which examines Leibniz's logic and the hidden ontology built on it, and *An Essay on the Foundations of Geometry* (1897), an expanded version of his fellowship dissertation, which justifies a class of Euclidean and non Euclidean geometries (those with constant curvature) by Kantian arguments. In *My Philosophical Development* (1959b), his comprehensive intellectual autobiography, Russell says that "Einstein's revolution swept away" this early geometrical work, and he disowns nearly all his philosophical work during the period (pp. 40ff.). In 1899 Russell and G. E. Moore led a celebrated rebellion against idealism. Although realism is the philosophy of both Russell's early and late analytic periods, English idealism (Berkeley, Hume, and Mill) in the form of phenomenalism and neutral monism dominated his middle analytic period.

II. The logical period (1900–10), during which he conceived the idea of deriving mathematics from logic, and developed a symbolic logic for the purpose. The conception was born when he met the Italian mathematician, Guiseppe Peano, at a conference in Paris and was immediately led to a study of the latter's work and method of symbolism. The conception was sketched in *The Principles of Mathematics* (1903b), and in "Mathematical Logic as Based on the Theory of Types" (1908) and other papers (see the collections edited by Marsh [1956a] and by Lackey [1973a]). Russell's most widely read philosophical work, "On Denot-

ing" (1905a), is among these papers. The conception was finally developed in full technical detail in the three volumes of *Principia Mathematica*, written over a ten-year interval in collaboration with A. N. Whitehead and published in 1910, 1912, and 1913. PM is, without doubt, Russell's most important contribution to philosophy, and quite possibly the most important philosophical work of the twentieth century so far. Although the focus was on technical logic during this period, Russell's early analytic philosophy was developing at the same time; consequently, there is some artificiality in distinguishing this period from the first of the three subsequent philosophical periods.

III. The early analytic period (1911–18), during which Russell extracted his method of logical analysis and synthesis from the logical work of the previous period, and used it to develop his metaphysics and epistemology. *The Problems of Philosophy* (1912) is a sketch of his early metaphysics and epistemology. It holds that we have "acquaintance" with sense-data and abstract universals, and that other existing things are known only by "description." *Theory of Knowledge* (1984) is a development of the doctrines of acquaintance, judgment, certainty, and truth sketched in PP. It was written in 1913, suppressed because of Wittgenstein's criticism of its doctrines, and published posthumously by the Russell Archives in 1984. *Our Knowledge of the External World* (1914b) is the development of a phenomenalist epistemology and associated philosophy of physics, and together with "The Relation of Sense-data to Physics" (1914c) constitutes Russell's phenomenalist phase. "The Philosophy of Logical Atomism" (1918b) is Russell's classical presentation of analytic philosophy, the method of analyzing entities and sentences into their logical atoms. *An Introduction to Mathematical Philosophy* (1919), written while Russell was serving a six-month prison sentence for allegedly seditious opposition to Britain's involvement in World War I, is a non-specialist overview of PM and an introduction to its underlying philosophy.

IV. The middle analytic period (1919–27), during which Russell perfected the application of his analysis to physics and extended its application to psychology, thus achieving an empiricist philosophy he hoped would be acceptable in itself and compatible with contemporary physics and psychology. The first work of the period is *The Analysis of Mind* (1921), which extends the phenomenalist analysis of matter in KEW and RSDP to mental entities, analyzing both minds and bodies into collections of sensations, in the manner of Hume and William James. Two semipopular expositions of science were published next: *The ABC of Atoms* (1923), and *The ABC of Relativity* (1925). These were followed by a popular exposition of his philosophy, *An Outline of Philosophy* (1927a). The last work of the period is *The Analysis of Matter* (1927b), which analyzes the central concepts of physics—force, matter, space, and time—into *events*. Events are held to include sensed and unsensed sensibilia, and midway during the book it is suggested that some events may not be perceivable even in principle. With the admission

of unperceivable events, the basic ontology becomes unambiguously unambiguously realist.

V. The late analytic period (1928–59), during which the realist shift at the end of the previous period is consolidated, and major deferred problems are addressed. The stated purpose of *An Inquiry into Meaning and Truth* (1940) is to discover the relation between our empirical knowledge and the experience on which it is based; and it develops an extensional hierarchy of statements built up from basic propositions (sense-datum statements, in an earlier incarnation) to describe the relation. In *The Philosophy of Bertrand Russell* (1944), a volume in the Library of Living Philosophers, there is an informative memoir by Russell, entitled "My Mental Development," and a useful "Reply" to the articles of criticism and commentary contained in the volume. In *Human Knowledge* (1948), Russell's philosophy achieves its final form. The epistemology is Humean empiricist. In the last two parts he treats the long-deferred problem of induction, and concludes that inductive inference cannot be justified by probability theory or in any other manner, although its principles can be described. The metaphysics is a return to the briefly sketched structural realism of PP (though cleansed of most subsistent, abstract entities), which holds that whatever the perception-independent world may consist in, only the logical structures that it shares with our sensations can be known. *My Philosophical Development* (1959b) is Russell's final summation and commentary on his metaphysics and epistemology. Its summaries and explanations are of great importance in interpreting his work, and occasionally it provides a final development to the doctrine being summarized.

By Russell's later philosophy, we mean the philosophy of the late analytic period together with AMa, which is a transitional work. There are several possible reasons for the neglect of this later work and for failure to appreciate the unity and integrity of Russell's philosophy. *First*, PM and the associated books and articles on logic comprise work so focused, subtle, and creative that Russell's later philosophical efforts can seem pale by comparison. *Second*, after PM a large part of Russell's writing was devoted to science, religion, education, history, biography, political science, world affairs, education, and other nonphilosophical topics. As a consequence, his philosophical writing has an appearance of discontinuity: it is spread out over a period of some fifty years, making it difficult to trace and appreciate its patterns and continuities. The difficulty is increased by his unhelpful habit of not mentioning previous developments in each new book. *Third*, most of Russell's philosophical work is found in books prepared for an audience not limited to professional philosophers. The first such book was PP, the so-called shilling shocker (that is, a popular book sold for a shilling), which Wittgenstein hated. Russell tells us that after completing PM he wished to descend from the cold beauty of mathematics to the human level, and to communicate with the world at large. His termination from Cambridge after being convicted of sedition, and his harsh financial circumstances (most of his fortune had been given

to charity), undoubtedly contributed to his decision to write for a general audience. One unfortunate effect was that much of his philosophical work is composed in too casual and unself-critical a manner to avoid the usual professional criticisms of such efforts—some deserved, some not.

Finally, just after World War II, Russell's philosophy came under attack by a new generation, who, under the influence of the later Wittgenstein, developed British linguistic philosophy. Russell called this school "the new philosophy" and declared that he had no sympathy with it. In 1956 he wrote a review (reprinted in MPD, pp. 215–30) of J. O. Urmson's book of the same year, *Philosophical Analysis: Its Development between the Two World Wars*, a book that attempts to present the objections of the later Wittgensteinian school both to logical positivism and to Russell's analytic philosophy. Russell says of the school (MPD, p. 216): "Its positive doctrines seem to me trivial and its negative doctrines unfounded. I have not found in Wittgenstein's *Philosophical Investigations* anything that seemed to me interesting and I do not understand why a whole school finds important wisdom in its pages." He concludes with these words (MPD, p. 230):

> Philosophers from Thales onwards have tried to understand the world. Most of them have been unduly optimistic as regards their own successes. But even when they have failed, they have supplied material to their successors and an incentive to new effort. I cannot feel that the new philosophy is carrying on this tradition. It seems to concern itself, not with the world and our relation to it, but only with the different ways in which silly people can say silly things. If this is all that philosophy has to offer, I cannot think that it is a worthy subject of study. The only reason that I can imagine for the restriction of philosophy to such triviality is the desire to separate it sharply from empirical science. I do not think such a separation can be usefully made. A philosophy which is to have any value should be built upon a wide and firm foundation of knowledge that is not specifically philosophical. Such knowledge is the soil from which the tree of philosophy derives its vigour. Philosophy which does not draw nourishment from this soil will soon wither and cease to grow, and this, I think, will be the fate of the philosophy that Mr. Urmson champions with an ability worthy of a better cause.

Such pronouncements strengthened the conviction of the new generation of philosophers that Russell was out of touch and out of fashion. In later years some were uncharitable enough to speculate that he had become senile. The speculation reached its peak in 1967 when Russell organized an international tribunal to try the United States for war crimes in Vietnam, and published a biting little book of essays entitled *War Crimes in Vietnam*. Commenting on this episode, A. J. Ayer says in his biography, *Russell* (1972): "The proceedings of this tribunal were ill-received at the time but the evidence which has since come to light has largely vindicated them" (p. 34). And, "I last saw him [Russell] on his ninety-fifth

birthday and found him physically active and intelligently alert. The rumour which was put about by his political adversaries that he became senile is quite without foundation" (p. 32).

By inference from the history of ideas, one may reasonably hope that future developments will correct both Russell's assessment of the new philosophy and its assessment of his philosophy, and will incorporate the most attractive features of both in some new synthesis. It would be gratifying if this volume contributed to such a development.

The essays presented here are divided into five topic groups.

The *first group* (Goldfarb, Cocchiarella, and Hochberg) deals with Russell's philosophy of mathematics and ontology: the project of PM to derive mathematics from logic (logicism), the theory of types that Russell devised to eliminate the paradoxes that threatened the project, and the varieties of logical atomism that grew out of the project.

The *second group* (Hylton, Fumerton, and Smith) treats Russell's philosophy of language: his theory of descriptions from POM to OD and its uses, his related theory of proper names, and his theory of indexicals in IMT.

The *third group* (Savage, Pears, and Demopoulos and Friedman) is concerned with Russell's epistemology, and to some degree his metaphysics: his theory of sensational and perceptual data both early and late, his early theory of judgment and Wittgenstein's criticism of it, and his structural realism as articulated in AMa.

The *fourth group* (Sainsbury, Earman, and Hawthorne) treats Russell's theory of nondemonstrative inference in HK: the status of his postulates of inductive inference, his rejection of induction as a postulate of inference, and his apparent adoption of a Bayesian theory of confirmation in which the postulates are used to assign prior probabilities.

The *fifth group* (Anderson, Eames, and Blackwell) addresses Russell's philosophy of science and metaphysics: his analysis of instants in terms of events, his treatment of the fundamental concept of causality both early and late, and his quasi-religious lifelong devotion to science and to its philosophy.

The following summaries of these essays are designed not merely to indicate the contents but also to assist readers who are not specialists in the topic areas. They are, of course, no substitute for the essays themselves.

Philosophy of Mathematics and Ontology

Warren Goldfarb: Russell's Reasons for Ramification

Goldfarb is concerned to show that Russell had good reasons for adopting a *ramified theory of types*, rather than the less complicated *simple theory of types* that Ramsey and other logicians recommended in criticizing his logic. Gödel and Quine are also among the critics. They insist that sets are real, i.e., language- and

mind-independent entities; and they hypothesize that Russell adopted the ramified theory because he subscribed to an antirealist, constructivist interpretation of sets, an interpretation on which sets come to exist only as they are constructed (defined) by set theoreticians. Their evidence that Russell is a constructivist is his use of the vicious-circle principle in his theory of types. This principle is most precisely stated for propositional functions, which take propositions as values and individuals (or propositions) as arguments. For example, the propositional function, *Red(x)*, takes as value the proposition that the fire hydrant is red where the fire hydrant is its argument. The vicious-circle principle holds that the definition of a propositional function—and hence of the set of arguments to that function—cannot require the function to be an argument of itself, since the function does not exist until it is constructed (defined).

Goldfarb argues, against the Gödel-Quine interpretations, that Russell regarded propositional functions and the classes defined by them as independent, real entities, and was not a constructivist. His reason for ramification therefore cannot have been the one suggested by Gödel and Quine. Rather, it is the reason he explicitly offers: without the ramified theory certain paradoxes arise. Ramsey classified these as *semantic* paradoxes, because he believed they arise from the particular language being used, and he dismissed them as of no importance to logic. He contrasted them with the *logical* and mathematical paradoxes, such as Russell's famous paradox of the class of classes that are not members of themselves, which can be avoided by means of a simple, nonramified theory of types. But Goldfarb argues that the so-called semantic paradoxes arise from the misuse of propositional functions, which are abstract entities and therefore logical objects like propositions and classes. Consequently, the semantic paradoxes are as important to logicians as those that arise from the misuse of classes. As Ramsey himself concedes, the Grelling paradox and the other semantic paradoxes require ramification for their solution. Hence Russell's reason for ramification was correct: it is to avoid paradoxes that logicians and mathematicians need to avoid.

Goldfarb believes, however, that Russell cannot be rescued from the well-known difficulty of the ramified theory. As Russell knew and Ramsey confirmed, mathematics cannot be derived from a ramified logic without adding to it the axiom of reducibility. Ramsey argued persuasively that the axiom of reducibility is not a logical axiom, and that in consequence the logicist project of deriving mathematics from logical axioms cannot be accomplished in the ramified theory of types.

Nino B. Cocchiarella: Russell's Theory of Logical Types and the Atomistic Hierarchy of Sentences

Russell's ontology becomes increasingly anti-Platonist, or nominalist, as his thought matures. Cocchiarella's thesis is that this process ultimately leads Russell to deny the real existence of propositional functions, and thus deprives him of the

machinery required to define numbers in such a way that the theory of numbers is derivable from logic. The required definition treats numbers as classes of classes, or as propositional functions of propositional functions, if we use Russell's definition of a class as the extension of a propositional function. Cocchiarella traces the process of nominalization from POM to IMT. In POM and other early works propositions and propositional functions were held to be real, i.e. to be logical subjects. But in PM propositions were declared to be logical fictions, incomplete symbols, and therefore not logical subjects. In PLA, written under the influence of Wittgenstein, facts suffered a similar fate (though they would later be resurrected as events in IMT). And in IMT so did propositional functions.

Cocchiarella notes that the atomism of IMT is very severe: its simples are limited to particulars (including concrete facts, or events) and n-adic relations (including properties, which are 1-adic, or monadic, relations). A linguistic hierarchy is built on these simples consisting of atomic sentences, truth-functional combinations of atomic sentences, and generalizations on the subjects and predicates of such sentences. The only doctrine of types required is a fragment of the simple theory: it stipulates only that n-adic predicates have n terms. The usual paradoxes cannot arise in this hierarchy because propositional functions are not real, that is, are not logical subjects, and therefore cannot be arguments of propositional functions. (Or as in Ramsey's proposal, and Russell's in the second edition of PM, a propositional function can appear in a proposition only through its values.)

Cocchiarella claims that the resulting logic is merely a fragment of second-order logic and that arithmetic cannot be derived from it in the manner of PM. For the derivation requires propositional functions to be logical subjects, that is, entities capable of being subjects of propositions and arguments of propositional functions. For example, the number 2 is the class of all pairs, or the property possessed by all properties whose extensions are pairs, or the propositional function that takes as arguments all propositional functions whose arguments are pairs. But the number 2 cannot be so defined in the logic of IMT, since propositional functions cannot be arguments of propositional functions. Thus, Russell's later nominalism destroys his earlier logicism.

Herbert Hochberg: Russell's Paradox, Russellian Relations, and the Problems of Predication and Impredicativity

Russell employed what is now known as the simple theory of types to resolve the paradox arising from the set of all sets not members of themselves, and also the companion paradox arising from the property of not being a property of itself, the property of *impredicability*, I. Impredicability is defined as follows: f is an impredicable property $= df f$ is not f, or, in symbols, $I(f) = df \neg f(f)$. For example, redness is impredicable since redness is not red (or any other color). Russell contended that it is illegitimate to substitute I for the variable f, in the definition

of impredicability, because it violates the rule that the instance of a property must be of lower type than the property, or, in other terms, the rule that the argument of a propositional function must be of lower type than the function. Hochberg proposes to resolve the paradox without employing any theory of types. (He rejects the attempt to resolve it by employing a definite description to define *I*, on the ground that this requires the identity of extensionally equivalent functions.) He argues that impredicability is not a property but a relation: the relation of non-self-exemplification, $\neg\phi(\phi)$, the relation a property ϕ has to itself when it does not exemplify itself. On this suggestion, $\neg\phi(\phi)$ is like the relation, $\neg Lxx$, the relation of a thing not being to the left of itself. He claims that the paradox arises from erroneously supposing that $\neg\phi(\phi)$ is a property and can be substituted for property variables such as *f* in the definition of impredicability. Blocking the paradox thus requires only the familiar distinction between properties and relations.

In the course of his argument, Hochberg examines Russell's attempt in TK to account for the sense of relational propositions (a topic also discussed in the papers by PEARS and SAVAGE), and proposes an interpretation designed to meet Wittgenstein's objections. Russell's doctrine is that relational order is to be defined on the pattern of the following example: $Lab = df\,(a\ L_1\ [Lxy, a, b])\ \&\ (b\ L_2\ [Lxy, a, b])$; that is, *a* is to the left of *b* if and only if *a* has first place in the relational fact which has form *Lxy* and contains particulars *a* and *b*, and *b* has second place. Hochberg argues that relational terms such as L_1 and L_2 cannot be avoided in such analyses, either by the Wiener-Kuratowski definition of ordered pairs and other *n*-tuples, or by any other means.

The notion of logical form is used by Hochberg to resolve Bradley's "paradox." Bradley argued that if the exemplification of a property by an object is a (two-term) relation, then that relation must be exemplified by the property and object, which requires a further (three-term) relation of exemplification, and so on ad infinitum. Hochberg avoids the difficulty by treating exemplification as a logical form that "shows itself" (cf. Wittgenstein, 1961) in the fact, instead of a relational constituent of the fact.

Hochberg concludes with a discussion of the ramified theory of types. He maintains (in agreement with GOLDFARB) that the theory is necessary to block certain paradoxes that should be regarded as logical, and that the Ramsey-Wittgenstein interpretation of quantifiers as infinite conjunctions or disjunctions will not do the job. But then to derive arithmetic from the theory requires the axiom of reducibility, and it is not a logical axiom.

Philosophy of Language

Peter Hylton: The Significance of "On Denoting"

According to the theory of denoting in OD, "The present king of France is bald" is analyzed as meaning, $(\exists x)(Rxf\ \&\ (y)(Rxf \supset y = x)\ \&\ Bx)$, read as "There

is an x such that x is a male ruler of France, and only one such, and x is bald." On the standard account, this theory of descriptions was adopted to explain the meaningfulness of such expressions as "the present king of France" without requiring that they denote existing, or even subsisting, entities. Hylton brings objections against this account, and offers a better one. The main objection is that the earlier theory of POM—according to which "all men," "some men," "a man," and "the man" express *denoting concepts* and not objects—avoids subsistent entities as effectively as does the theory of OD. Consequently, there must be motivation and significance for the theory of OD that the standard account has missed.

The main significance of OD, according to Hylton, lies in its doctrine that the grammatical (surface) form of a sentence need not correspond to its logical form (the form of the underlying proposition), and that analysis is required to discover the logical form. The analysis of the sentence in our example shows in the underlying proposition that there is no constituent corresponding to the present king of France, for the constituents are the relation of being male ruler, the property of baldness, France, and (or one interpretation) the variable, x. The status of the quantifiers and connectives is unclear. Furthermore, France will not be a constituent in the completely analyzed proposition, since proper names are held to be disguised descriptions. (For proper names see FUMERTON.) The distinction between grammatical and logical form forced Russell and other analytic philosophers to pay explicit attention to expressions of propositions, to *language*. Words and sentences could no longer be regarded as transparent, but had to be regarded as potentially misleading and capable of producing metaphysical error.

According to Hylton, it is important to distinguish two kinds of analysis: eliminative and noneliminative, and to realize that the theory of descriptions can be employed in either kind. The analysis of our sentence whose subject is the present king of France is of the second kind, since it does not eliminate the thing that exists when such sentences are true. Similarly, Russell's use of the theory of descriptions prior to 1913 to analyze sentences about physical objects does not eliminate the thing that is the bearer of the sense-data. But his analysis of physical-object sentences after 1913 (in KEW and elsewhere) does eliminate the subject of the sentence, leaving only sense-data and relations between them.

Richard Fumerton: Russelling Causal Theories of Reference

The theory of denoting in OD is applied by Russell, not only to definite descriptions such as "the present king of France," but also to ordinary proper names, such as "Aristotle" and "Mont Blanc." On this application, ordinary proper names are held to be disguised descriptions. For example, the name "Dedefre" might be defined as follows:

(*) Dedefre = *df* the Egyptian ruler who built the second pyramid.

Fumerton defends this theory of names from several objections, the strongest of which is associated with the causal theory of proper names. He then shows how to enlist the causal theory to defend Russell's theory, a maneuver described by the paper's title.

Several objections to (*) are considered: (1) "Dedefre" is a rigid designator, but the descriptive phrase is not; (2) (*) is not logically necessary, or at least not analytic, and definitions should be; (3) different speakers associate different descriptive phrases with the name, so none can provide the definition. Fumerton shows how each of these objections can be met. The most serious objection is one usually brought by the causal theorist: (4) (*) may be false (e.g., Dedefre may have built the *third* pyramid) even when "Dedefre" is meaningfully and referentially used to say something true, for example, that Dedefre is an Egyptian. From such cases the causal theorist concludes that Russell's theory cannot be correct, and that the reference of names is fixed, not by descriptions, but by a causal chain beginning with the referent of the name and ending with its utterance on the occasion in question.

Fumerton replies that the description of the causal chain posited by the causal theorist can be used to improve Russell's definition of the proper name, as follows:

> (**) Dedefre = *df* the person whose being called by some name resulted (by a long and complicated causal chain) in the present utterance of the name "Dedefre."

This definition employs a description that satisfies the requirements of Russell's theory as well as the causal theory of reference.

The most serious objection to his suggestion is that the defining phrase in (**) cannot be substituted for "Dedefre" in all contexts. Substituting the definiens in the sentence, "Dedefre is an Egyptian," we obtain, "The person whose being called by some name resulted (by a long and complicated causal chain) in the present utterance of the name 'Dedefre' is an Egyptian." In the new sentence the name "Dedefre" is mentioned but not used (not uttered); consequently, the new sentence removes the referent for "the present utterance of the name 'Dedefre,' " which then becomes meaningless. Fumerton's reply, in brief, is that the defining description need not be substitutable for the name. It is sufficient that the description express an intended content that we associate with the name on occasions of its use, that is, on occasions when there is a referent for "the present utterance."

Janet Farrell Smith: Russell on Indexicals and Scientific Knowledge

Indexicals are *strict (logically proper) names* whose denotation generally varies from use to use. The most important examples are "I," "this," "now," and "here." In her paper Smith contends that Russell was right to hold in IMT and HK that strict names are indispensable, but that he was wrong to hold that indexi-

cals are completely interdefinable. She considers objections to both doctrines by Bar-Hillel in reaching her conclusions.

Carnap held in *The Logical Structure of the World* that every name can be replaced by a description: for example, names of entities in space and time can be replaced by a description mentioning the spatiotemporal coordinates (locations) of the entity. Russell objected that unless the chain of definitions terminates in names, it must become either an infinite regress or a circle. The origin of any spatiotemporal coordinate system must be named by "(0, 0, 0, 0)" (three spatial coordinates and one temporal), and any description that replaces this name must refer to the same coordinate system (circular) or to another coordinate system (regressive). Consequently, according to Russell, names are indispensable.

Bar-Hillel objects that Russell's thesis that names are indispensable in a scientific language has been incorrectly inferred from their indispensability in *learning* the language. Smith defends Russell from the objection. She concedes that indexicals are not necessary to designate simple particulars, since there are no particulars in the ontology of HK; and that names are not necessary to accomplish unique reference, since definite descriptions can do that. But she insists that names are epistemologically necessary to express one's awareness of one's own sensory experience, on which all empirical knowledge is based.

Russell maintains in IMT that "I" can be defined as "the person experiencing this." Bar-Hillel objects that "I" is not ambiguous, whereas "the person experiencing this" is ambiguous. The latter phrase may refer to something experienced by the speaker, or by the speaker and someone else. After examining several attempts to escape it, Smith accepts this objection. She concludes by connecting the basis of the objection to Russell's doctrine that indexicals have a twofold meaning, public and private, that enables the speaker to relate public knowledge to its private basis in experience.

Epistemology and Metaphysics

C. Wade Savage: Sense-Data in Russell's Theories of Knowledge

Sense-Data in Russell's early theory of knowledge are the completely certain, immediate, precise data of experience on which all our empirical knowledge is allegedly based. They are immediately sensed by what Russell calls *acquaintance*, and they provide the ground and test for the basic perceptual knowledge (judgments of perception) from which all other empirical knowledge is obtained by deductive or inductive inference. Russell maintains that he "abandoned" sense-data in 1921, but it is clear that he continued to employ sensory or perceptual data of some sort in his later theory of knowledge. Savage attempts to discover precisely what the "abandonment" consists in, and how the later notion of perceptual data differs from the earlier. Some commentators have claimed that Russell abandoned little more than the term "sense-data," others that he abandoned sense-data

in favor of fallible percepts. Savage attempts to show that the correct interpretation lies between these two extremes.

Through an examination of preabandonment texts, especially PP and TK, Savage builds a case that even during this early period Russell did not hold—in spite of contrary appearances—that sense-datum judgments are absolutely certain or infallible. For in the completely developed view of TK, the process of analyzing the sense-data on which sense-datum judgments are based is not infallible and therefore cannot produce indubitable judgments. Accordingly, the preabandonment doctrine is consistent with Russell's postabandonment insistence that nothing is absolutely certain.

Nonetheless, the notion of absolutely certain data is retained in the postabandonment view, on Savage's interpretation, as a ideal toward which we should strive. In Russell's later theory of knowledge, sense-data become the sensory core of perceptual experiences, the part of the experience that is causally most dependent on the stimulus, and a part that can only in theory be completely separated from the conscious and unconscious inferences that inevitably surround it. The more of these inferences one strips away, the purer the datum; and the purer the datum, the more reliable the scientific inferences based on it. The process of purifying data is extremely difficult, and at some points Russell suggests that it requires the aid of a psychological theory. This suggestion, though of great interest, is shown to lead to difficulty.

Savage suggests that the Russellian view of data may be precisely the view required to reconcile the traditionally opposed correspondence and coherence theories of empirical knowledge.

David Pears: Russell's 1913 *Theory of Knowledge* Manuscript

Pears examines that part of TK that Russell suppressed, apparently because of Wittgenstein's severe criticism, for the light that it throws on the development of logical atomism. In this part of the manuscript Russell tried to explain a subject's ability to understand contingent propositions (judgments) such as "*a* is to the right of *b*" (abbreviated "*aRb*") merely by means of *S*'s acquaintance with the constituents, *a*, *R*, and *b*, of the proposition. But he encounters two problems: (1) acquaintance with the constituents does not explain why *S* groups them together in a meaningful combination rather than some meaningless one, and (2) it does not explain how *S* knows that the combination selected is a meaningful one. Reliance on what Pears calls *extensional* acquaintance (roughly, acquaintance not involving any knowledge) prevents Russell from bringing *S*'s intention or knowledge of types of objects into the explanation. And so he is led to hypothesize that S has acquaintance with the form of the fact, *xFy*, a sort of schema into which *S* fits the constituents. According to Russell, what it means to say that *S* is acquainted with the form is that *S* knows the general logical fact,

$(\exists x)(\exists y)(\exists F)(xFy)$, read as "There is an individual x, and an individual y, and a relation, F, such that x has the relation F to y."

Pears considers three alternative construals of these general logical facts: that they are contingent, that they are necessary, and that they are self-evident. He finds that there are insuperable problems on each construal, and offers evidence that some of these problems were urged against Russell by Wittgenstein in his *Notebooks 1914–1916*.

The most important problem, according to Pears, is that even if we grant that S has acquaintance with a, R, b, and xFy, this still fails to explain how S knows that the combination aRb makes sense. Pears suggests that it is precisely this problem that Wittgenstein had in mind in his celebrated objection to Russell's theory of judgment in a letter written in June 1913, while Russell was at work on the sections of TK that would later be suppressed.

Pears argues that Wittgenstein's rejection of Russell's theory of judgment was an important step in the development of his picture theory of meaning in the *Tractatus*, with its doctrine that to know an object is to know the combinations into which it can enter. If S knows the objects, or constituents of facts, in this sense, then knowledge of the postulated form of the fact is unnecessary.

William Demopoulos and Michael Friedman:
The Concept of Structure in *The Analysis of Matter*

The metaphysical theory of AMa—its theory of theories—is usually called *structural realism*. It holds that the objective, scientific properties (and relations) of the world are the *structural* properties, which are known indirectly, by description; and that the subjective, ordinary properties are the *intrinsic* properties, which are known directly, in sensation. Structural properties are second-order properties, properties of properties. For example, the transitivity of the relation of being to the left of something is a structural property. The left-of relation is first-order, and also intrinsic (at least if taken to be a relation of the observer's visual field).

The authors take the central feature of structural realism to be its claim that the reference of theoretical predicates of a scientific theory can be explained non-reductively in terms of the reference of the perceptual or observable predicates of the theory. Structural realism therefore has important similarities to Ramsey's view that theoretical terms are not constants but rather existentially quantified variables, and consequently do not refer to particular entities. It is also similar to Carnap's view that a scientific theory is a partially interpreted formal system, a system in which only the observation terms are given interpretations. The authors examine M. H. A. Newman's little-known objection to Russell's structural realist view, and then identify counterpart objections to views similar to Russell's.

Newman's objection is presented as follows. Any set of empirical objects of

sufficient cardinality can be used to construct any structure, since a structure is simply a set of sets of objects. On the structuralist view scientific theories are about the existence of structures, which are properties and relations of at least second-order, or in set-theoretical terms, sets of sets of sets of...objects. But since the existence of such structures is constrained only by considerations of cardinality, scientific theories on this philosophical view are not empirical, or at least not empirical in various important respects. If we could distinguish "empirically important" from empirically unimportant structures, then we could require that scientific theories postulate only the existence of the former. But the distinction cannot be drawn within a purely structuralist framework.

Newman's objection is compared to Putnam's recent objection to the Carnapian view of scientific theories as partially interpreted formal systems, which can be summarized as follows. Any model (true interpretation) of the observational part of a theory can be used to define a model of the theoretical part, if the cardinality of its domain is sufficiently great; so the truth of the theoretical part is guaranteed for some interpretation. Since it does not matter which interpretation is chosen for the theoretical part on a Carnapian view, the truth of that part is automatically guaranteed, and the theory is therefore trivial.

The general suggestion is that all structuralist theories of scientific theories succumb to the same difficulty: they carry the unwanted and unacceptable implication that scientific theories are not empirical, or at least not as empirical as they should be.

Nondemonstrative Inference

R. M. Sainsbury: On Induction and Russell's Postulates

In HK Russell claimed that we need a priori knowledge of contingent propositions—what he called the postulates of scientific inference—in order to know anything other than our own data. A second, connected claim was that these postulates would also serve to characterize the kinds of nondeductive reasoning we in fact take to be valid.

Sainsbury's paper aims to clarify the first of these claims and to assess its truth. He supports Russell's view that principles of evidence—i.e., generalizations setting out the characteristics propositions must have for one set of them to confer rational credibility on another—cannot all be established by the data without circularity. But he does so for reasons different from Russell's. Russell seems to think that principles of evidence must be known if ordinary nondeductive reasoning is to be correct, and in this he was mistaken. On the other hand, Russell was right in thinking that there is a genuine philosophical question about whether the principles can be known, and if so, how.

Sainsbury suggests that this philosophical question is simply a reformulation of the problem of skepticism about induction. Since Russell's attempt to show that

all principles of evidence are contingent fails, it would seem natural to try to meet skepticism about induction by proposing that some principles of evidence are necessary and knowable a priori. But this gambit is unsuccessful, Sainsbury argues, for skepticism reemerges on the view that the principles of evidence are necessary. Where principles of evidence are held to be contingent, the skeptical doubt is simply whether the principles are true. Where the principles are held to be necessary, the skeptical doubt is whether merely *credible* beliefs (data) can lead by the use of the principles to *true* beliefs. Consequently, there is no epistemological issue of substance that rests on the question of whether the principles of evidence are contingent or necessary.

John Earman: Concepts of Projectability and the Problems of Induction

Earman attempts to state the conditions under which, according to probability theory, inductions from and projections of observed patterns are correct. The most familiar sort of induction infers a general hypothesis from its instances and, appropriately, is called *general* induction. An example is the inference that all swans are white from observations of some number of white swans and no observations of nonwhite ones. Inferring from the same evidence that the next swan encountered will be white is called *instance* induction. Earman formulates the conditions under which, assuming Bayes's theorem of probability theory, the (posterior) probability of a hypothesis, or of its next instance, goes to 1 (i.e. to certainty), given infinitely accumulating evidence.

Instance induction is treated first. Earman distinguishes between *future-moving* induction, which is based on evidence obtained in the future, and *past-reaching* induction, which is based on evidence already obtained in the past. He also distinguishes between *strong* induction, in which the probability of the inferred instances goes to 1, and *weak* induction, in which the probability of the inferred instances merely increases continually. He cites proofs that a nonzero prior probability for a hypothesis is a sufficient condition for strong future-moving induction to one of its instances, and a necessary condition for weak future-moving instance induction. He shows that a nonzero prior is not sufficient for past-reaching induction, unless one assumes that differently ordered sequences of evidence are exchangeable; and he suggests that exchangeability is a version of the principle of uniformity of nature, whose truth probability theory cannot decide. He concludes that Humean skepticism regarding instance induction is either defeated, or at least not supported, by these results.

Earman goes on to show that general induction to a hypothesis, H, is not strongly projectable if H has rival hypotheses that are assigned high nonzero prior probabilities; but that if H is assigned a nonzero prior, then it is weakly projectable. Consequently, strong induction, which of course is the most desirable, requires that competing hypotheses be given low prior probabilities; and it will be

difficult to justify these assignments by any rational means. (HAWTHORNE examines ways of justifying them.)

Earman examines the treatment of induction by Russell, Reichenbach, Goodman, and others in the light of the foregoing results. He finds Russell's treatment in HK disappointing. For Russell failed to distinguish future-moving and past-reaching induction, and although he discovered the objection to induction based on Goodmanian (nonprojectable) predicates, he failed to see that the objection does not apply to future-moving induction, and that this sort of induction is acceptable. Also, Russell failed to realize that competing hypotheses prevent projection of all except observable hypotheses, whether these contain Goodmanian predicates or not. Earman concludes with a pessimistic prognosis for anything but a minimalist theory of objective projectability, i.e., something like the theory offered in the first half of his paper. And he criticizes the attempts of Jaynes, Keynes, Russell, and Reichenbach to obtain a more ambitious theory. Subjectivist probability is not criticized but is deemed the province of cognitive psychology.

James Hawthorne: Giving Up Judgment Empiricism:
The Bayesian Epistemology of Bertrand Russell and Grover Maxwell

Hawthorne's paper compares the views of Russell and Grover Maxwell on induction. He notes that Maxwell agreed with Russell on nearly all points, including the point that judgment empiricism is false. (Judgment empiricism is the thesis that all synthetic statements are a posteriori [non-a priori], i.e., confirmable by the data of experience.) Only on one point was there disagreement: Russell proposed five postulates, or principles, governing nondemonstrative inference; and Maxwell found these inadequate. Hawthorne suggests that this disagreement flows from a general failure to appreciate Russell's Bayesian framework, and the role of the postulates in that framework. Hawthorne's theme is that Russell was really a Bayesian, and employed both the special and the general forms of Bayes's theorem as forms of nondemonstrative (inductive) inference.

The most familiar version of Bayes's theorem is

$$Pr(H/E) = Pr(H)Pr(E/H) \div Pr(E),$$

where $Pr(H/E)$ abbreviates "the probability of hypothesis H given evidence E," and E is a finite conjunction of any number of evidential statements. Where H is a general hypothesis, such as "All swans are white," and the evidential statements are instances, "Swan #1 is white," "Swan #2 is white," etc., H entails E, and $Pr(E/H) = 1$. The version of Bayes's theorem used by Russell is stated as follows:

(*) The probability of a general hypothesis (or of the next instance of the hypothesis) goes to 1 as the number of instances of positive evidence goes to infinity.

Keynes's results are used to show that (*) is true if the following two conditions are satisfied: (1) the prior probability of the hypothesis is nonzero (or finite, as Russell says), and (2) the probability of any piece of evidence given the falsity of H falls below some value, q, less than 1. Apparently Russell believed that (2) is true for all empirical hypotheses. And Hawthorne suggests that the purpose of the postulates of nondemonstrative inference was to assign nonzero prior probabilities so as to satisfy (1).

The generalized version of Bayes's theorem shows how the probability of a hypothesis is affected by rival hypotheses. Both Russell and Maxwell held that every hypothesis has an infinite number of rivals (though most of these will seem artificial), and they realized that the number of such rivals must be reduced to a finite, small number if Bayes's theorem is to confirm a hypothesis for a practically obtainable amount of evidence. The reduction is obtained by assigning a finite, small number of hypotheses nonzero probabilities. Accumulating evidence can then eliminate all but one of these. The assignment of prior probability is made with the assistance of the five postulates of nondemonstrative inference. Hawthorne finds this use of the postulates implicit in, or at least consistent with, Russell's treatment.

Hawthorne believes that even if Maxwell had interpreted Russell in the manner just described, he would have found the postulates inadequate because too narrow in scope. According to Maxwell, there is only one postulate for assigning prior probabilities, and it is the following rule: order and weight the probabilities of rival hypotheses intuitively. His basis for this rule is that humans have evolved in such a way that they now possess the innate ability to select hypotheses close enough to the truth that evidence will favor one of them. Hawthorne points out that an idea very like this can be found in HK.

Philosophy of Science and Metaphysics

C. Anthony Anderson: Russell on Order in Time

Russell's program of replacing inferred entities by logical constructions was applied to instants of time in KEW and generalized in AMa to accommodate the theory of relativity. Still later, in a little-studied paper, "On Order in Time" (OT, 1936), Russell brings the full logical machinery of PM to bear on the question of the possibility of usefully defining instants as certain classes of events. Here his conclusion is negative: "...the existence of instants [constructed out of events] requires hypotheses which there is no reason to suppose true" (OT, p. 216).

Anderson argues that Russell underestimated what he had accomplished in OT. Adopt as a primitive the relation that holds between events x and y if and only if x wholly precedes y. Define "x overlaps y" as "x does not wholly precede y and y does not wholly precede x." Finally, define "x ends before y ends" as

"Some event is wholly preceded by x and overlaps y." Using these definitions (which are Russell's) Anderson proposes as the best axioms for Russell's project: (1) no event wholly precedes itself, and (2) if x ends before y ends and y wholly precedes z, then x wholly precedes z. Russell's definition of an instant of time is as a class consisting of exactly those events that overlap every event in that class. It appears that many of the important properties of instants of time follow from axioms (1) and (2).

One thing that does not follow is that any instants *exist*. Earlier, in AMa, Russell had used the axiom of choice (actually an equivalent well-ordering principle) to prove the existence of instants, but he came to have doubts. Anderson explains the proof and urges that from an extensional point of view (which Russell would reject) the postulate is correct and the argument is convincing.

Anderson shows, however, that some further assumptions about events are necessary. Instants of time should form a *compact* series—there should be an instant between any two. Russell claimed to prove that certain simple conditions suffice to guarantee compactness. Anderson shows, by counterexample, that the conditions are not sufficient. It appears that Russell must simply assume as an additional axiom that there is an event between any two nonoverlapping events. Further axioms may be necessary to guarantee the continuity of the series of instants.

Anderson argues that these results—in some ways less and in some ways more than Russell thought he had established—are not defeated by objections that Russell presented earlier, or by objections arising from the theory of relativity. And he tries to defend constructionalism here against a general refutation based on Benacerraf's objection to defining numbers in terms of sets. Basically the defense is that equally good alternative definitions of points have not been shown to exist, and that even if alternatives exist, any one of the definitions may still be better than none. He concludes that epistemological (and even aesthetic) considerations support the adoption of a Russellian construction.

Elizabeth R. Eames: Cause in the Later Russell

Eames argues that Russell's later analysis of causation was unlike his early analysis. In his early realist period (that of PP), Russell held that inferences from sensations (percepts) to the physical objects that cause them are uncertain, since the cause can never be observed. In RSDP and KEW, physical objects are analyzed as structures of sensed and unsensed (but sensible) sensibilia. This analysis is accompanied by an analysis of cause of the empiricist, Hume-Mill variety: cause is defined in terms of observable regularities, and metaphysical ingredients are excluded from the definition. In his final, realist phase in AMa and HK, Russell constructs physical objects out of structures of observable *as well as unobservable* events defined in causal terms. Since the causes may not be observable, an empiricist analysis can no longer be employed, and Russell is forced to formulate postulates that govern inferences from observable effects to unobservable

causes. These postulates are undesirable from an empiricist point of view for two reasons. First, they contain metaphysical notions, such as *production* and *power*. Second, they cannot be empirically confirmed.

There is a further difficulty. In AMa and HK Russell holds that if inferences from the data of perception are to be reliable, then perceptual experience must be analyzed and purified, to separate it from the encrustations of habit, memory, and expectation that may well not be veridical. His idea is that the purer the sensory datum the greater its causal dependence on the physical stimulus to perception. Thus to identify the relatively pure datum requires making causal judgments. However, causal judgments are based on data, and the more reliable the judgment the purer the data. Causal judgment requires the purification of data, and the purification of data requires causal judgment; thus, the process of obtaining data is circular.

In summary, the necessity of metaphysical causal postulates, as well as circularity in the basis of causal concepts, are difficulties for Russell's later philosophy of science, and for any view, like Maxwell's, based on it.

Kenneth Blackwell: Portrait of a Philosopher of Science

It is widely known that as an undergraduate at Cambridge Russell concentrated on mathematics, and that his early research was in the foundations of geometry. Blackwell corrects and expands this picture with information from Russell's early writings and from documents in the Russell Archives. Annotated books from Russell's library show that he was reading widely in physics during his twenties and thirties, and published and unpublished memoirs show that during this period he was trying to fit current physics into the Kantian-Hegelian framework obtained from various of his mentors at Cambridge. Although Russell rejected Kant and Hegel, from these efforts emerged the project of PM, the project of deriving arithmetic from logic.

Blackwell suggests that Russell's devotion to science was quasi-religious, arising from his deep need for certainty, and was possibly a substitute for his lost adolescent religiosity. He supports this interpretation by references to Russell's early writing on religion and science, and his later writings on science. In one of the latter we find (*The Scientific Outlook*, 1931, p. 102):

> [Science] belongs with religion and art and love, with the pursuit of the beatific vision, with the Promethean madness that leads the greatest men to strive to become gods. Perhaps the only ultimate value of human life is to be found in this Promethean madness. But it is a value that is religious, not political, or even moral.

In another passage Russell says that the mystic, the lover, the poet, and the scientist are all seekers after knowledge, and that they desire to know the object of their pursuit, not for power or any other manipulative end, but because in the

"mystic union" that such knowledge brings "the object in and for itself sheds happiness upon the lover."

Blackwell notes that these remarks by Russell are continuous with others made near the end of his life in "The Expanding Mental Universe" (1959, p. 397). There Russell claims that seers, poets, and scientists all undergo an "expansion of the ego," in which they come to "embrace. . . distant portions of space and time" and steadily approach a God-like view of the universe "as one vast whole, without any here-now, without that partiality of sense and feeling to which we are, in a greater or lesser degree condemned." The suggestion is that Russell's preoccupation with science and its philosophy is metaphysically, even religiously grounded. For he views the aim of scientific knowledge as a mystical union of the ego with the whole universe.