

Russell and the Metaphysics of Neutral Monism

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Summary of thesis (Abstract)

My overall aim in this thesis is to elucidate the precise nature of Russell's mature 'neutral monist' metaphysic.

I show how an understanding of it has been hampered by pervasive misunderstandings. The approach I take is an historical one, and my account reveals that, after his adoption of neutral monism in 1918, there were no radical changes in his worldview, and certainly no lurch from a supposed quasi-phenomenalistic system prior to 1921, to a causal theory of perception after 1927. Instead, the earlier system is not as phenomenalistic as is sometimes supposed and his later philosophy is a development, not a repudiation, of the themes in the earlier.

Russell sought to show how his metaphysic dovetails with the outcome of modern physics in his 1927 book *The Analysis of Matter*. I seek to show how a proper understanding of modern physics indeed leads to Russellian conclusions. I also discuss the implications of quantum mechanics for metaphysics – a task which Russell could not have performed when he wrote *The Analysis of Matter*, since QM was still very much in a state of flux.

I show how Russell moved from empiricism to a naturalistic position in the theory of knowledge, and in doing so supplied a definitive solution to Hume's scepticism. Once again, the usual perception of him as an “empiricist” fails to do justice to the complexity and subtlety of his philosophy.

Finally, I argue that Russell's solution to the mind-body problem is the only one with any chance whatsoever of being true.

In all this I seek to show how Russell's philosophy has been unjustly neglected in contemporary debates and how it can provide elegant solutions to contemporary philosophical puzzles in the philosophy of science, epistemology and the mind-body problem.

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Preface

The aim of this thesis is to expound and defend Russell's 'neutral monist' metaphysic. In particular, it is my contention that this metaphysic in large part supplies the correct solution to the 'mind-body problem'. Consequently, in the first four chapters I shall be attempting to explain the precise nature of Russell's neutral monism and how it solved the problem of the relation of conscious states to brain processes. Russell's solution to the mind-body problem has hitherto been largely obscured by pervasive and persistent misunderstandings concerning the nature of his metaphysic. These misunderstandings have, in turn, been fostered by misunderstandings concerning the course of Russell's philosophical development. This volume aims to put right this state of affairs.

In the last four chapters of my thesis I shall be developing and extending the central ideas of Russell's metaphysic into other areas, specifically, the philosophy of science, the interpretation of physics, the philosophy of mind, and epistemology. I shall show how Russell's metaphysical framework and overall philosophical approach is capable of providing solutions to age-old problems in each of these areas, such as the problem of the nature of intentionality, and the 'problem of induction'. In each case, the solution to these problems was at least partially developed by Russell himself, though in each instance his ideas were not as fully developed as they were in the case of the mind-body problem. Thus the second portion of my thesis will be more speculative in nature than the first half.

I shall begin this second part of my thesis by examining Newman's criticism of Russell's alleged 'structuralist' philosophy of science, and evaluating the extent to which his criticism need undermine a Russellian account. I shall argue that Russell's metaphysic is entirely capable of answering Newman, though not quite in the way Russell himself supposed. Furthermore, the correct solution to this puzzle throws further light on the fundamental and inescapable *limits* of our knowledge. I shall then examine how a Russellian metaphysic can successfully integrate and interpret the findings of modern natural science. I shall argue that relativity can be easily assimilated; indeed that, properly understood, it must lead to an account similar to that of Russell's. In the case of quantum mechanics I shall argue that current understandings of quantum mechanics are philosophically muddled and that a perfectly straightforward realist interpretation of quantum mechanics is available which is wholly consistent with Russell's scientific realism. Furthermore, I argue that this realist interpretation is precisely the one we ought to adopt on other grounds, simply from a careful examination of

quantum theory itself. I should mention here that I entirely reject the currently fashionable 'relative state', 'Many Worlds' and 'Many Minds' interpretations, for reasons which I hope shall become clear in the course of presenting my account. And whilst I have a considerable respect for the theories of Bohm, my account does not presuppose their validity. Moving on to the philosophy of mind, I argue that the same general approach that Russell applied to conscious states can also be profitably applied to the topic of intentional states, thus yielding a complete theory of mind. Lastly, I shall show that Russell's approach to the theory of knowledge in his mature system was less straightforwardly 'empiricist' than is customarily supposed, despite Russell's own professed allegiance to the empiricist tradition, and that his metaphysic is consistent with a naturalistic approach which indeed has a lot more in common with Kant than Russell himself was prepared to admit. In going beyond traditional empiricism, I argue that Russell supplied a wholly original approach to the problem of knowledge, one which throws fresh light on the traditional problems of epistemology and offers a route to definitive solutions in this field, just as his metaphysic offers a definitive solution to the mind-body problem. In particular, I maintain that the analysis of knowledge in *Human Knowledge: Its Scope and Limits* provides a philosophically satisfactory answer to Hume's scepticism in a manner that previous philosophical systems had largely failed to achieve. The empiricist answer to Hume in the twentieth century (for example in the works of A. J. Ayer) was simply to say that induction is the final court of appeal in evaluating factual inference, and is thus not itself susceptible to criticism in the light of any higher criterion. Whilst this may be correct, it cannot help but feel like something of an evasion. I think that Russell supplies something better, and far more sophisticated, an account which answers Hume in a manner that is not only completely definitive but is also wholly satisfying in a manner in which the ordinary empiricist answer to Hume is not. In the course of expounding his approach I also outline aspects of Russell's epistemology that have been largely ignored in the secondary literature, such as his strident rejection of 'induction' as a valid form of non-demonstrative inference, and his complete anticipation, by nearly twenty years, of Goodman's 'New Riddle of Induction'.

Finally, in the conclusion to my thesis, I shall briefly return to the question of the mind-body problem, and argue that the Russellian solution to this problem is the only solution with any probability whatsoever of being true.

Introduction

QUESTIONS

It is a curious fact that, despite the considerable material that has been written about Russell, understanding of his mature metaphysic is somewhat sketchy. What, precisely, was Russell's final view of the world? What relation does his final view bear towards his earlier views? Was there a radical change in his metaphysic involving his abandonment of phenomenalism and the adoption of a causal theory of perception alongside a scientific realism – a change concerning which he was strangely silent?

Part of the reason that the answers to these questions have remained unclear is, I think, to be found in a seeming lack of interest in what the answers might be. One sometimes gets the distinct impression that few contemporary philosophers believe that Russell has much to teach them. Often his views are regarded as merely quaint and outdated. Ray Monk, for example, in his biography of Russell, quotes Russell's argument for the causal theory of perception in order to ridicule it.¹ He characterises Russell's argument as 'a strange form of epistemological solipsism' which, moreover, is 'spectacularly unconvincing'. Sadly, he does not deign to inform us where he thinks the argument goes astray. Other commentators, whilst displaying greater sympathy with Russell, frequently find themselves perplexed. Thus even so sympathetic a commentator as A. J. Ayer, in his little volume on *Russell*, ends up, when discussing the mature system, confessing that he is unable to completely make sense out of Russell's claims.²

The precise nature of Russell's 'neutral monism' is itself something of a mystery to some scholars. Some writers have conflated this doctrine with the 'phenomenalism' which Russell allegedly adopted in 1914.³ They have thus been led to see his espousal of a causal theory of perception in the latter half of the 1920s as constituting a tacit abandonment of neutral monism. This, in turn, has led them to be perplexed by Russell's apparent continued endorsement of neutral monism throughout the remainder of his philosophic career. Some

1 Ray Monk, *Bertrand Russell 1921-79: The Ghost of Madness*, pp. 243-4.

2 A. J. Ayer, *Russell*, p. 115.

3 For example, see A. J. Ayer's account in *Russell and Moore: The Analytical Heritage*, p. 122, and W. T. Stace's 'Russell's Neutral Monism' in P. A. Schilpp (ed), *The Philosophy of Bertrand Russell*, p. 354 and p. 355n. Both these examples are taken from Michael Lockwood's essay on 'What Was Russell's Neutral Monism?', pp. 143-4, in Peter A. French, Theodore E. Uehling and Howard K. Wettstein (eds), *Midwest Studies in Philosophy*, vol. VI: *The Foundations of Analytic Philosophy*.

have even gone so far as to conclude that Russell must have ‘vacillated’ on the question of neutral monism and phenomenalism versus a causal theory of perception. Indeed, Ayer even imagines that Russell changed his mind within a single book (*The Analysis of Matter*).⁴ And so confusion continues, all caused by a failure to properly get to grips with his mature system. There is a real lacuna here which, if filled, could help to illuminate Russell’s earlier writings as well, by revealing the direction in which Russell was travelling.

The less than wholly satisfactory state of Russell scholarship, with respect to the metaphysics of neutral monism, is evidenced in *The Cambridge Companion to Bertrand Russell*, edited by Nicholas Griffin. In his Introduction to this work, Griffin refers to what he calls the ‘narrow canon’ of Russell’s writings which has represented ‘Russell’ for much of the twentieth century, and continues to dominate many philosophers’ perceptions of Russell’s contribution to philosophy.⁵ This narrow canon, Griffin explains, extends ‘from “On Denoting” in 1905 to “The Philosophy of Logical Atomism” in 1918 – thirteen years out of a career of more than five decades.’⁶ Griffin to some extent defends this canon from a pedagogical perspective: ‘it contains enough elementary material for an undergraduate course, with bits of tougher material for those going on to graduate school...The only really difficult matter that occurred as a central part of the narrow canon was the Gray’s *Elegy* argument in “On Denoting”, and this was for a long time dismissed as based on a simple misuse of quotation marks. By such means, the narrow canon could be made safe for everyone.’⁷ Still, however, Griffin in the end concludes that the narrow canon has had, and continues to have, a baleful influence on the understanding of Russell’s philosophy. Its effects, he writes, ‘can be readily observed in this volume [*The Cambridge Companion to Bertrand Russell*] in the relatively sketchy treatment of his later work, despite the best efforts of its editor!’⁸

Indeed, of the various contributions to Griffin’s volume, only three chapters can really be taken as dealing with Russell’s mature metaphysic. Tully’s essay on ‘Russell’s Neutral Monism’ aims to clear up some of the confusion surrounding this issue, but, if I am not mistaken, serves only to muddy the waters still further.⁹ Demopoulos and Friedman are interested in Russell’s alleged ‘structural realism’ to the extent necessary to refute it. But they are clearly somewhat nonplussed by Russell’s reply to Newman’s criticism of his structural realism and can make little sense out of it. As we shall see, their difficulty arises from the fact that, having foisted on Russell a full-fledged ‘structuralist’ interpretation of science, they find it difficult to assimilate a reply to Newman which appeals to those aspects of Russell’s theory that are incompatible with this structuralist

4 A. J. Ayer, *op. cit.*, p. 84.

5 Nicholas Griffin (ed), *The Cambridge Companion to Bertrand Russell*, p.44.

6 *Ibid.*

7 *Ibid.*, p. 45.

8 *Ibid.*, p. 46.

9 See below, pp. 57-9.

approach¹⁰. Grayling's chapter repeats a lot of the material from his 'popular' book on *Russell: A Very Short Introduction*, though it also in part expands on this material. Like so many of his predecessors, Grayling supposes that Russell tacitly changed his metaphysic at some unspecified point in the 1920s. But, as we shall see, Grayling goes further than his predecessors in inventing a fictitious reason for this change.¹¹

Thus, there is ample scope for the clarification and illumination of Russell's mature neutral monism. My own motivation for undertaking this task is that (like the contemporary Oxford philosopher Michael Lockwood, whose views I shall examine later on) I believe that Russell's metaphysic contains the clue to the definitive solution to the mind-body problem, or at least to one part of it, namely the problem of consciousness and its relation to the brain. The key to this solution lies in realising that the world consists neither of material particles nor selves but of momentary Heraclitean individuals which Russell calls 'events'. My thesis will therefore be partly expository and partly a defence. But even if I do not convince the reader of the credibility of this metaphysical standpoint, a proper understanding Russell's theory can still, I think, serve a useful function. For if we know *why* we reject a theory we can gain greater clarity as to the nature of our own views, and the assumptions on which these views are based. Besides, Russell's metaphysic is interesting in itself.

I shall begin my account by describing, as clearly as I can, the metaphysic at which Russell finally arrived. I shall then set out the course of Russell's development from about the time of his completion of *Principia Mathematica* to the writing of *The Analysis of Matter*. In doing so, I shall vindicate Russell's own belief in the fundamental continuity of his thinking, despite the twists and turns that inevitably occurred along the way.

If Russell is right then the difference between the mental and the physical is not metaphysically fundamental. The universe, for Russell, consists of an indefinite number of 'events' and the events that constitute the brain are the very same events that, when differently ordered, constitute the mind of the person whose brain it is. In the following chapter I shall seek to explain precisely how this works.

10 See below, pp. 67-8.

11 See below, chapter 4, section II (pp. 49-54).

Chapter 1

Russell's Mature View of the World

There is really no better way of presenting Russell's mature world view than Russell's own account in the chapter entitled 'My Present View of the World' which he wrote for his intellectual autobiography *My Philosophical Development* (1959). Since, however, despite the lucidity of this account, his final theory has still not been fully understood, I shall attempt here an independent exposition of his metaphysic.

Perhaps the best place to start is with his distinction between perceptual and physical space. The distinction which Russell draws between these two spaces has been questioned, but it seems to me to be entirely defensible. Consider Macbeth's dagger. Now there is a sense in which, when Macbeth 'saw the dagger' before him, he didn't 'really see' a dagger at all, for there was in fact no dagger for him to see. He was merely hallucinating. But there is clearly a *sense* in which he *did* 'see a dagger'. A certain visual pattern occurred in his visual field, a pattern which we could characterise as a 'visual dagger pattern'. Or, to take another example, I currently think that I see a book before me. But I would have exactly the same visual experience if my optic nerves were stimulated by a skilful neurologist. In this latter case, I would not really be 'seeing a book'. However, I would still have exactly the same quality of visual experience that I have now when I actually am seeing a book. There is a perfectly intelligible sense of the verb 'to see' in which I can say that I 'see a book' even in the case of visual illusion. For even in this case a certain visual pattern, a certain pattern of colours, occurs in my visual field, such as I would normally associate with a book.

The qualities of my visual experiences can occur on more than one occasion. This is true for both 'simple' qualities, such as colours, and more complex sensory patterns, such as the precise visual pattern of a book that I am experiencing now. The next step is to introduce the terminology of 'percepts'. Percepts differ from simple qualities and sense-patterns in that they cannot occur on more than one occasion or to more than one observer. Thus a percept is effectively a sense-pattern that is individuated to a given observer and a given moment. Hence, Russell's talk of 'percepts', whatever else one might think, is at least perfectly intelligible.

The various sensory spaces, or sense-fields, within which our percepts are situated, must not be conflated with

physical space. In the case of Macbeth's dagger, a visual dagger pattern occurs in Macbeth's visual field, even though there is no corresponding physical object with a position in physical space. The spatial relations between percepts are just those spatial relations that are perceptible, irrespective of whether there are objects corresponding to the percepts with corresponding spatial relations. Thus none of the 'spaces', or fields, of my diverse sense modalities are to be identified with physical space, or with any part of physical space.

However, it is precisely the identification of sensory with physical space that is made by the naïve realism of common sense judgement. In this, common sense commits a grave error. For naïve realism leads to physics, and physics undermines naïve realism by showing that our percepts are the effect of the external physical world on our nervous systems, and thus cannot be identified with any part of that external world itself. Naïve realism, therefore, is self-refuting. In fact, if events are to be located *via* causal considerations, as seems reasonable, then percepts should be located in some part of the brain of the percipient. Thus a percept will occupy some small volume in my brain and have some small extension in physical space. This extension is not to be conflated with its extension in its perceptual space. A minimum of *six* coordinates is actually necessary to specify the position of my percept: three coordinates to specify its location in my visual field and three coordinates to specify its position in physical space. Thus we should regard space as having six dimensions, and not just three. The whole of the space of my visual field is in my head. When I 'see a chair', *three* places are involved. There is the place where the chair is in physical space to which my visual percept of the chair 'belongs'; there is the place my chair percept is in visual space in relation to other percepts belonging to the same sense modality; and finally there is the place where my chair percept is in physical space, this last being a certain small volume in my brain.

The next stage concerns the sort of events that occur in places where there is no living nerve tissue. Suppose I look out of my window and see a landscape and some clouds. When I turn away from the window, I cannot suppose that the precise visual scene of the landscape and the clouds which I saw when I was observing it persists when it ceases to be a percept, for its character whilst it was a percept was a function of my sense organs, nerves and brain. But I can reasonably suppose that *some* occurrences continue at the place from which I saw the landscape and clouds, corresponding to the visual pattern I would observe were I at that place. Obviously, I cannot know anything about the intrinsic character of these unperceived events. All I can infer from the percept as to the stimulus is that the latter must have at least as much structural complexity as the percept to which it gives rise. We can also suppose that, like percepts, unperceived events occupy small regions of physical space and thus that they are not a different *kind* of entity to percepts, but share the same overall *physical* characteristics as percepts.

Generalising from the above example, we can reasonably suppose that at every arbitrarily small region of physical space there are events occurring corresponding to everything that could be witnessed by an observer from the place in question or measured as occurring by an appropriate scientific instrument. A ‘place’ is to be considered as standing for some arbitrarily small region of space. On this view, every ‘place’ in physical space comprises a vast number of events corresponding to everything that could be observed or measured from that place.

The inference to unperceived events seems required by considerations of causal continuity. If I see a chair then there must be something occurring at every place (or point) between the place in physical space where the object is and the place in physical space where my chair-percept is. As Russell said in his ‘Reply to Critics’ (1944) (printed in the Schilpp volume on *The Philosophy of Bertrand Russell*), ‘Mr. Stace is puzzled by my hypothesis of unperceived aspects. Yet the hypothesis of such aspects is inevitable if we admit – as we all do in fact – that (a) causation does not act at a distance, (b) we can perceive (in some sense) things from which we are separated by an interval which is not a plenum of souls.’¹ This argument is (characteristically) terse, but it strikes me as persuasive.

Russell, then, envisages the world as consisting of a vast number of ‘events’. The term ‘event’ is here being used in a technical sense. ‘Events’ are the ultimate ‘stuff’ of the universe. Each event is conceived as occupying some small finite continuous region of space-time. Events differ from the old-fashioned ‘matter’ of the nineteenth century physicist in that they are not impenetrable. On the contrary, each event is conceived as overlapping innumerable other events which occupy partly, but not wholly, the same region of space-time. We also assume that events have intrinsic qualities although we do not, in general, know what the intrinsic qualities of events are, except when the events concerned are percepts. ‘Events’, then, are the *fundamental* ‘stuff’ of reality. Unlike numbers, physical objects, minds, etc. events are not set-theoretic entities, or logical constructions, out of more fundamental occurrences, for there *are* no more fundamental occurrences.

And with just this inference to unperceived events we have sufficient materials to supply an interpretation of physics. For instance, physics might require a smooth mathematically continuous space of ‘points’. Now it can be shown that the mathematician can construct ‘points’ of four-dimensional space-time out of certain groups of overlapping events. The details of the construction need not concern us here but are dealt with in some detail by Russell in *The Analysis of Matter* (1927). Simplifying somewhat, a ‘point’ can be defined in terms of all the events that we should naturally say ‘contain’ the point in question. This, of course, is not a definition, but merely an indication of how the construction is to be carried through. In fact, if we are to construct a

1 ‘Reply to Critics’, reprinted in *Collected Papers* 11, p. 39.

mathematically continuous space, then it is necessary to suppose that each region contains an infinite number of events. It is not necessary, however, to suppose that every region defines an event; nor is it necessary to suppose that there are events below a certain minimum size. If physical space turns out not to be infinitely divisible then it is not necessary even to make the assumption of an infinity of events. In this case, space will be 'granular' at some microscopic level. Either way, physical space can be constructed without assuming any other materials than events – both perceived (percepts) and unperceived. It is thus possible to vindicate physical realism with the utmost ontological parsimony. We know that 'events' do in fact exist, since percepts are an instance of events. What Russell pointed out is that it is not necessary to suppose that anything else exists in order to arrive at a realist interpretation of physics. (Of course, we need to infer the existence of events that are not percepts, but this does not constitute an inference to a different *kind* of entity.) 'Matter' can be interpreted as a certain sub-class of regions, or points, within physical space. These regions or points will be those around which certain events are clustered. Statements about the behaviour of matter will amount to statements about the regions which are the 'source', as it were, of certain other events, including such as occur within nerve tissue and are percepts. Hence, there is no need to credit the 'matter' of the physicist with any independent reality. This clearly results in an immense simplification of our picture of the world.

The place where an object is constitutes a certain finite volume in physical space. In nearly all cases, we cannot know anything about the events characterising the region where the material thing is said to be. The exception to this, as we shall see, is the brain. In any case, events proceed outwards from the place where a given material thing is at the speed of light (in the case of 'luminous' events, i.e. such as would be the direct causal antecedents of visual percepts). As the events belonging to a given object proceed outwards, they undergo two sorts of changes. There are first what might be called 'regular' changes resulting from differences of 'point of view' or 'perspective'. Thus a piece of furniture from one point of view will look different to the way it looks from another point of view. These differences count as differences of 'perspective', and are a function of the location of the place at which the event occurs relative to the object. In addition to such 'regular' changes, there are also alterations resulting from what might be called the 'intervening medium'. Thus mist or fog will alter the appearance of an object, as will blue-tinted glasses. The sense-organs, nerves and brain of the percipient are also to be regarded as belonging to the 'intervening medium'. When a series of events terminates in an appropriate event in brain tissue the resulting event is a 'percept'. A percept is simply an event in a region of space where there is living nerve tissue, that is, a region comprising events that form chains exhibiting 'habits' and learned responses to a very marked degree, such as are characteristic of what we call 'mind'. The existence of such learned responses is what principally distinguishes 'mind' from non-living matter. A burnt child fears the fire, but a poker will not fear the fire however often one places it in the flames. Our ascription of 'minds' to other beings seems to be largely a function of the degree to which we are prepared to suppose that

the entity in question is capable of 'learning'. We might hesitate to ascribe even a rudimentary mind to a jellyfish, since we might not suppose that the jellyfish can form even the simplest conditioned (as opposed to instinctive) reflexes. But a dog certainly does have a mind, because it is capable of learned responses. Thus percepts differ from non-percepts in their causal properties, owing to the physical properties of the medium which they serve to constitute, but they do not differ in any fundamental sense from events elsewhere.

It follows from the above theory that the brain actually *consists* of 'thoughts'. I am here using the word 'thought' in a very wide sense, so as to include percepts. It would perhaps be more accurate to say that percepts are a very tiny sub-class of the events comprising the brain. The fact that the brain consists of thoughts arises in the following manner. The brain consists of neurons, which in turn consist of physical particles. Let us, for the sake of argument, say that the physical particles are all quarks and electrons. Let us also say, for the sake of argument, that each of these particles is to be regarded as occupying a single point. Nothing substantial in our argument is affected if this is not correct. Then each material particle composing the brain, being a point, will be a group of overlapping events, as we discussed earlier. The events constituting a given particle will include all those events we should ordinarily say are 'at' the point in question. Now if percepts are located at certain regions of the brain, then they will be members of all the points comprising these regions, including such as constitute 'material particles'. Thus percepts will be among the events constituting the electrons and quarks composing the brain.

The account is somewhat complicated by the fact that it is not clear whether physics wishes to conceive of the ultimate units of matter as point-like particles. Nevertheless, however physics conceives of the ultimate units of matter, they must surely be conceived as spatio-temporally localised at least to some degree. And thus the ultimate material units of the brain will be some logical construction out of the events occurring in the region where the brain is.

Russell's theory, as adumbrated above, is neither materialism nor idealism but what, following a suggestion by the logician H. M. Sheffer, Russell called 'neutral' monism. The 'neutral stuff' of this monism consists of 'events'. 'Minds' and pieces of matter are classes of events grouped together in different ways. It is quite possible for an event to belong to both groups, and thus to be at once mental and material; indeed, this happens in the case of percepts. Grouped together by 'memory chains' backwards and forwards they form part of the biography of a given 'mind'. Grouped into overlapping classes with other events they form the matter of the brain.

The theory is to be recommended on the ground of its 'elegance', that is, its theoretical and ontological

parsimony. ‘Matter’, as we have seen, can be constructed out of events, and thus need not be supposed to be anything other than a logical fiction. The inference to unperceived events is a good deal less precarious than the inference to the physicist’s ‘matter’ would be, since the former does not involve inferring to a different kind of entity to percepts. Indeed, it is only necessary to invoke considerations of continuity in order to justify our inference to unperceived events. If the only ‘real’ events were percepts, then the world would have some very odd characteristics indeed. Whenever a number of people were observing some pieces of furniture, for instance, there would be events at each of the places occupied by the observers, but not at any intermediate locations. The world would thus have a curiously staccato quality. The inference to unperceived events, therefore, seems reasonably secure. What Russell pointed out is that once the inference to unperceived events is admitted, the philosopher has sufficient materials out of which to construct the ‘space’ and ‘matter’ of the physicist. Thus no *further* inference is required. Similarly, ‘mind’ is susceptible to construction out of certain series of events within the brain. Hence, there is no need to regard either ‘mind’ or ‘matter’ as ontologically fundamental. Both can be dispensed with by an application of Ockham’s Razor.

Russell’s theory, though a form of monism, is not ‘physicalist’ since it holds that there is an aspect of events – namely, their intrinsic nature – which is not captured by physical description. Physics is confined to the description of the space-time structure of events, since this is all that is inferable from our percepts. The intrinsic character of events outside our heads must remain forever unknown. On this view, our knowledge of external reality is abstract and mathematical.

CONCERNING THE PLAUSIBILITY OF RUSSELL’S METAPHYSIC

The Russellian metaphysic inevitably arouses a certain degree of suspicion, simply because it *is* a metaphysic. The history of philosophy is, after all, replete with metaphysical systems, none of them any more credible than their predecessors. What reason is there to think that Russell’s metaphysic is any different, particularly as it seems quite elaborate? How could we ever know it to be true? As a matter of fact, however, I think the Russellian metaphysic is perhaps more modest in its claims than might at first be apparent. For in some ways it bases itself on the fact that we know very little, rather than on the supposition that we know a great deal. Once it is realised that it is based on an essentially sceptical outlook, its merits become much clearer.

To begin with, Russell’s metaphysic results to a large extent from the rejection of the naïve realist view that we have direct epistemic access to external reality. For Russell, naïve realism is self-refuting, because it leads to a physical science with which it is inconsistent. This argument was lucidly expounded by Russell in a passage

which won the admiration of Einstein:

Scientific scripture, in its most canonical form, is embodied in physics (including physiology). Physics assures us that the occurrences which we call ‘perceiving objects’ are at the end of a long causal chain which starts from the objects, and are not likely to resemble the objects except, at best, in certain very abstract ways. We all start from ‘naïve realism’, i.e., the doctrine that things are what they seem. We think that grass is green, that stones are hard, and that snow is cold. But physics assures us that the greenness of grass, the hardness of stones, and the coldness of snow, are not the greenness, hardness, and coldness that we know in our own experience, but something very different. The observer, when he seems to himself to be observing a stone, is really, if physics is to be believed, observing the effects of the stone upon himself. Thus science seems to be at war with itself: when it most means to be objective, it finds itself plunged into subjectivity against its will. Naïve realism leads to physics, and physics, if true, shows that naïve realism is false. Therefore, naïve realism, if true, is false; therefore it is false. And therefore the behaviourist, when he thinks he is recording observations about the outer world, is really recording observations about what is happening in him.²

The fundamental point of Russell’s metaphysic is that we know nothing about the *nature* of physical reality. Matter is known to us essentially as whatever is the cause of our percepts. Since our immediate knowledge is of our own percepts, what else, indeed, could ‘matter’ refer to? But once this is realized, the gulf separating matter from consciousness immediately begins to seem not quite so formidable. Matter comprises regions of space from which ‘radiations’ proceed. These latter consist of some kind of disturbance in the space-time continuum that propagates outwards until it encounters matter. If the matter it encounters includes a human eye, then this will cause a different sort of disturbance in an optic nerve ending in a certain region of the cerebral cortex. Since we know nothing about the nature of any of this chain of occurrences there is no difficulty in principle in supposing that the disturbance in the visual cortex *is* the visual percept.

All the objections you might feel to this suggestion arise from the naively realistic picture of the physical world which physics has falsified. Thus it might seem that the stimulation of nerve fibres in the brain is something quite different to the visual sensation of the person whose brain it is. But this is based on the illusion that the physiologist is directly acquainted with the nerve fibres. If, however, the physiologist’s account of perception is true, then all that *he*, the physiologist, can ever be directly acquainted with are events occurring in his *own* brain, not in the brain he is examining.

2 *An Inquiry into Meaning and Truth*, p. 15.

There is, however, an objection to the identification of percepts with brain processes which may at first seem stronger. Brain processes, it might be said, have a certain highly complex *structure* which is not represented in the corresponding sensation. Therefore, the two cannot be identified. More generally, there is much more going on in the sensory cortices of the brain, at the microphysical level, than is ever represented at the level of phenomenology. Phenomenology seems ‘coarser grained’ than the physical reality on which it supervenes. This objection has come to be known as the ‘grain problem’.³ In the context of Russellian metaphysics it is subject to a straightforward rejoinder. A physical region comprises, not a single occurrence, but a vast number of occurrences. Thus a percept will overlap a vast number of other events. The whole group of events will then be the ‘physical reality’ at the microphysical level corresponding to the neural process. The point is that the grain problem can be easily overcome by admitting that each tiny region of physical space comprises not one occurrence but a vast number. These occurrences will then be said to ‘overlap’. The positing of these occurrences is required precisely by the grain problem.

The outcome is an ‘identity theory’ of conscious states and brain processes, but one that is not physicalist or even, perhaps, materialist, at least in the traditional sense of the term. For ‘matter’ is no more fundamental than ‘conscious states’. What is fundamental are Heraclitean ‘events’. Certain temporal series of these events will constitute ‘minds’; certain other groupings will constitute ‘matter’. Neither is any more ‘real’ than the other since both alike are logical fictions. ‘Mind and matter’, Russell once wrote, ‘were something like the lion and the unicorn fighting for the crown; the end of the battle is not the victory of one or the other, but the discovery that both are only heraldic inventions.’⁴ Russell’s metaphysic is thus a form of ‘identity theory’, but in its weakest form – for as maintained by Russell, it implies mind-body *monism*, but it does not imply either physicalism or ‘materialism’. Indeed it is possible to say of Russell’s monism what John Gaskin has said of what he calls Epicurus’ ‘one-world realism’⁵: ‘the word “physical” [Gaskin writes] is wholly redundant. There is simply nothing else from which this world can or cannot be distinguished as “physical”. There is *one* world, this world, and all that is real is of it.’⁶

Russell’s metaphysic is thus both sophisticated and elegant, whatever we might conclude with respect to its final acceptability. Our task in the next chapter is to show how Russell arrived at this view of the world.

3 See Lockwood, Michael, ‘The Grain Problem’, in Robinson, Howard (ed.), *Objections to Physicalism*.

4 From ‘What Is the Soul?’, in Russell, Bertrand, *The Collected Papers of Bertrand Russell, Volume 10*, p. 204.

5 John Gaskin, *The Epicurean Philosophy*, p. xxvi.

6 Ibid.

Chapter 2

The ‘Problem of Matter’

I. THE PROBLEM OF MATTER, 1911-13

The first three chapters of *The Problems of Philosophy*, written at the end of 1911 and published early the following year, comprise Russell’s first sustained discussion of perception; and it is clear at once that Russell is operating within a fairly traditional empiricist framework. He begins his account by distinguishing between the matter of the physicist and the immediately perceptible qualities of things. All the qualities we perceive depend on the conditions under which a given object is viewed and therefore cannot be regarded as belonging to the object itself. The real table, if it is known at all, must be known by inference from our immediate data of sense. Our immediate data are not physical objects but ‘such things as colours, sounds, smells, hardnesses, roughnesses, and so on.’¹ These Russell terms ‘sense-data’, a term that was already in use by the end of the nineteenth century, and which was used by William James in his *Principles of Psychology* published in 1890.² The quotation above might make it seem that Russell is using the term ‘sense-datum’ to stand for sensory qualities. However, it is clear from the discussion that follows that by a particular ‘colour’ he does not mean a particular shade, but rather the particular *occurrence* of a shade of colour on a particular occasion. Thus if the precise same shade were to occur to two different observers, or to the same observer at two different times, then this would count as two separate sense-data.

Ultimately, Russell contends, there is no logical absurdity in supposing that I myself conjure up all the objects I imagine I am observing and that the whole of my life is a dream. However, this hypothesis, Russell says, is ‘a less simple hypothesis, viewed as a means of accounting for the facts of our own life, than the common sense hypothesis that there really are objects independent of us, whose action on us causes our sensations.’³ This is illustrated with an example of a cat. If a cat is seen first at one place, and then at another, it is natural to suppose that it occupied a series of intermediate positions. But if the cat exists only as my sense-data we should have to believe that it ‘did not exist at all while I was not looking, but suddenly sprang into being in a

1 *The Problems of Philosophy*, p. 4.

2 For the somewhat obscure origins of the term ‘sense-datum’ see Roland Hall, ‘The Term “Sense-Datum”’, *Mind* Vol. 73, No. 289 (Jan. 1964), pp. 130-1.

3 Russell, *op. cit.* p. 10.

new place.’⁴ Without the hypothesis of a ‘real’ cat, further oddities become inevitable.

If the cat exists whether I see it or not, we can understand from our own experience how it gets hungry between one meal and the next; but if it does not exist when I am not seeing it, it seems odd that appetite should grow during non-existence as fast as during existence. And if the cat consists only of sense-data, it cannot be *hungry*, since no hunger but my own can be a sense-datum to me. Thus the behaviour of the sense-data which represent the cat to me, though it seems quite natural when regarded as an expression of hunger, becomes utterly inexplicable when regarded as mere movements and changes of patches of colour, which are as incapable of hunger as a triangle is of playing football.⁵

Thus ‘every principle of simplicity urges us to adopt the natural view, that there really are objects other than ourselves and our sense-data which have an existence not dependent upon our perceiving them.’⁶

Whether Russell’s appeal to ‘simplicity’ will do the work required of it is debatable. He speaks of the absurdity of seeing the ‘cat’ at one moment and then, after an interval during which it is not observed, supposing that it springs into existence, when in all strictness he ought not to be speaking about ‘cats’ at all but merely feline sense-data. Unlike the cat, our sense-data really are discontinuous, and are acknowledged as such by Russell, and thus their discontinuity should not be an occasion for surprise. Thus Russell seems to trade on a naïve realist view of perception, which he is in fact seeking to replace, in order to establish the existence of external objects. In this way, he perhaps makes his inference to the continued existence of the physical cat seem more ‘natural’ than in fact it is. This difficulty was really first pointed out by Hume in his *Treatise of Human Nature*.⁷ Having discovered that what he calls the ‘vulgar system’ of common sense realism is untenable, what the philosophers have done, according to Hume, by setting up a theory of representative realism is in effect to invent a duplicate world of perceptions that possess the characteristics of continuity that our actual perceptions lack. But this ‘philosophical system’ is a fraud, for it trades for its credibility on the vulgar system which it seeks to displace. Had the immediate objects of our awareness been acknowledged as discontinuous from the start (as is implied by the representative realist’s rejection of the vulgar system) then we should never have had occasion to infer the existence of a physical world of any sort from them.

What all this shows, I think, is that the appeal to ‘simplicity’ to justify our belief in ‘matter’ requires a much more elaborate treatment than Russell gives it. Indeed, as we shall see, Russell himself soon began to feel that

4 Ibid.

5 Ibid, pp. 10-11.

6 Ibid, p. 11.

7 See Hume, *Treatise of Human Nature*, Book I, Part IV, Section II, ‘Of scepticism with regard to the senses.’, pp. 187-218.

his justification for our belief in external objects had been too glib.

Returning to the account in *The Problems of Philosophy*, having established the existence of matter, at least to his own satisfaction, Russell goes on to consider what, if anything, we can know about its nature. The space of physics is not to be identified with any of the spaces of our sense modalities. However, there should be a rough correspondence between the position of sense-data in our private spaces and the position of physical objects in physical space. This correspondence enables us to determine the order or arrangement of physical objects in physical space, but does not permit us to know anything concerning the nature of this space, or, for that matter, of the objects that are ordered in this space. Russell says that we can know certain facts about the *relations* of physical objects. For example, of two distances between two pairs of objects we can know of one distance that it is greater than the other. It is, then, the mathematical features of reality that are knowable, not its intrinsic nature.

This idea was first mooted as far back as 1905, in a review of Poincaré's *Science and Hypothesis* which Russell wrote in that year. In this review, Russell expresses approval of Poincaré's idea that we can only know about the *relations* of physical things, not the things themselves. But, significantly, he adds that 'We may even push the theory further, and say that in general even the relations are for the most part unknown, and what is known are properties of the relations, such as are dealt with by mathematics.'⁸ Thus, in 1912, the idea that we can only know the abstract mathematical features of external reality was already quite an old one for Russell. It was to suffer a temporary eclipse in the years after 1912 as Russell sought to define matter in terms of materials not wholly unlike sense-data, only to re-emerge in the 1920s. In its mature form, the principle states that physics tells us only the *structure* of the physical world, but can tell us nothing about its *intrinsic nature*, a view which has come to be known as 'structural realism'.

'Structure', incidentally, has a precise mathematical definition. At the same time, it is possible that Russell had not at this stage realised the precise nature of structural realism. For he does not refer specifically to the concept of 'structure' in his account. Russell *does* refer to the 'order' of external things as something we can know, and the notion of 'order', or ordinal number, is an instance of the more general concept of relation number, which is central to the concept of structure that Russell and Whitehead had developed in their *Principia Mathematica* (1910-13). Of course, such mathematical technicalities as 'relation number' would no doubt have been out of place in a more or less popular exposition. Nevertheless, there is no indication that at this stage that Russell had determined that the precise concept of 'structure' was of central importance to his philosophy of physics.

8 'Review of Poincaré' (1905), in *Collected Papers 4*, pp. 593-4.

There were to be further interesting developments later on in 1912 that were embodied in an unpublished paper entitled 'On Matter'.⁹ The overall tone of this paper, as Russell himself realised, is much more sceptical concerning the possibility of knowledge of the physical world than his earlier writing had been. To his lover Lady Ottoline Morrell, Russell wrote 'I expect my paper on matter will be a model of cold passionless analysis, setting forth the most painful conclusions with utter disregard of human feelings. I haven't had enough courage hitherto about matter, I haven't been sceptical enough. I want to write a paper which my enemies will call "the bankruptcy of realism".'¹⁰ The paper opens by saying:

In what follows, I shall endeavour to maintain three theses:

- (1) That all the arguments hitherto alleged by philosophers against matter are fallacious;
- (2) That all the arguments hitherto alleged in favour of matter are fallacious;
- (3) That, although there may perhaps be reason to suppose that there is matter, yet we can have no means of finding out anything whatever as to its nature.¹¹

This opening statement represents an attractive programme. However, rather than arguing directly for these theses, Russell instead opts to consider what we could mean by the word 'matter'. In connection with this he introduces a powerful new idea into his philosophy of physics. Instead of accepting the concept of matter as relatively unproblematic and asking how we can be justified in inferring it, Russell is now disposed to define matter as whatever it is that physics deals with. This makes it possible to identify 'matter' with some logical construction. The elements of this construction might then be arrived at as a result of an inference from sense-data which is less problematic than a direct inference to the 'matter' of the physicist would be. 'Matter', Russell considers, can be defined as 'that class of objects, if any, which are inferrible from sense-data and satisfy the hypotheses of physics.'¹² The question now becomes whether any such class of entities *are* inferable from sense-data.

Among the arguments in favour of matter that Russell now regards as fallacious is the argument from the supposed simplicity of the physical hypothesis. We saw how in *The Problems of Philosophy* Russell had appealed to a criterion of 'simplicity' to justify our belief in external objects. Now, however, he is breezily dismissive of such a criterion. He writes that the argument from simplicity 'is merely teleological, and has absolutely no weight whatever.' And he continues 'If it were known that the universe had been created for the

9 Reproduced in *Collected Papers* 6, pp. 80-95.

10 Quoted in quoted in *Collected Papers* 6, p. 77.

11 *Collected Papers* 6, p. 80.

12 *Ibid*, p. 83.

purpose of delighting mathematicians, there would be some reason to suppose that, of two hypotheses which both fit the facts, the simpler is more likely to be true. As, however, there is no evidence that this is the purpose of the universe, there is no reason whatever to expect the true laws of nature to be simple.¹³

The question, for Russell, is one of supplying physics with a true interpretation. But there is no reason to assume that the ‘simplest’ interpretation is the true one. Instead, we should opt for the interpretation which involves the fewest and least precarious assumptions. Ideally, it would be an interpretation in terms of sense-data alone. However, at this stage, Russell does not think that such an interpretation is available. The science of dynamics requires a material world with a many-one relation to sense-data. In astronomy, for example, it is assumed that a celestial body has a radius vector (i.e. a distance from the point of observation) to which nothing in the astronomer’s sense-data corresponds. Therefore, the ‘problem of matter’, i.e. the problem of justifying our belief in a physical world, becomes the question ‘what ground have we for supposing that the relation of the state of the world to our sense-data at any moment is many-one, not one-one?’¹⁴

To answer this question, Russell sets up the following thought experiment:

To clear our ideas, let us imagine an ideally simplified world, in which our only sense-data are two discs, one red and one yellow, which move backwards and forwards in what appears to be a straight line, with periodic changes of velocity. Let us suppose that when they reach the same line of sight, sometimes the red disc gradually disappears and reappears, and sometimes the yellow disc does so. How will science interpret such a series of events? One obvious interpretation will be to regard the two discs as the sensible representatives of two spheres, moving in ellipses about their common centre of gravity in the same plane with the observer. This interpretation, in common with any other that current science would be likely to entertain, assigns to the physical objects a property of distance to which nothing sensible corresponds. It may be said that the apparent size of the discs will vary with the distance. But if the difference between the greatest and least distances is very small compared to the mean distance, the difference of apparent size will be imperceptible. It is therefore not this that causes us to assume distance: what makes us assume distance is the difference between the case when the red disc is eclipsed and the case when the yellow disc is eclipsed. We may suppose the sensible antecedents of the two cases exactly similar, and yet the result different. Hence we infer differing antecedents which were not sensible.¹⁵

13 Ibid, p. 86.

14 Ibid, p. 88.

15 Ibid, p. 90.

The principle on which we rely in such cases is something like ‘different effects, different causes’ which is the corollary of ‘same cause same effect’. This principle, says Russell ‘is of fundamental importance in establishing the existence of matter’.¹⁶

At the same time, Russell says that this result is only preliminary. For a start, in the real world, as opposed to the ideally simplified world in our thought experiment, the total sense-data of one moment are practically certain to be different from the total sense-data at any subsequent moment. Hence, even assuming the truth of physical science, the relation of total sense-data to the world is still likely to be one-one. We need to be able to break up the totality of sense-data into different groups corresponding to different objects if our principle is to yield the results required of it.

Rather than tackle these issues, Russell decides to shelve them for another day. Instead, in the short second section of the paper, he sketches a radically new theory of perception. Russell has already decided that physics cannot be interpreted in terms of sense-data alone. But now Russell considers the possibility that ‘qualities which are or resemble sense-data, or at least those of sight and touch, exist at times when they are not given in sense.’¹⁷ This possibility had already been very briefly alluded to in section I of the paper. The sense-data of one person do not supply sufficient materials wherewith to construct a stable physical world. The world that results merely from considering one man’s sense-data is too staccato to sustain our common sense notion of ‘things’. If all that exists are my sense-data then the furniture of my room ceases to exist when I leave my room. But once we realise that the occurrences that are sense-data can exist when they cease to be data we can, Russell thinks, construct a stable enough world for the purposes of common sense and physics.

The theory is not phenomenalistic. The unsensed items exist just as much as sense-data. In some ways, this metaphysic is reminiscent of Berkeley. However, the unperceived items are in no sense mental and do not require an observer, either human or divine, to sustain their existence.

‘Matter’ then will consist of items not differing fundamentally from sense-data and actually including sense-data as constituents. This view, Russell argues, is to be commended on the ground that the inference to ‘constituents of the same *kind* as the data of sense’ is ‘less precarious’ than the inferences that would otherwise be required to directly establish the existence of the physicist’s ‘matter’.¹⁸

The apparent difficulties this point of view throws up can, Russell suggests, be met by sufficient boldness.

16 Ibid, pp. 90-91.

17 Ibid, p. 93.

18 Ibid, p. 94.

Thus it might be supposed that if we admit that each person's sense-data of a given part of the surface of an object actually belong to that object then we shall be faced with the problem of ascribing incompatible colours to one and the same place. With the aid of ideas derived from T. P. Nunn's paper 'Are Secondary Qualities Independent of Perception?', to which Russell refers, Russell now thinks that there is no difficulty in supposing that different colours can co-exist at the same physical place.¹⁹ Russell does not develop these ideas any further in the paper, but in some unpublished manuscripts on 'matter' reproduced in *Collected Papers 6* and written over 1912 and 1913 Russell develops the notion, derived from Nunn, that instead of supposing that a quality is at a place *simpliciter* we should instead say that a quality is at a place *from* a place. The idea of their being two places associated with every sensed element is first mooted in a short manuscript entitled 'Matter, the Problem Stated'.²⁰ The distinction between the 'place from' and the 'place at' which a given element is sensed was to be considerably developed before playing a key rôle in the 1914 paper 'The Relation of Sense-Data to Physics'. In any case, this distinction enables us to preserve the notion that what we perceive are the actual qualities of physical objects. The price we pay for this, of course, is that the 'thing' of common sense is broken up into a vast number of sense-data relativised to points of view.

Summing up his discussion in 'On Matter', Russell writes that the best way of avoiding scepticism about matter would seem to be by preserving 'what is most essential' to naïve realism, namely the view that our sense-data do not depend for their existence on our perceiving them. He goes on to write that:

It seems possible that this view might be preserved by assuming that all that could be a sense-datum to any possible observer actually exists, and that collections of such actual and possible sense-data are bound together in ways which enable us to regard them as one 'thing'. The 'matter' of the physicist and the 'thing' of common sense will then be collections of constituents of the nature of sense-data, some actually perceived, some not. Most of these constituents of one 'thing' will have a certain resemblance to each other, but some will be erratic; it is these erratic constituents which are perceived in dreams and hallucinations.²¹

The view expressed at the end of 'On Matter' is, of course, just an outline. The ideas in the paper foreshadow the ideas he was to develop in a more sophisticated manner later on, after a hiatus during which he worked on the abortive *Theory of Knowledge*. No doubt it was because the ideas contained in 'On Matter' were in embryonic form that Russell felt no need to have the paper published during his lifetime. The paper is also somewhat rambling. Nevertheless, it contains so many novel and interesting ideas that it deserves to be more

¹⁹ Nunn's paper is published in *Proceedings of the Aristotelian Society, Volume 10, 1909-19*, pp. 191-231.

²⁰ Reproduced in *Collected Papers 6*, pp. 98-99.

²¹ *Collected Papers 6*, p. 95.

widely read than it is.

Perhaps the most important idea in the paper is that matter should be defined as what physics deals with, rather than vice versa. Assuming that physics is susceptible to some true interpretation, we find out what this realist assumption actually entails concerning the fundamental ingredients of reality. We then only assume such entities as are necessary to fulfil the rôle of these ingredients, remembering that the fundamental *physical* ingredients of reality may well turn out to be complicated logical constructions out of more primitive elements. In any case, whatever fulfils the required rôle can be taken as *being* the ‘matter’ of the physicist, however different to the traditional conception of matter it might be.

II. THE NEW IDEAS OF 1914

In 1914 Russell came up with several new ideas concerning the nature of the physical world. These ideas were set forth in his book *Our Knowledge of the External World* (1914) and in a number of papers written at about the same time, namely ‘The Relation of Sense-Data to Physics’ (written in January 1914), ‘On Scientific Method in Philosophy’ (written in November of 1914), and ‘The Ultimate Constituents of Matter’ (written in early 1915 and completed by mid-February of that year).

Most of *Our Knowledge of the External World* was written in the last months of 1913. However, Kenneth Blackwell has persuasively argued that the account of six dimensional ‘perspective space’ towards the end of Lecture III was added to the book *after* the composition of ‘The Relation of Sense-Data to Physics’.²² This is corroborated by Russell’s own testimony, for in *My Philosophical Development* he wrote: ‘There were several novelties in the theory of our knowledge of the external world which burst upon me on New Year’s Day, 1914. The most important of these was the theory that space has six dimensions and not only three.’²³ Blackwell has shown how Russell incorporated ideas from his paper into Lecture III of the book (which accounts for the fact that this lecture is significantly longer than any of the others) because he regarded the formulation of his ideas about space as they are set out in the paper as in some respects more satisfactory than anything he had previously written in the book.

The three papers I referred to above were all reprinted in Russell’s 1918 collection *Mysticism and Logic*. However, interestingly, the order of the papers in *Mysticism and Logic* does not follow their order of

²² See John G. Slater’s Introduction to the 1993 edition of Bertrand Russell, *Our Knowledge of the External World*.

²³ *My Philosophical Development*, p. 105.

composition. On the contrary, both ‘On Scientific Method in Philosophy’ and ‘The Ultimate Constituents of Matter’ are placed before ‘The Relation of Sense-Data to Physics’. In *The Collected Papers 8* an explanation is supplied for this. The authors use a bold type ‘1’ to refer to ‘The Relation of Sense-Data to Physics’ and a bold type ‘4’ to refer to ‘On Scientific Method in Philosophy’. “‘The Ultimate Constituents of Matter’ [they write] makes no mention of “sensibilia” which are so prominent in 1. Instead he favours “data of sense”, “sensible objects”, “objects of sense” and “particulars”. The language of this essay, then, resembles more closely the language of *Our Knowledge of the External World* (1914) and its derivative, “On Scientific Method in Philosophy” (4), than the language of 1. By placing it before 1 in his book Russell seems to be treating it as a popular introduction to the technical topics in 1.’²⁴

This is not to downgrade the other papers written at this time. On the contrary, as is noted in the introduction to ‘On Scientific Method in Philosophy’ in the *Collected Papers 8*, although ‘the central methodological points made in the lecture [i.e. ‘On Scientific Method in Philosophy’] are all to be found in the book [i.e. *Our Knowledge of the External World*]’ they are nevertheless ‘put into sharper focus in the lecture. His [Russell’s] requirement that all philosophical propositions be both general and à priori, and his claim that “*philosophy is the science of the possible*”...are two examples of points made explicit in the lecture which are implicit in the book.’²⁵

The construction of physical objects expounded in ‘The Relation of Sense-Data to Physics’ was to remain unchanged in Russell for some years. The same construction is set out in *The Analysis of Mind* in 1921. The only difference in this later work is that the terminology is slightly different. In ‘The Relation of Sense-Data to Physics’ Russell talks of ‘sensibilia’ and ‘sense-data’; in *The Analysis of Mind* he talks of ‘particulars’ and ‘sensations’. This is essentially a change in terminology. However, there was a change in Russell’s broader metaphysic between ‘The Relation of Sense-Data to Physics’ and *The Analysis of Mind*. In 1918 Russell abandoned the ‘subject’ of experience and thus embraced ‘neutral monism’. The change in the terminology that Russell used reflects this shift, since in his earlier philosophy Russell had regarded a ‘sense-datum’ as a constituent of a sensation, this latter comprising the subject in a relation of direct acquaintance with the sense-datum. Once Russell abandoned the subject, the distinction between the sense-datum and the sensation evaporated and there was no longer any need for the more technical term ‘sense-datum’. Effectively, however, the ‘sensation’ had now become what had formerly been referred to as the ‘sense-datum’, though this latter was no longer conceived as the ‘object’ of a psychological ‘act’.

I shall now briefly set out the construction of the physical world as it was elaborated by Russell in the period

²⁴ *Collected Papers 8*, p. 74.

²⁵ *Ibid*, p. 56.

from 1914 to 1921, concentrating in particular on the exposition in ‘The Relation of Sense-Data to Physics’ but also taking note of *Our Knowledge of the External World* and *The Analysis of Mind*.

‘The Relation of Sense-Data to Physics’ is a masterpiece of lucid exposition. In contrast to ‘On Matter’ one feels that Russell has arrived at much more definite views on the philosophy of perception. The metaphysic set out in the paper is somewhat similar to Leibniz’s monadology to which, indeed, Russell compares it. To begin with, each observer views the world from a certain point of view. The ‘spaces’ belonging to my various sense modalities have no place in common with the spaces of the sense modalities belonging to other observers. On this ground they can be termed ‘private spaces’. A private space contains ‘appearances’ belonging to every object that is perceptible from the place where the observer is. Besides the appearances that things present in private spaces that are observed, it is reasonable, Russell thinks, to suppose that things present appearances at places where there are no percipients. He writes, ‘If a man were to sit down between two others, the appearances which the room would present to him would be intermediate between the appearances which it presents to the two others; and although this appearance would not exist as it is without the sense organs, nerves and brain, of the newly arrived spectator, still it is not unnatural to suppose that, from the position which he now occupies, *some* appearance of the room existed before his arrival.’²⁶ Russell coins the term ‘sensibilia’ (singular ‘sensible’) to denote the ‘appearances’ of things, whether they are data for some observer or not. This is in order to obviate the suggestion of the word ‘appearance’ that the appearance must ‘appear to’ some observer.

‘Sensibilia’, it should be noted, are not at all like Mill’s ‘permanent possibilities of sensation’; they are actual existents whether they are observed or not. When they are observed they are ‘sense-data’. To this extent they *can* be described as ‘possible sense-data’, but only in the sense that a ‘man’ can be described as a ‘possible father’. No one thinks that a man who becomes a father springs into existence at the moment he becomes a father but previously only existed in a shadowy limbo as a ‘possible father’. The same considerations go for the relation of ‘sensibilia’ to ‘sense-data’. Russell’s own example is the relation of the term ‘man’ to the term ‘husband’. He writes that ‘the relation of a *sensible* to a sense-datum is like that of a man to a husband: a man becomes a husband by entering into the relation of marriage, and similarly a *sensible* becomes a sense-datum by entering into the relation of acquaintance. It is important to have both terms; for we wish to discuss whether an object which is at one time a sense-datum can still exist at a time when it is not a sense-datum. We cannot ask “Can sense-data exist without being given?” for that is like asking “Can husbands exist without being married?” We must ask “Can *sensibilia* exist without being given?” and also “Can a particular *sensible* be at one time a sense-datum, and at another not?” Unless we have the word *sensible* as well as the word “sense-

26 ‘The Relation of Sense-Data to Physics’, in *Collected Papers* 8, pp. 10-11.

datum”, such questions are apt to entangle us in trivial logical puzzles.’²⁷

Drawing on ideas which, as we have seen, he developed between 1912 and 1914, Russell introduces a distinction between two places, the ‘place at’ which a given sense-datum appears, and the ‘place from’ which it appears. The ‘places’ concerned are not places within sensible space itself, but are instead places in a space resulting from the ordering of the ‘points of view’ or ‘perspectives’ within which the sense-data occur. A ‘perspective’, in this context, can be regarded as comprising all the private spaces observable at a given place.

In order to work out the details of this ordering of perspectives in ‘perspective space’ Russell uses an example of a penny seen from different points of view. From some perspectives, the penny will appear circular, in others elliptical. Beginning with all those perspectives from which the penny looks circular, we order them in a series according to how large the penny looks from each of these perspectives. This series, then, forms a line in our perspective space. The perspectives in which the penny appears completely edge on all lie in a plane. In this instance there will be many perspectives from which the penny appears the same size. These groups will form concentric circles around the penny ordered as before by the apparent size of the penny. By such means every perspective from which the penny appears can be located in a three dimensional space. In each series in which the apparent size of the penny grows larger, there will be a limit due to the fact that were the penny any nearer to the eye it could no longer be seen. However, by imagining each of the series indefinitely prolonged so as to form lines continuing ‘beyond’ the last point from whence the penny can be seen, they will all converge at a certain perspective. This will be ‘the place where the penny is’ in perspective space. By locating physical objects, such as the penny, in perspective space, Russell identifies physical space with perspective space. Physical space, then, is a space of six dimensions, being a three dimensional ordering of three dimensional perspectives.

The ‘place from’ which the penny appears will be the perspective at which a sensible belonging to the penny occurs; the ‘place at’ which it occurs will be the perspective where the penny is in the above construction. There is also a third ‘place’ associated with every sensible, namely the place which the sensible occupies in its ‘private space’ or perspective in relation to other sensibilia comprising the same perspective. Thus there are *three* places associated with every sensible alongside a distinction between *two* sorts of space – the private space, or spaces, of each perspective and the ‘perspective space’ resulting from the ordering of perspectives in relation to each other. One interesting consequence of this construction is that the whole of the contents of my ‘private world’ will have an actual location in physical space. Indeed, all my sense-data will be ‘in my head’.

27 Ibid, p. 7.

Furthermore, ‘Since our mind is correlated with the perspective to which our sense-data belong, we may regard this perspective as being the position of our mind in perspective space.’²⁸ Consequently, ‘there is a good meaning for the statement that the mind is in the head.’²⁹ This idea is not perhaps entirely new to Russell, but is a revival or restatement of a position Russell had held much farther back. For, in 1902, Russell had written a paper (which remained unpublished) entitled ‘Do Psychological States Have Position in Space?’³⁰ in which he answered this question in the affirmative. The arguments in this paper do not strike me as entirely convincing. None of them are conclusive, although they raise a number of interesting issues, such as how it is possible that indexicals such as ‘here’ can have significance. In an interesting anticipation of ideas to which he would return much later on in his career, Russell rejects the notion of a permanent ego underlying experience, declaring that the soul ‘seems to be a mere delusion’, and continuing ‘for my part, I should regard personality as a term not capable of precision, but compounded of a mixture of memory with sameness of body.’³¹ The question is thus, not whether ‘I’ have a position in space, but whether separate ‘thoughts’ have a spatial position and the conclusion of this short paper is that thoughts are in our heads. In 1914, then, this notion was revived as a result of his placing sense-data in physical space.

In any case, on the basis of the above construction Russell goes on to say that there are two ways of collecting sensibilia into bundles. One can collect together all the sensibilia that are appearances of a given object from diverse perspectives, or one can collect together all the sensibilia that are appearances of diverse objects from a given perspective. In the second way one has a collection of interest to psychology; in the first the class can be identified with the ‘physical object’. Thus a physical object will simply be a collection of all the sensibilia that we should normally regard as being appearances, or effects, ‘of’ the object in question.

The question remains how we are to assign appearances to distinct physical objects. Neither resemblance nor continuity are sufficient criteria, since (for example) one can pass continuously from a drop of water in the ocean to another drop in the ocean, and yet the two portions of water can be regarded as materially separate. What we need in addition to continuity is something like conformity with physical law.

These considerations lead Russell in *Our Knowledge of the External World* to define a physical ‘thing’ as ‘those series of aspects which obey the laws of physics.’³² Of course, strictly speaking, it is not the common sense ‘thing’ that conforms to physical laws, but rather ‘matter’. The ‘matter’ of the physicist requires a somewhat elaborate treatment owing to the fact that the appearances of objects are distorted by the

28 Ibid, p. 16.

29 Ibid.

30 Reproduced in *Collected Papers* 3, pp. 544-9.

31 *Collected Papers* 3, p. 545.

32 *Our Knowledge of the External World*, pp. 115-6.

‘intervening medium’ between the place where they occur and the place where the object is to which they belong. In general, as we move closer to the object, the distortion due to the intervening medium grows less. Consequently, in ‘The Relation of Sense-Data to Physics’ Russell supplies a preliminary definition of the ‘matter’ of a given object as the *limit* of the sensibilia belonging to the object as their distance from the object diminishes, though, as we shall see, Russell regards this definition as ‘not quite satisfactory’³³ and attempts to refine his definition in *The Analysis of Mind* (about which more later).³⁴

Nevertheless, the definition of matter allows Russell in ‘The Relation of Sense-Data to Physics’ to give the slightly sharper definition of ‘physical things’. ‘*Physical things* [he writes] *are those series of appearances whose matter obeys the laws of physics*’ adding ‘That such series exist is an empirical fact, which constitutes the verifiability of physics.’³⁵

The idea that ‘matter’ should be identified with groups of ‘sensibilia’ might be thought to be a concession to idealism. This, however, would not be Russell’s view, since Russell holds that sensibilia are *physical*, and not mental, elements. The reasons for this view are set out in Section IV of ‘The Relation of Sense-Data to Physics’ entitled ‘Sense-Data are Physical’. Russell admits that it is unlikely that any sense-datum persists unchanged after ceasing to be a datum, since the way things appear depends on the state of our physiology. But this is a dependence on something physical (our bodies) not on something ‘mental’. The physiology of an observer can thus be regarded as part of the ‘intervening medium’ of observation. We cannot know what sensibilia are like where there are no sense-organs, nerves and brain, for we carry these around with us.

In 1915, not only are sense-data physical, but also they are definitely *not* mental. In a report to *The Athenaeum* concerning a discussion of phenomenalism at which Russell was present, the author says that according to Russell ‘the sense-datum is mental’.³⁶ This led Russell to fire off a letter to a journal in which the report appeared in which he said ‘I did not see the *Athenaeum*, and do not remember what I said, but it can not have been what I am reported as having said, for I strongly hold that the sense-datum is *not* mental – indeed my whole philosophy of physics rests upon the view that the sense-datum is purely physical.’³⁷ Russell says that he does not know how he would define the word ‘mental’ but suggests that it is applicable to *facts* rather than particulars of any sort, i.e. my being acquainted with a particular shade of blue would be ‘mental’, since it involves acquaintance, but the shade of blue would not. Thus a mental fact can include as a constituent an object or entity that is not mental. Thus, Russell’s considered opinion after writing ‘The Relation of Sense-

33 ‘The Relation of Sense-Data to Physics’, reprinted in *Collected Papers 8*, p. 17.

34 See below, Chapter 3, section II, ‘The definition of matter’ (pp. 44-6).

35 ‘The Relation of Sense-Data to Physics’, reprinted in *Collected Papers 8*, p. 22.

36 Reprinted in *Collected Papers 8*, p. 311.

37 Reprinted in *Collected Papers 8*, p. 88.

Data to Physics' was that nothing mental was physical or vice versa, but that a mental fact could include something non-mental (and physical) as a constituent.

Russell's ground was to shift somewhat when he wrote *The Analysis of Mind* due to his adoption of neutral monism. As a result of his identification of the sensation with the sense-datum sensations are now regarded as physical as well as mental occurrences. On the other hand, there are still particulars that are purely physical (the unsensed 'appearances' of things). Furthermore, there are particulars, such as mental images, that do not enter into the construction of physical objects, but do enter into the construction of minds. These elements are purely mental. The 'neutral stuff' of *The Analysis of Mind* consists of 'happenings' that are deemed 'mental' or 'physical' by their membership of 'mental' or 'physical' groups. Sensations represent the 'intersection' of mind and matter. But in themselves, the elements of minds and pieces of matter are neither mental nor physical.

We have said something about Russell's construction of physical space and matter. Next, we shall say something about time. In this earlier phase of his thought, Russell regards the 'one all-embracing time' of physics as just as much a construction as physical space. Between two perspectives belonging to the history, or 'biography', of a given observer there will be a *direct* time relation of before and after. This suggests a way of defining local times without introducing anything 'mental'. 'We may define a "biography"', Russell writes, 'as everything that is (directly) earlier or later than, or simultaneous with, a given "sensible".'³⁸ Consequently, there will be 'biographies' that do not belong to any 'mind'. 'By this means', Russell goes on to say, 'the history of the world is divided into a number of mutually exclusive biographies.'³⁹ The reference to biographies being 'mutually exclusive' is interesting. It shows, I think, that at this stage Russell does not conceive of any biography as having any ingredient in common with any other biography. Thus biographies, and by implication perspectives, do not 'intersect'.

This is confirmed by his discussion of the definition of 'place' or 'perspective' in *The Analysis of Mind*. Here he writes that we may define a 'perspective' to which a given sensation belongs as 'the set of particulars that are simultaneous with this sensation.'⁴⁰ One perspective will comprise all my sensations and images at one moment, a group that Russell was later to call my 'total momentary experience'. Consequently, every member of this perspective will be simultaneous with every other member. Now notice that this consequence does not follow from the definition of perspective as the set of particulars simultaneous with a given sensation, unless we suppose simultaneity to be a transitive relation; for otherwise, a sensation could be simultaneous with two

38 'The Relation of Sense-Data to Physics', in *Collected Papers 8*, p. 18.

39 Ibid.

40 *The Analysis of Mind*, p. 128.

particulars that are not simultaneous with each other, and this would mean that the set would not comprise solely the contents of one perspective. Two particulars that were not simultaneous with each other would belong to different perspectives and any sensation that was simultaneous with both of them would belong to both of these diverse perspectives. In this circumstance, perspectives could have members in common, and ‘intersect’. Russell’s definition of perspective, however, implies that this is *not* possible. Perspectives have no members in common and thus, in practice, ‘simultaneity’ is a transitive relation.

In Russell’s later metaphysic, ‘compresence’ replaces ‘simultaneity’ and ‘complete complexes of compresence’ come to replace ‘perspectives’. ‘Compresence’ is just like simultaneity, except that it is a *non-transitive* relation. A complete complex of compresence, which includes my ‘total momentary experience’ as an instance, is defined as a class of items, or ‘events’, all of which are compresent with each other and which is such that nothing outside the group is compresent with *every* member of it. It follows that an event can be a member of two such complexes; that is, an event could be compresent with events that are not compresent with each other.

This may seem a somewhat theoretical discussion, but it brings out an important difference between the ‘particulars’, or ‘sensibilia’, of Russell’s earlier philosophy, and the ‘events’ of his later. A perspective counts as a ‘point’ in physical space. Particulars are elements of only one perspective. They exist, therefore, at only one point in space. Thus, particulars are extended in *time*, but not in space. Their relations of temporal overlapping can be used to define ‘instants’ in the biography to which they belong. But although a given particular can exist at a number of instants belonging to one biography, it cannot belong to more than one point of space at any one moment. If a particular is simultaneous with two particulars that are not simultaneous with each other than one of these particulars precedes the other in time, and this time-relation is *direct*, not constructed.

In the later metaphysic, ‘point-instants’ are ‘complete complexes of compresence’ and an ‘event’ can be at more than one such complex. The events with which a given event is compresent, if they are not compresent with each other, need not be before or after each other. This means that ‘events’ occupy a finite continuous region of space. They have acquired a ‘thickness’ in space-time. Indeed, every event in the universe is linked to every other event by a chain of ‘overlapping’ or ‘compresence’. Thus, in his 1928 letter to Newman, Russell writes that ‘I had assumed that there might be co-punctuality [i.e. overlapping] between percepts and non-percepts, and even that one could pass by a finite number of steps from one event to another compresent with it, from one end of the universe to the other.’⁴¹

41 Reproduced in *Autobiography*, p. 413.

Similarly, in the later philosophy there are *direct* (as opposed to constructed) time relations between any two events where one has a ‘time-like’ interval to the other, but this is not the case in the earlier metaphysic. In *The Analysis of Mind*, for example, Russell writes that ‘Such time relations as can be constructed between events in different biographies...are not experienced, and are merely logical, being designed to afford convenient ways of stating correlations between different biographies.’⁴²

Thus the switch from ‘particulars’ in *The Analysis of Mind* to ‘events’ in *The Analysis of Matter* is not merely a change of terminology, but is a modification, or addition, to the physical properties of Russell’s fundamental ingredients, his ‘neutral stuff’. Essentially, whereas ‘particulars’ were extended in time but not (at least explicitly) in space, the ‘events’ of Russell’s mature philosophy are extended in space as well as in time. This is something which I don’t believe has been noticed before. Its importance lies in the fact that it reveals that Russell did make significant *tacit* modifications to his metaphysic, which perhaps justifies the broad division of his philosophical development after 1914 into two periods – that culminating in *The Analysis of Mind*, published in 1921, and a later period culminating in *An Outline of Philosophy* and *The Analysis of Matter*, both published in 1927. However, it is important to be clear about the somewhat technical nature of the change that occurred in the second period. In particular, it is a myth to suppose that Russell lurched from a straightforwardly phenomenalist point of view to an equally uncompromising scientific realism. In the next chapter, I shall deal with the earlier phase of Russell’s thought, and in particular tackle the vexed question of Russell’s alleged ‘phenomenalism’.

42 *The Analysis of Mind*, pp. 128-9.

Chapter 3

Russell and Phenomenalism

I. WAS RUSSELL EVER A PHENOMENALIST?

It is often maintained that Russell's earlier construction was either phenomenalistic, or at least 'more or less' phenomenalistic. We have already seen that 'sensibilia' are not to be construed as 'possibilities of sensation'. If this is the ground on which Russell's metaphysic is treated as phenomenalistic then it is definitely incorrect. However, the matter is not quite so simple, since it is not immediately clear how important a part of Russell's final metaphysic 'unsensed sensibilia' are. There is a suggestion in many of the works during the earlier period that they need not be regarded as actually existing, but are introduced simply to assist with the initial construction of matter. Furthermore, it is suggested that it might be possible to construct the physical world out of actual sense-data alone, and dispense with unsensed sensibilia. If Russell held the view that physics could ultimately be interpreted in terms of actual sense-data alone then I think his view could justly be regarded as phenomenalistic. On the other hand there is (as we shall see) the evidence of Russell's repeated denials over this period that his view was a form of phenomenalism. I think we can sort out this tangle by taking a careful examination of the evidence.

On the face of it, the stance taken in *Our Knowledge of the External World* does seem to warrant the notion that, at the time when he wrote this book (towards the end of 1913) Russell's philosophy of physics was indeed a form of phenomenalism. In Chapter III he says that '*in so far as physics or common sense is verifiable, it must be capable on interpretation in terms of actual sense-data alone. The reason for this is simple. Verification consists always in the occurrence of an expected sense-datum. Astronomers tell us there will be an eclipse of the moon: we look at the moon, and find the earth's shadow biting into it, that is to say, we see an appearance quite different from that of the usual full moon. Now if an expected sense-datum constitutes a verification, what was asserted must have been about sense-data; or at any rate, if part of what was asserted was not about sense-data, then only the other part has been verified.*'¹ In Chapter IV Russell writes that 'If physics is to consist wholly of propositions known to be true, or at least capable of being proved or disproved' then

1 *Our Knowledge of the External World*, pp. 88-9.

unperceived appearances ‘must all be capable of being exhibited as logical functions of sense-data.’² ‘Thus’, he goes on to say, ‘it is unnecessary, for the enunciation of the laws of physics, to assign any reality to ideal [i.e. unperceived] elements: it is enough to accept them as logical constructions, provided we have means of knowing how to determine when they become actual. This, in fact, we have with some degree of approximation; the starry heaven, for instance, becomes actual whenever I choose to look at it. It is open to us to believe that the ideal elements exist, and there can be no reason for *disbelieving* this; but unless in virtue of some *a priori* law we cannot *know* it, for empirical knowledge is confined to what we actually observe.’³ When Russell wrote Lecture IV of *Our Knowledge of the External World*, then, he was persuaded that ultimately physics could be reformulated in phenomenalist terms. At the same time, in the section of the book added *after* the New Year of 1914, Russell says that we can ‘reasonably suppose’ that some aspect of the universe is presented at places where there are no percipients,⁴ and in ‘The Relation of Sense-Data to Physics’ he says that the inference to unperceived appearances is ‘not unnatural’.⁵

These passages are not necessarily incompatible. One could hold that the belief in the real existence of unperceived appearances is ‘reasonable’ or ‘natural’ but also hold that physics is confined to what is strictly verifiable and must therefore construe unperceived appearances as a roundabout way of talking about actual appearances. By the time he wrote ‘The Relation of Sense-Data to Physics’ he had come to view the task of reducing physics wholly to actual sense-data as, at best, a long and difficult one. For instance, he writes that ‘A complete application of the method which substitutes constructions for inferences would exhibit matter wholly in terms of sense-data, and even, we may add, of the sense-data of a single person, since the sense-data of others cannot be known without some element of inference’, but he immediately adds that ‘This, however, must remain for the present an ideal, to be approached as nearly as possible, but to be reached, if at all, only after a long preliminary labour of which as yet we can only see the very beginning.’⁶ Notice here the clause ‘if at all’, introducing a certain degree of uncertainty concerning the phenomenalist project.

This uncertainty is illustrated with respect to unsensed sensibilia. In the passage alluded to above when Russell says that it is ‘not unnatural’ to suppose that things continue to present appearances at places that are no longer occupied by an observer, he immediately comments that he should ‘regard these supposed [unperceived] appearances only in the light of a hypothetical scaffolding, to be used while the edifice of physics is being raised, though possibly capable of being removed as soon as the edifice is completed. These “sensibilia” which are not data to anyone are therefore to be taken rather as an illustrative hypothesis and as an aid in preliminary

2 Ibid, p. 116.

3 Ibid, p. 117.

4 Ibid, p. 95.

5 ‘The Relation of Sense-Data to Physics, in *Collected Papers* 8, p. 10.

6 Ibid, p. 12.

statement than as a dogmatic part of the philosophy of physics in its final form.’⁷ Again the word ‘possibly’ in the first sentence indicates that Russell does not want to commit himself concerning the ultimate feasibility of the phenomenalist project.

The final statement in this paper on the issue of whether unsensed sensibilia are eliminable occurs at the end of the paper where Russell writes that ‘I should hope that, with further elaboration, the part played by unperceived “sensibilia” could be indefinitely diminished, probably by invoking the history of a “thing” to eke out the inferences derivable from its momentary appearance.’⁸

I think that his considered position can be summarised in the following propositions (i) although the inference to unsensed sensibilia seems reasonable and natural, nevertheless he would *like* to exhibit physics as susceptible to interpretation in terms of sense-data alone (ii) he is nevertheless not willing to definitely assert that physics can do without unsensed sensibilia in addition to sense-data (iii) nor is he willing to assert, at this stage, that physics *requires* unsensed sensibilia in addition to sense-data (iv) until it can definitely be shown that physics can be interpreted in terms of sense-data alone, it is good to make explicit the inferences that one is allowing. Russell allows himself inferences to (a) the sense-data of others and (b) unsensed sensibilia. This point is paralleled by Russell’s work in mathematics, where such dubious principles as the Axiom of Infinity and the Axiom of Reducibility are framed clearly *as axioms*, so as to make the assumptions they involve completely explicit. Finally (v) the overall *impression* created by the paper is that Russell does *think* that it will finally be possible to dispense with these two assumptions, perhaps for the reason indicated in Lecture IV of *Our Knowledge of the External World* that only the occurrence of an expected sense-datum is ever strictly verified, so that physics, which claims to be an empirical science, must be susceptible to reformulation in terms of sense-data alone. Indeed, right at the start of the paper there is an argument which exactly parallels the argument for phenomenism in the book. He writes:

We may succeed in actually defining the objects of physics as functions of sense-data. Just in so far as physics leads to expectations, this *must* be possible, since we can only *expect* what can be experienced. And in so far as the physical state of affairs is inferred from sense-data, it must be capable of expression as a function of sense-data.⁹

I think that Russell’s position in ‘The Relation of Sense-Data to Physics’ can be called ‘phenomenalist’ provided this epithet is used in a guarded fashion. For it is clear that Russell’s *ambition* is to exhibit physics as

7 Ibid, p. 13.

8 Ibid, p. 26.

9 Ibid, p. 5.

amenable to interpretation in terms of actual sense-data alone. At the same time I think it can be seen why Russell, throughout this early period, is not willing to call himself a ‘phenomenalist’. For, despite the above quoted argument, Russell was not prepared to assert that the phenomenalist project was *definitely* possible. Indeed, his position at this time is characterised by a lack of dogmatism. More work, he thinks, is required to discover what are the minimum of assumptions necessary to get physics off the ground.

The picture that emerges is that, when Russell wrote the first draft of *Our Knowledge of the External World*, he was inclined to phenomenalism on the ground that if physics is to be a strictly empirical science, as it claims to be, then it must be susceptible to interpretation in terms of actual sense-data alone. By the time he wrote the paper he still believed, as we saw above, that a ‘complete application of the method which substitutes constructions for inferences’ would reduce matter to actual sense-data. The reason for this is that every diminution of assumptions reduces the risk of error. However, he is no longer sure that this task can be fulfilled, though neither is he sure that it cannot. To the extent that it cannot physics will cease to be a wholly empirical science. The phenomenalist programme has become a *task*, not something that has actually been carried through, or whose successful completion is necessarily guaranteed. For the moment, Russell is willing to grant the thesis of unsensed sensibilia, though he is not prepared to assert that they could not be eliminated in a completed interpretation of physics.

It might be asked whether Russell, who so disliked ‘idealist’ doctrines, would really be happy with a philosophy that dispensed with everything outside of sense-data. Certainly, Russell would never have become a solipsist, even if he had achieved his ambition of exhibiting physics as susceptible to interpretation in terms of the actual sense-data of a single person. Nevertheless, I think he believed that every diminution of inferences reduced the risk of error and thus increased the security of the branch of knowledge concerned. Furthermore, I think Russell was interested in what might be termed the ‘mathematical’ aspects of logical construction, the ingenuity involved in the construction itself. He regarded this as delightful and the smaller the hat out of which one could pull the rabbit, as it were, the more delightful it was. With regard to unsensed sensibilia there is not the same degree of emotional commitment as there is in the case of the existence of other minds. If he could have shown that physics could get along without the assumption of unsensed elements this may very well have weakened his confidence in their existence, however ‘natural’ the inference seemed. Even so, he need not have completely abandoned belief in their existence, even had he shown that they were dispensable *for physics*.

The account of Russell’s somewhat complex relationship to phenomenalism is, I believe, corroborated by all the remaining evidence concerning Russell’s attitude during this early period. In ‘On Scientific Method In

Philosophy' the existence of unperceived appearances is regarded as probable, though not as certain. Russell writes that 'The view which I should wish to advocate is that objects of perception do not persist unchanged at times when they are not perceived, although probably objects more or less resembling them do exist at such times'.¹⁰ In a letter written in June 1917 to a philosophic journal, Russell writes that 'A particular which is a datum does...appear to be causally dependent upon sense-organs and nerves and brain. Since we carry those about with us, we can not discover what sensibilia, if any, belong to perspectives from places where there is no brain' and 'we can not know the nature of those perspectives (if any) which belong to places where there are no minds.'¹¹ Russell always qualifies his statements about unperceived aspects so as not to definitely assert that such aspects exist.

There is a very interesting paper in Appendix I of *Collected Papers 8* which is a report published in *The Athenaeum* in April 1915 concerning a paper on 'Phenomenalism' by C. D. Broad which he read out to a meeting at which Russell was present. We have already had occasion to refer to this report above.¹² According to the report, Broad characterised Russell's philosophy as more or less phenomenalist but also criticised Russell for the assumption of unsensed 'sensibilia' which by their very nature were not observable. What is interesting is Russell's response:

Mr. Bertrand Russell, replying in the discussion, said that 'phenomenalism' was not the term he himself used to denote his theory. His own view was not dogmatic phenomenism; he had suggested merely a preliminary method. There are two different problems: (1) How much of ordinary physics can be stated in phenomenalist terms? and (2) If physics cannot be stated in such terms, what conceivable principles can be discovered by which we may find ground for belief in them? The second problem cannot be tackled until the first is solved...

With regard to his own theory, it was only intended to be rough and preliminary, not to be put forth as a finished thing. He had no definite result. His aim was to see how much could be done with the smallest amount of material; and if the material be inadequate, to find out where it is inadequate...

He had nothing particular to say about sensibilia, and wanted to get physics stated without assuming them...His real interest was the method.¹³

The undogmatic character of Russell's attitude is very evident in this report. Russell cannot be unequivocally characterised as 'phenomenalist' since he does not state that the phenomenalist reduction is definitely possible.

10 'On Scientific Method in Philosophy', reprinted in *Collected Papers 8*, p. 72.

11 Reprinted in *Collected Papers 8*, p. 88.

12 See above, pp. 30-1.

13 Reprinted in *Collected Papers 8*, pp. 310-11.

Nor will he rule out phenomenalism as a final philosophy. His attitude is one of genuine uncertainty.

Further fascinating evidence concerning Russell's attitude to phenomenalism is found in a review of Broad's *Perception, Physics, and Reality* written and published in 1918. Discussing a statement on the part of Broad that physics cannot be established on a phenomenalist basis, Russell writes that:

This certainly *seems* true; but is it? I am troubled by an argument which needs to be tested by practice, but which meanwhile I will advance with due hesitation. My problem is: How can we ever obtain any evidence for a causal law except through perception? And, that being so, must not the unperceived elements in such a law be definable as functions of the perceived elements? And, in that case, do these functions serve any vital purpose except *as* functions of perceived elements, and is there any reason to suppose that they represent independent reals?...The assumption that the ideal [i.e. unperceived] elements 'exist' is, it seems to me, theoretically otiose, and merely convenient as affording resting-places for our feeble logical imagination. I grant at once that undiluted phenomenalism cannot yield as well-filled a science of physics as we are accustomed to, but I contend that what would have to be omitted represents mere prejudice or guess-work, for which there is no shred of empirical evidence...I do not say this is certainly the case; I merely think it may be, and Mr. Broad has not shown that it is not.¹⁴

Here the argument in favour of phenomenalism is essentially the same as that used in *Our Knowledge of the External World*. Since verification consists in the occurrence of an expected sense-datum, the only part of a physical theory that is verified is that part asserting the existence of the sense-datum. Reference to unsensed elements must theoretically be capable of interpretation in terms of actual sense-data. But this argument is not put forward as definitely sound. Russell confesses that he is 'troubled' by the argument. It is an argument which 'needs to be tested by practice', presumably by seeing how much of physics can actually be reformulated in phenomenalist terms. It shows why Russell always held on for so many years to the idea that a phenomenalist physics might be possible. But it also shows that Russell, though troubled by this argument, wasn't totally convinced by it.

The uncertainty over unperceived appearances was to persist for many years. As late as *The Analysis of Mind* he was to write 'Instead of supposing that there is some unknown cause, the "real" table, behind the different sensations of those who are said to be looking at the table, we may take the whole set of these sensations (together possibly with certain other particulars) as actually *being* the table.'¹⁵ The word 'possibly' in

¹⁴ Ibid, pp. 128-9.

¹⁵ *The Analysis of Mind*, p. 98.

connection with the ‘certain other [i.e. unsensed] particulars’ indicates that Russell was still not totally committed to definitely asserting their existence, although in the remainder of *The Analysis of Mind* the existence of unsensed particulars is more or less taken for granted.

There are various references to phenomenism after 1921. Thus in an essay on ‘Physics and Perception’ written in 1922 and published in *Mind*. Russell replies to a claim made by C. A. Strong that ‘Mr. Russell accepts the phenomenist principle’.¹⁶ In response Russell writes:

I have never called myself a phenomenist, but I have no doubt sometimes expressed myself as though this were my view. In fact, however, I am not a phenomenist. For practical purposes, I accept the truth of physics, and depart from phenomenism so far as may be necessary for upholding the truth of physics...Having accepted the truth of physics, I try to discover the minimum of assumptions required for its truth, and to come as near to phenomenism as I can. But I do not in the least accept the phenomenist philosophy as necessarily right, nor do I think that its supporters always realize what a radical destruction of ordinary beliefs it involves.¹⁷

This passage confirms what we have said above concerning Russell’s attitude to phenomenism. However, the stridency of the last clause of the last sentence sounds a more definite note than has hitherto been the case. Later in this essay Russell writes that ‘the world is full of particulars of the sort dealt with by physics’¹⁸ only some of which are experienced. In other words, Russell now seems to be much more definitely rejecting the notion that phenomenism could be an adequate philosophy of physics. Indeed, 1922 is actually the beginning of the second phase of Russell’s thought, culminating in *The Analysis of Matter* and *An Outline of Philosophy* (both 1927). By 1925 Russell is more emphatic in his rejection of phenomenism. In an unpublished paper written in that year, Russell writes that:

There is a philosophy called ‘phenomenism’ which is attractive, but to my mind not practically feasible. This would base physics on phenomena alone. I think those who advocate this philosophy have hardly realized its implications. Phenomena are disjointed, and are always necessarily coloured by our sense-organs. The propagation of light, for example, cannot possibly be stated in phenomenist terms, because it is concerned with what happens where there is no eye. Again, there are limits to the smallness of what we can see, but we do not regard these as limits to the smallness of what can be involved in physics. Continuity is incompatible with phenomenism. Physics absolutely requires the possibility of

¹⁶ Quoted in ‘Physics and Perception’, *Mind*, 31, Oct 1922, reprinted in *Collected Papers* 9, p. 127.

¹⁷ ‘Physics and Perception’, *Mind*, 31, Oct 1922, reprinted in *Collected Papers* 9, p. 128.

¹⁸ *Ibid*, p. 131.

inferring unobserved occurrences in places where there are no sense-organs...For my part, I regard phenomenalism as an ideal, which a prudent man will approach as nearly as he can without rejecting physics. Perhaps a phenomenalist physics may prove possible ultimately, but for the present it only seems possible through not realizing its implications.¹⁹

The notion that phenomenalism is unacceptable because it violates causal continuity is also present in *The Analysis of Matter* and made the basis for Russell's rejection of this philosophy. Russell outlines a phenomenalist metaphysic in which unsensed elements would be regarded as purely 'ideal'; that is, as functions of actual elements. But the staccato world of phenomenalism would violate the physical principle that there is no 'action at a distance'. Thus, Russell concludes, 'although it is logically possible to interpret the physical world in terms of ideal elements [i.e. elements reducible to actually sensed elements], I conclude that this interpretation is unpalatable, and that it has no positive grounds in its favour.'²⁰

There is also an interesting passage in Russell's 'Reply To Critics' in the Schilpp volume of *The Philosophy of Bertrand Russell*. Commenting on phenomenalism, he says 'There are some who would deny that physics need say anything about what cannot be observed; at times I have been one of them. But I have become persuaded that such an interpretation of physics is at best an intellectual game, and that an honest acceptance of physics demands recognition of unobserved occurrences.'²¹ This is a curious passage. Russell says that 'at best' phenomenalism is an 'intellectual game'. This seems to suggest that even though phenomenalism might be a possible interpretation of physics, it is still an inadequate one. It does seem that Russell came to the view that, though it is possible to interpret physics in terms of sense-data alone, the resultant picture of the world would be too scanty to answer to our conception of physical reality, and too staccato to be plausible. The first part of the passage just quoted confirms that for some years Russell did, at least on occasion, think that the phenomenalist programme could be carried through.

This idea, that Russell abandoned his hopes for phenomenalism because, even if the programme were tenable, the resulting picture would still not be satisfactory, is borne out by another passage in his 'Reply to Critics'. Again commenting on Stace – this time on Stace's claim that Russell believed that it is possible to construct physics out of 'verifiabiles' alone – Russell writes:

The question arises: What is meant by 'verifiabiles'? If it means 'things that I experience', or 'things that human beings experience', then, I will admit, I do not see how to construct out of such materials alone a

19 'The Philosophical Analysis of Matter' (1925), reprinted in *Collected Papers* 9, p. 281.

20 *The Analysis of Matter*, p. 214.

21 'Reply To Critics' (1944), reprinted in *Collected Papers* 11, p. 33.

world that we can soberly believe to be complete. I will also admit that, at times, I have hoped to find such materials sufficient. I still hold that they are sufficient for everything that is empirically verifiable. But I have found that no one, not even the most emphatic empiricist, is content with what can be empirically verified. It has gradually become clear to me that empiricists (including, at times, my former self) allow a great many shaky inferences, and shrink from much valid analysis, in order to reconcile their faith in empiricism with every-day beliefs which they are not prepared to abandon. We all believe in other people, cats and dogs, chairs and tables, and even the other side of the moon. My real problem is: What are the minimum of assumptions which will justify such beliefs?²²

This passage is very illuminating. It suggests that in 1944, when he wrote his ‘Reply to Critics’, Russell had persuaded himself of the soundness of the argument for the phenomenalist programme being possible that he had first set out in *Our Knowledge of the External World*. Phenomenalism might be an adequate analysis ‘for everything that is empirically verifiable’ in physics. However, this is no longer a vital consideration, for phenomenism is still an inadequate interpretation of physics. The reason for this is that, in practice, even phenomenists make inferences that cannot be justified by a strict empiricism. Thus there is no reason why the physicist should not be permitted the inferences that supply him with a fuller picture of the world, particularly if, as Russell believed, it was possible to exhibit these inferences as inferences to the same *kind* of entity as sensed elements themselves.

The above quoted passage from the Schilpp volume also reveals the transition in Russell’s epistemological concerns. He is no longer so concerned with exhibiting matter in terms of sense-data (as in ‘The Relation of Sense-Data to Physics’). Having accepted that this is not a desirable goal, even if it is possible, he has now switched to the question of what are the *assumptions* involved in physics in virtue of which it (and common sense insofar as this is compatible with physics) is able to justify its beliefs. Russell’s answer to this question was to lead to his uncovering various ‘postulates of scientific inference’ in his *Human Knowledge* (1948).

Russell’s account of his own development in *My Philosophical Development* (1959) in the main corroborates the account we have given. He writes that ‘In my first enthusiasm on abandoning the “matter” of the physicist, I had hoped to be able to exhibit the hypothetical entities that a given percipient does not perceive as structures composed entirely of elements that he does perceive. This was suggested as a possibility in my first exposition of the theory that I advanced in the Lowell Lectures. The first exposition was in a paper called “The Relation of Sense-Data to Physics”’.²³ However, he goes on to say, ‘I soon...became persuaded that this is an impossible programme and that physical objects cannot be interpreted as structures composed of elements actually

²² Ibid, p. 38.

²³ *My Philosophical Development*, p. 104.

experienced.²⁴ Consequently, Russell writes, he contented himself ‘with a picture of the world which fitted physics and perception harmoniously into a single whole.’²⁵ In fact we have seen that for many years he was not entirely sure whether phenomenalism was ‘an impossible programme’ or not, and preferred not to commit himself publicly either way. What is the case is that he quickly became persuaded that he needed, at least provisionally, to allow inferences to unsensed sensibilia as well as to the minds of others, but he hoped for some years that it might ultimately prove possible to dispense with these inferences.

I think it can fairly be said, however, that Russell’s settled view throughout the first phase of his development (from about 1914 to 1921) was never wholeheartedly phenomenalistic. Instead, he vacillated on the issue of whether phenomenalism was possible and regarded the task of reducing physics to sense-data as, at best, a long and difficult one.

In the second phase of his thought, beginning in 1922, he was to become much more sceptical about phenomenalism. Interestingly, he was inclined to accept that a phenomenalist reduction *was* possible for everything that was strictly empirically verifiable in physics, but that such a programme was nevertheless an irrelevance since the world that would result would be too scanty to adequately answer to our conception of the physical world. The physicist was after all permitted his own inferences; for even strict phenomenologists allowed inferences to things that they could not directly verify, such as the past and the minds of others. And if they were allowed their inferences, why should the physicist not be allowed his, particularly if it could be shown (as Russell believed) that the entities presupposed by physical theory could be exhibited as logical constructions out of entities that are of the same *kind* as the data of sense from which they are inferred?

Russell’s attitude to phenomenalism, therefore, was somewhat more complex than is usually made out. If we ask, ‘was Russell ever a phenomenalist?’ we must first be clear what we mean by phenomenalism. If to be a phenomenalist is to definitely subscribe to the notion that it is possible to reduce statements about physical objects to statements about sense-data, then Russell subscribed to this doctrine towards the second half of 1913 (when he wrote *Our Knowledge of the External World*) and at the beginning of 1914 (when he wrote ‘The Relation of Sense-data to Physics’). After this point, he became doubtful as to whether the phenomenalist reduction could be carried through, but was haunted by the argument he had used in 1913, and still hoped phenomenalism *might* be tenable. By the time he decided that it *was* possible to analyse physics in terms of sense-data (or percepts) alone, he had ceased to believe that this would constitute an acceptable interpretation of physics. Hence, strictly speaking, Russell was only a phenomenalist for a few months from the end of 1913 to the beginning of 1914.

²⁴ Ibid, p. 105.

²⁵ Ibid.

II. THE DEFINITION OF MATTER

We have seen that any claim that Russell was a phenomenalist from 1914 to 1921 is one that can only be made with severe qualification. In the sense in which his philosophy was ‘phenomenalistic’ during this period it was compatible with a sophisticated version of scientific realism and, indeed, a causal theory of perception. The ‘scientific realism’ is simply a consequence of the view that ‘unsensed sensibilia’ are usually regarded as real existents. By the time he wrote *The Analysis of Mind*, though he does not rule out complete phenomenism, the overall theory that is presented in the work accepts the existence of unperceived particulars. Of course, the ‘realism’ is a realism of momentary Heraclitean ‘particulars’ rather than physical objects.

The causal theory of perception derives from Russell’s distinction, in *The Analysis of Mind*, between the ‘regular’ appearances of an object and its ‘irregular’ appearances. The ‘regular’ appearances of a given thing are those presented where there is no distortion due to the ‘intervening medium’ between the place where the appearance occurs and the place where the thing is of which it is an appearance. Thus the regular appearance is a function solely of the object and the location of the perspective at which it occurs relative to the object. An appearance which is distorted due to the ‘intervening medium’ is an ‘irregular’ appearance. A physical object is then defined as the set of all its ‘regular’ appearances. Taking as his example a star seen on a cloudless night he writes that ‘Every regular appearance is an actual member of the system which is the star, and its causation is entirely internal to that system. We may express this by saying that a regular appearance is due to the star alone, and is actually part of the star, in the sense in which a man is part of the human race.’²⁶ But Russell also thinks that the only regular appearances of the star are those which it presents in the vacuum of space. When the light from the star reaches our atmosphere it begins to be distorted. Finally, the causal chain ends in a visual sensation. The point is that *all* sensations are ‘irregular’ appearances, since their character is determined in part by the sense-organs, nerves and brain of the percipient. Such irregular appearances are not members of the system of particulars that *is* the physical object. Nevertheless, they are caused by the regular appearances. When the character of the irregular appearance can be calculated from the regular appearances by means of laws expressing the distorting influence of the medium then ‘the particular in question may be regarded as caused by the regular appearances, and therefore by the object itself, together with the modifications resulting from the medium.’²⁷ Thus, alongside a scientific realism of physical ‘particulars’ there is also a version of the causal theory of perception whereby perceptions are caused by the objects which they are perceptions of.

²⁶ *The Analysis of Mind*, p. 134.

²⁷ *Ibid*, p. 136.

As a definition of matter, the above account may not seem entirely satisfactory due to the fact that there may be objects that do not present any ‘regular’ appearances at all. Russell himself recognises this. Consequently, in *The Analysis of Mind* Russell proposes a very sophisticated definition of the ‘matter’ of an object. He writes:

Given any appearance of an object, we can construct hypothetically a certain system of appearances to which the appearance in question would belong if the laws of perspective alone were concerned. If we construct this hypothetical system for each appearance of the object in turn, the system corresponding to a given appearance x will be independent of any distortion due to the medium beyond x , and will only embody such distortion as is due to the medium between x and the object. Thus, as the appearance by which our hypothetical system is defined is moved nearer and nearer to the object, the hypothetical system of appearances defined by its means embodies less and less of the effect of the medium. The different sets of appearances resulting from moving x nearer and nearer to the object will approach to a limiting set, and this limiting set will be that system of appearances which the object would present if the laws of perspective alone were operative and the medium exercised no disturbing effect. This limiting set of appearances may be defined, for purposes of physics, as the piece of matter concerned.²⁸

Incidentally, in his essay on ‘Physics and Perception’ (1922) which we referred to earlier²⁹ Russell acknowledges the problem that some objects may present no ‘regular’ appearances at all. He quotes A. C. Strong’s criticism that ‘the object, as physical science conceives it, is not correctly defined as the *system* of all the perspectives (even of the ‘regular’ ones, i.e. those undistorted by the intervening medium), but is rather their mathematical limit.’³⁰ (Presumably here Strong meant ‘appearances’ or ‘aspects’ rather than ‘perspectives’.) Russell responds to this by saying ‘I myself suggested this view in my book on the *External World*, but rejected it for the reason that there is no limit to which the appearances approach. For this reason, in *The Analysis of Mind* (pp. 106-7), I defined a piece of matter as that set of appearances to which the set approximates which consists of a given appearance together with all those others which would exist if the given appearance were regular...The device is essentially the same as that of defining an irrational number as a certain class of rationals.’³¹ Now in fact there is no such suggestion at all in *Our Knowledge of the External World* of matter being defined as a limit of appearances. However, there is such a suggestion in ‘The Relation of Sense-Data to Physics’, which reads as follows:

It is obvious that from the point of view of physics the appearances of a thing close to ‘count’ more than

28 Ibid, pp. 106-7.

29 See above, p. 40.

30 Quoted in ‘Physics and Perception’, *Mind*, 31, Oct 1922, reprinted in *Collected Papers* 9, p. 133.

31 ‘Physics and Perception’, *Mind*, 31, Oct 1922, reprinted in *Collected Papers* 9, p. 133.

the appearances far off. We may therefore set up the following tentative definition:

The *matter* of a given thing is the limit of its appearances as their distance from the thing diminishes.

It seems probable that there is something in this definition, but it is not quite satisfactory, because empirically there is no such limit to be obtained from sense-data.³²

This reinforces Kenneth Blackwell's contention that Russell was prone to mix up *Our Knowledge of the External World* with 'The Relation of Sense-Data to Physics'. In the passage quoted from 'Physics and Perception' above Russell himself compares the definition in *The Analysis of Mind* to the definition of an irrational number in terms of a certain class of rationals. It might be useful to draw out the mathematical analogy. The method of constructing irrational numbers from sets of rationals involves something called a 'Dedekind cut'. We divide all the rational numbers into two sets L and R such that every member of L is less than every member of R . In this manner we can form sets of rationals that define irrational numbers. Thus $\sqrt{2}$ will divide the rationals into two sets, L and R , such that the square of every member of L is less than 2, and the square of every member of R is greater than 2. In Whitehead and Russell's *Principia Mathematica* a real number is identified with the Dedekind L class and all mathematical statements about $\sqrt{2}$ can be reformulated so as to be about L .³³ The point of this analogy is that it is unnecessary to suppose that the limiting set constituting the 'matter' of an object actually exists. Just as everything that is said about irrational numbers can be rephrased so as to be about classes of rationals, so every statement about matter can be reformulated in terms of series of actual appearances (including unsensed 'appearances', i.e. unsensed sensibilia).

Precisely how this is accomplished is not clearly stated in essays such as 'The Relation of Sense-Data to Physics'. But then, these early essays present the task of construction as a work in progress, not as something completed, so it is perhaps legitimate for Russell to be sketchy concerning the details. If matter is defined as a certain region of space about which sensibilia cluster, as it were, then obviously to talk about matter will ultimately be a roundabout way of talking about sensibilia. This is the direction in which Russell was to go when he came to defining matter in *The Analysis of Matter*. By this time, of course, just as the terminology of 'sensibilia' had been dispensed with in favour of 'particulars', so 'particulars' were dispensed with in favour of 'events'. I argued earlier on that this latter change represented more than *merely* a change in terminology.³⁴ But to what extent is it indicative of a radical discontinuity in Russell's view of the world? This question will occupy us in the next chapter.

32 'The Relation of Sense-Data to Physics', reprinted in *Collected Papers 8*, p. 17.

33 See Jeffreys & Jeffreys, *Methods of Mathematical Physics*, pp. 6-8.

34 See above, p. 33

Chapter 4

The Continuity of Russell's Philosophy

I. INTRODUCTION

The standard account of Russell's philosophical development would have us suppose that he adopted a more or less phenomenistic theory of perception in 1914 from which he 'reverted' sometime in the mid-1920s to a causal theory of perception similar to that which he had held before 1914 and which he had expounded in *The Problems of Philosophy* (1912). The mature causal theory, so it is alleged, had its first exposition in *The Analysis of Matter* (1927). In my opinion this viewpoint, which is sufficiently widespread to count as the orthodox interpretation, is mistaken, and is caused by a failure to understand Russell's metaphysics as it was developed in the years from 1914 onwards.

What is perhaps most surprising is that the orthodox interpretation has gone virtually unchallenged for so long, for there is a considerable amount of evidence against it. To begin with, it is obvious that Russell himself did not regard the ideas he developed in the 1920s and which were embodied in *The Analysis of Matter* as in any way overthrowing his earlier metaphysics. Indeed, Russell never gives any indication that his ideas underwent any radical alteration at all between 1921 and 1927. It was not as though Russell was shy of advertising his changes of mind. On the contrary, more often than not he was at pains to draw attention to them and was fond of presenting his own philosophic development as being constituted by a series of dramatic epiphanies. As it is, Russell was to describe *The Analysis of Matter* as 'in some sense a companion volume' to *The Analysis of Mind*¹, which would have been an odd description had the two books contained radically opposed metaphysics. Furthermore, in *My Philosophical Development*, his intellectual autobiography, Russell does not mention any change occurring to his view of perception or the philosophy of physics in the 1920s. On the contrary, the chapter on 'The External World' makes it abundantly clear that he still endorses the ideas that occurred to him in 1914, including the idea of two kinds of spaces and three places associated with every sensed element. In 1964, Russell was to say to Elizabeth Eames 'I am conscious of no major change in my opinions since the adoption of neutral monism.'² (Russell's adoption of neutral monism dates to 1918.)

1 *Autobiography*, p. 387.

2 Elizabeth Eames, *Bertrand Russell's Theory of Knowledge*, p. 108.

Thus Russell's own testimony constitutes powerful evidence for continuity and equally powerful evidence against the orthodox interpretation. The second piece of evidence in favour of continuity is derived from Russell's works themselves. I think that a careful examination of Russell's writings from 1912 onwards fully bears out Russell's own insistence on the continuity of his thought.

The belief that Russell radically changed his metaphysics across this time period has been fostered by a number of unfortunate misinterpretations. For instance, *The Analysis of Matter* clearly contains a form of scientific realism. If the earlier philosophy is construed as 'phenomenalistic' then it is obvious that his ground has shifted a great deal. But we have already found reason to reject the notion that his earlier philosophy was a form of phenomenalism. Similarly, it is sometimes supposed that 'neutral monism' is incompatible with scientific realism, and consequently that *The Analysis of Mind* must have represented the high water mark of a neutral monism that he abandoned by the time he wrote *The Analysis of Matter*. But there is no evidence that Russell thought that neutral monism was incompatible with scientific realism. Russell's scientific realism was a realism of 'particulars', and later 'events', which are not *intrinsically* either 'mental' or 'physical' but can be regarded as one or the other in virtue of their being members of 'mental' or 'physical' sets (i.e. minds or pieces of matter). In *An Outline of Philosophy*, published in the same year as *The Analysis of Matter*, and in which Russell expounds in less technical terms the scientific realism of *The Analysis of Matter*, Russell writes that 'It will be seen that the view which I am advocating is neither materialism nor mentalism, but what (following a suggestion of Dr. H. M. Sheffer) we call "neutral monism".'³

There is another interesting piece of evidence. In 1926 Russell revised *Our Knowledge of the External World* for reprinting and made some minor modifications to bring the doctrine set out in the book up to date with his most recent thinking. However, very little 'revision' was required. Essentially, as Robert E. Tully has pointed out the revision amounted to little more than the alteration of a single paragraph.⁴ The alteration consisted in a statement that he no longer considers that there is any difference between the sensation and the 'sense-datum'. However, besides this alteration there was one important *addition* to the text. An entire paragraph is added to Lecture IV that does not occur in the first edition of the book (I have verified this myself by comparing a copy of the book printed before 1926 with one printed after). The new paragraph begins as follows:

The space-time of physics has not a very close relation to the space and time of the world of one

³ *An Outline of Philosophy*, p. 293.

⁴ See 'Russell's Neutral Monism', reprinted in *Bertrand Russell: Critical Assessments* III, p. 269. It should be noted that I dissent from Tully's overall interpretation of Russell's 'neutral monism', on which point see below pp. 55-6.

person's experience. Everything that occurs in one person's experience must, from the standpoint of physics, be located within that person's body; this is evident from considerations of causal continuity. What occurs when I see a star occurs as the result of light-waves impinging on the retina, and causing a process in the optic nerve and brain; therefore the occurrence called 'seeing a star' must be in the brain. If we define a piece of matter as a set of events (as was suggested above), the sensation of seeing a star will be one of the events which *are* the brain of the percipient at the time of the perception. Thus every event that I experience will be one of the events which constitute some part of my body. The space of (say) my visual perceptions is only *correlated* with physical space, more or less approximately; from the physical point of view, whatever I see is inside my head. I do not see physical objects; I see effects which they produce in the region where my brain is.⁵

Both the language and the theses in this paragraph are characteristic of Russell's later thought, including the emphasis on the causal theory of perception and the notion that not only are thoughts 'in our heads' (as was the case in the earlier philosophy) but that the brain actually *consists* of 'thoughts' such as my 'seeing the star'. This is a quite new doctrine; and not only is it new but, arguably, it is incompatible with what is said in the remainder of Lecture IV. For the view developed there is that physical objects are to be construed in terms of their 'appearances' in places where they are not, not in terms of the occurrences at the place where the physical object actually is. However, Russell clearly does not notice this inconsistency. The point is that, by inserting this paragraph into Lecture IV of *Our Knowledge of the External World*, Russell shows that he does not regard the ideas contained in it - ideas characteristic of his later metaphysic - as incompatible with the metaphysic he set out in this earlier book. He might have been wrong in thinking this, but this is undoubtedly what he thought.

II. GRAYLING'S MUDDLE

In saying this, I am opposing those commentators who have stated, or insinuated, that Russell radically revised his metaphysic at some unspecified point in the 1920s. Foremost among such commentators in modern times is A. C. Grayling who has provided a chapter on Russell's metaphysic entitled 'Russell, Experience and the Roots of Science' for *The Cambridge Companion to Bertrand Russell*.⁶

Like many commentators, Grayling shares the view that Russell radically altered his views between 1921 and 1927. After describing the metaphysic of 'The Relation of Sense-Data to Physics', Grayling writes 'Instead of

⁵ *Our Knowledge of the External World*, p. 129.

⁶ Ed. Nicholas Griffin, 2003.

developing this distinctive theory further, Russell abandoned it. In later work...he reverted to treating physical objects and the space they occupy as inferred from sense-experience'.⁷ This statement can scarcely be accepted without certain qualifications. Certainly Russell did not regard himself as 'abandoning' his earlier metaphysic. In the earlier metaphysic, perspective space, which Russell identifies with physical space, is constructed out of perspectives, but only some of these perspectives are actually observed, the rest are inferred. (Although, as we have seen, Russell clung for some time to the hope that perhaps unperceived perspectives could be exhibited as functions of perceived perspectives.) There is, however, some ground for saying that Russell's view of physical space in the later metaphysic is different to his view in the earlier theory. We have seen that, in his earlier theory, there are no *direct* (as opposed to merely constructed) time relations between particulars belonging to diverse 'biographies'. There are temporal relations between perspectives belonging to one and the same biography, but between (for example) my current perspective and a perspective in your biography there are no time relations that are not constructed.

In the later metaphysic, on the other hand, overlapping in space-time was identified with 'compresence' or (absolute) simultaneity, and this would allow items in my perspective to be compresent with items outside my perspective, and for them to be compresent with further items, and so on, thus linking items in diverse perspectives via a chain of compresence. As a consequence, every item in the universe would be related to every other item via a chain of overlapping, or compresence, a consequence that was confirmed by Russell himself in the letter to Newman which we have already quoted above.⁸ One result of this is that the fundamental stuff of the world has acquired an extension in space as well as in time, i.e. that the fundamental stuff consists of 'events'. Another is that the spatial relations between items belonging to diverse points of view are constructed from a real relation between these items, namely compresence. In the earlier metaphysic, perspectives were arranged by considerations of their 'internal' characteristics, e.g. the various perspectives containing appearances of a penny were located in space on the basis of the different characteristics of the sensibilia belonging to the penny. Given the sensibilia, then, the 'space' in which they are situated follows merely from a consideration of their own characteristics, and does not require the positing of a separate spatial relation. In the later theory, the spatial relations consist in chains of copunctuality, or compresence, and the fact that these relations subsist between items belonging to diverse perspectives is an inference to a matter of fact. There is, therefore, some ground for saying that, in the later metaphysic, space is inferred, whilst in the earlier theory it is constructed.

It should be noted, however, that this change does not consist in some lurch from phenomenalism to Lockean

7 'Russell, Experience and the Roots of Science' in *The Cambridge Companion to Bertrand Russell*, ed. Nicholas Griffin, p. 460.

8 See above, p.32.

realism, but amounts to supposing that the items ('particulars' or 'events') that constitute physical reality are compresent with items outside their own biographies (that is, they are compresent with items that are not also before or after them), and consequently the items have a certain 'width' in space-time and are not elongated in only one dimension. Perhaps it would be safer to say that there is no suggestion as yet from Russell that these items have a 'width' as well as a temporal extension, and that furthermore his definition of 'perspectives' in terms of all the particulars simultaneous with a given particular seems to rule it out.

Grayling goes on to say that the change to Russell's metaphysic was prompted by a number of considerations, one of which was 'his acceptance of the standard view offered by physics and physiology that perception is caused by the action of the environment on our sensory surfaces.'⁹ This, however, cannot be a reason for the change in Russell's metaphysic since, as we have seen, it is a point that is accepted in his earlier theory. Thus, in *The Analysis of Mind*, the physical object is defined in terms of its 'regular' appearances and our sensations are the result of the interaction of this system of appearances on our sense-organs. Next, Grayling offers the following explanation for the changes in Russell's theory:

Another reason for Russell's abandonment of the sensibilia theory was the sheer complexity and, as he came to see it, implausibility of the views he tried to formulate about private and public spaces, the relations between them, and the way sensibilia are supposed to occupy them. He makes passing mention of this cluster of problems in *MPD* [*My Philosophical Development*], before there reporting, as his main reason for abandoning the attempt to construct 'matter out of experienced data alone', that it 'is an impossible programme...physical objects cannot be interpreted as structures composed of elements actually experienced' (*MPD* p. 79). This last remark is not strictly consistent with Russell's stated view in the original texts that sensibilia are not, and do not have to be, actually sensed; *MPD* gives a much more phenomenalist gloss to the theory than it originally possessed. But it touches upon a serious problem with the theory: which is that it is at least problematic to speak of an 'unsensed sense-datum' which does not even require - as its very name seems *per contra* to demand - an intrinsic connection to perception.¹⁰

This passage is such a tangled web of muddles that it is difficult to know where to begin. Nevertheless, I shall attempt to unravel the strands in this web, since it is actually representative of the pervasive misinterpretations and interpolations that characterise much Russell scholarship.

9 'Russell, Experience and the Roots of Science' in *The Cambridge Companion to Bertrand Russell*, ed. Nicholas Griffin, p. 460.

10 *Ibid*, pp. 460-1.

Firstly, to say that Russell ‘abandoned’ sensibilia is not quite correct. He always believed that things presented aspects or appearances in places where there are no living percipients. We have already had occasion in Chapter 1 to quote the passage from his ‘Reply To Critics’ written in 1944 in which Russell reaffirms this belief. It is worth quoting again:

Mr. Stace is puzzled by my hypothesis of unperceived aspects. Yet the hypothesis of such aspects is inevitable if we admit - as we all do in fact - that (a) causation does not act at a distance, (b) we can perceive (in some sense) things from which we are separated by an interval which is not a plenum of souls.¹¹

The characteristics of these unperceived aspects or appearances changed somewhat between his earlier and his later philosophy to the extent that they acquired an extension in space as well as time, but these items are still located in ‘private spaces’ or ‘perspectives’, most of which are not observed and which are ordered in a public, physical space that is to be carefully distinguished from the private space or spaces within each perspective. For this reason, he certainly did not object to what Grayling above calls ‘the sheer complexity and, as he came to see it, implausibility’ of his views concerning the distinction between public and private space. On the contrary, these same views are set out in *My Philosophical Development* (in the chapters on ‘My Present View of the World’ and ‘The External World’) and are ideas he thoroughly endorses.

Grayling then goes on to talk about Russell’s hope of constructing matter out of sense-data alone, i.e. his flirtation with phenomenalism. We have seen that Russell was undogmatic concerning whether such a programme was possible. However, he thought that even if the programme were possible, a lot of work would be required to show how it could be carried out, and in the meantime he felt that he needed to keep unsensed sensibilia. Hence there is no inconsistency here with Russell’s stated view that sensibilia do not actually have to be sensed. When Russell explains why he came to suppose that physical objects cannot be interpreted in terms of elements actually experienced, by ‘elements actually experienced’ he means sense-data, not unsensed sensibilia. In other words, he is explaining that he came to the conclusion precisely that he needed to *keep* unsensed sensibilia. *My Philosophical Development* does not give a ‘phenomenalist gloss’ to Russell’s theory, since he is not discussing the complete system of ‘The Relation of Sense-Data to Physics’ but only the idea that he could abandon the two inferences that he in fact allowed himself in this paper and construct physical objects out of sense-data alone. It is this phenomenalist (indeed solipsist) ambition that he is rejecting as impossible, not the system expounded in the paper which accepts these two inferences, at least provisionally. Indeed, we saw earlier on that Russell’s account in *My Philosophical Development* if anything somewhat downplays his

¹¹ ‘Reply To Critics’, reprinted in *Collected Papers* 11, p. 39.

phenomenalism, declaring that he ‘soon’ became persuaded that phenomenalism was impossible, whereas in reality he remained unsure for many years.

Finally, Grayling says that he thinks the whole notion of ‘unsensed sense-data’ is problematic. Of course, Grayling is right since an ‘unsensed sense-datum’ is in fact a contradiction in terms. It is for this reason that Russell *never* uses the phrase ‘unsensed sense-data’ and why he introduces the term ‘sensibilia’ to obviate the difficulty of talking about ‘appearances’ which are not presented to any observer. Obviously a sense-datum cannot exist when it ceases to be sensed; but I see no reason why an item with all the qualities of a sensed item could not exist without being sensed. Indeed, this is the view of naïve realism, except that the sensed items are placed in a single public space rather than being located in private spaces which in turn constitute a single public space. Grayling returns to this issue later on in his essay. He writes:

One of the chief reasons for Russell’s reversion to a realistic, inferential view about physical things was the difficulty inherent in the notion of unsensed *sensa* or, in the later terminology, percepts...But it is obvious that the idea of unsensed *sensa* (or unperceived percepts) is, if not indeed contradictory, at least problematic. It makes sense - although, without a careful gloss, it is metaphysically questionable - to talk of the existence of *possibilities* of sensation; but to talk of the existence of *possible sensations* arguably does not...This is just what Russell himself came to think.¹²

Again, it is not easy to know where to begin. ‘Unsensed *sensa*’ is not a phrase that occurs in Russell, any more than ‘possible sensations’ or (outrageously) ‘unperceived percepts’. In connection with ‘*sensa*’ there is a very interesting discussion by Russell in his review of C. D. Broad’s *Scientific Thought* published in 1923. In Broad’s book, Broad had criticised Russell on the ground that to call unsensed items ‘*sensa*’ was misleading. Russell replied that ‘I never have called such things “*sensa*”. At one time I called them “sensibilia”, for the special purpose of distinguishing them from *sensa*; then I adopted the more colourless word “particulars” in order to weaken still further the analogy with *sensa*.’¹³ This passage, incidentally, is illuminating in showing why Russell switched from the terminology of ‘sensibilia’ to ‘particulars’.

It is not clear to me what the substance of Grayling’s criticism of Russell actually is in the passage quoted above. He allows that we can talk of ‘possibilities’ of sensation but not of ‘possible sensations’. Of course, Russell’s ‘sensibilia’ are certainly not ‘possibilities of sensation’ in the Millian sense, for they are actual existents, not merely ‘possibilities’. Perhaps what Grayling means is that it is impossible for an immediately

¹² ‘Russell, Experience and the Roots of Science’ in *The Cambridge Companion to Bertrand Russell*, ed. Nicholas Griffin, p. 466.

¹³ ‘Review of C. D. Broad, *Scientific Thought*’ (1923), reprinted in *Collected Papers* 9, p. 264.

sensed item – a patch of colour in the visual field for example – to continue to exist when it is no longer sensed. Of course, such an item will no longer exist *as* a sensed item, but I see no reason to think that it could not continue to exist, and Grayling does not supply such a reason. Could it be, I wonder, that Grayling has fallen into the trap of supposing that sense-data are inherently ‘mental’?

Grayling ascribes this muddle to Russell himself, but this is certainly incorrect. Grayling has succumbed to the dangers of interpolation. That is, he has ascribed to Russell his own difficulties with Russell’s metaphysic. There is no evidence that Russell held the same views as Grayling and no evidence that the (in my opinion illusory) difficulties with unsensed sensibilia were ‘one of the chief reasons’ for the supposed change in Russell’s theory, as Grayling claims. In essence, then, Grayling’s account is an excursion into fiction.

Grayling is only the latest commentator on Russell to suppose that his later metaphysic was a separate development to his earlier philosophy. But this notion goes back some way, despite Russell’s own belief in the continuity of his thought abundantly evidenced by *My Philosophical Development*. Thus after expounding Russell’s earlier philosophy of perception, A. J. Ayer in his beautifully written little volume on *Russell* writes that ‘Russell himself makes no attempt to develop his theory any further, and indeed we soon find him reverting to his earlier theory, in which physical objects are postulated as external causes of percepts.’¹⁴ Now certainly physical objects are regarded as the external causes of percepts in Russell’s later philosophy. This is also, however, true in his earlier philosophy, as we have seen. Furthermore, even in his later philosophy, Russell still regards physical objects as ‘logical constructions’ out of elements that do not differ fundamentally from percepts. The details of the construction are somewhat different in his later philosophy, as we shall see. But, as I hope to show, the later phase of Russell’s thought constitutes very much a development of the earlier phase, rather than an abandonment of it, at least in Russell’s own mind.

III. NEUTRAL MONISM

In his ‘Reply to Critics’ in the Schilpp volume mentioned above Russell is clearly somewhat exasperated that his critics have not taken into consideration the changes in his views since the period 1914-21. Thus he writes ‘Mr Stace’s essay on my neutral monism is a little difficult for me to deal with, because it is concerned with the view I advocated in *Knowledge of the External World and Analysis of Mind*, with which I no longer wholly agree, partly for reasons analogous to those which he puts forward against them. I am rather sorry that he excluded *The Analysis of Matter* from the scope of his discussion, because, although there is some change of

14 A. J. Ayer, *Russell*, p. 84.

view in this book, in the main there is a fuller and more careful statement of theories not very different from those of *The Analysis of Mind*.¹⁵ This passage, it should be noted, does not constitute any repudiation of ‘neutral monism’. On the contrary, immediately following the above passage Russell writes ‘I cannot understand why Mr. Stace holds that neutral monism must not regard physical objects as causes of sense-data.’¹⁶ We have already seen that Russell reaffirmed his commitment to neutral monism in 1927 in his *Outline of Philosophy*. What Russell says in the above quoted passage is that *The Analysis of Matter* contains ‘a fuller and more careful’ formulation of theories ‘not very different’ from those of *The Analysis of Mind*. I think that this is amply borne out by a detailed consideration of his later metaphysic.

As we have already seen (and as Russell reaffirms in his ‘Reply to Critics’) in his final metaphysic there are still unperceived ‘aspects’ or ‘appearances’ of things that are ranged about the places where the things are. To this extent, *pace* Grayling, Russell never abandoned the ‘unsensed sensibilia’ of ‘The Relation of Sense-Data to Physics’. However, these appearances are now conceived as having a certain finite extension in physical space as well as being extended in time; that is, they have been transformed into ‘events’ occupying finite continuous regions of space-time. Each region will comprise a vast number of overlapping events. A ‘material region’ will consist of all the events happening to any of the points comprising the region concerned. If matter is conceived as ‘punctual’ (i.e. point-like), then a ‘material point’ will consist of all the events happening at the point concerned. An event ‘happens’ at a point if it is a member of the class of overlapping (or ‘copunctual’) events that *is* the point. Now this is certainly a different definition of matter to that suggested in *The Analysis of Mind*. Instead of matter being defined in terms of events in regions where the matter is not, it is now being defined in terms of the events at the place where the matter actually is. The brain will comprise all the events at the region where the brain is. Since physics tells us nothing concerning the intrinsic character of external events, there is no reason not to suppose that among these events percepts are included. Hence, the brain actually consists of ‘thoughts’ (in the sense of percepts) as well as a vast number of other events.

Percepts are ‘aspects’ or ‘appearances’ of things that are presented at regions where there is nerve tissue, i.e. matter with the peculiar property of being liable to form habits. This is what makes these appearances into something mental. But not every event that constitutes the brain need be an appearance of an external object. Mental images, for example, are not ‘aspects’ of anything external. Thus, more generally, we do not have to suppose that *all* events are ‘appearances’. This considerably augments the wealth of materials available for our construction. In *The Analysis of Mind*, unsensed ‘particulars’ were all appearances of objects; at least, there was no suggestion that there were any purely physical particulars that were not appearances of objects. And yet, there were particulars belonging to minds that were not appearances of anything, namely mental images.

¹⁵ ‘Reply to Critics’, reprinted in *Collected Papers* 11, pp. 37-8.

¹⁶ *Ibid*, p. 38.

This is clearly a somewhat anomalous result, and Russell's new theory tidies up the anomaly. Appearances are now only a proper subset of events and this goes for the events comprising external physical objects as much as for the brain. This is clearly (at least to my mind) a more satisfactory theory.

'Overlapping' in space-time is equivalent to what Russell now calls 'compresence', which is basically the same as 'simultaneity' except that, unlike simultaneity, compresence is regarded as a *non-transitive* relation. Thus compresence is an immediately perceptible relation when it occurs between two percepts belonging to one observer at one time. We saw how, in Russell's earlier formulation, particulars were assigned to just a single 'perspective'. The 'complete complexes of compresence' that now replace perspectives are classes of events with the following two properties: (i) any two events that are members of the class are compresent (ii) nothing outside the class is compresent with *every* member of the class. This allows that an event can belong to more than one such complex. And since a complete complex of compresence is a point-instant in space-time, this is equivalent to saying that an event occupies a finite region of space-time. Thus, events, unlike the particulars of *The Analysis of Mind*, are explicitly members of more than one point, in physical space.

I think one can see how this system is very much a development and refinement of Russell's older system. In other words, Russell is entirely justified, in my opinion, in thinking that his philosophical development from 1914 to 1927 and after was continuous. The most important tacit change is not, *pace* Grayling, the abandonment of sensibilia, but rather that these 'sensibilia', along with other events, have acquired an extension in all four dimensions of space-time. This makes possible the definition of matter in terms of events comprising the region where the piece of matter is.

Russell's mature philosophy is still a form of neutral monism. The 'neutral stuff' of this monism consists of 'events'. This is unequivocally confirmed by Russell himself in *An Outline of Philosophy* (1927) in which the system developed in *The Analysis of Matter* is expounded in a more widely accessible form. We have already quoted part of the relevant section above, but I think it is worthwhile here to quote a little more. 'It will be seen', Russell writes, 'that the view which I am advocating is neither materialism nor mentalism, but what (following a suggestion of Dr. H. M. Sheffer) we call "neutral monism". It is monism in the sense that it regards the world as composed of only one *kind* of stuff, namely events'.¹⁷ In *The Analysis of Mind*, mental images were mental, but not physical. Now, however, images and sensations are events that happen where the brain is and thus serve to constitute the brain. Thus they are members of 'physical' sets as well as mental sets. In Russell's mature system, the 'mental' is a proper subset of the physical. All mental events are also physical, but not vice versa. An event is not *intrinsically* either mental or physical; it can be regarded as 'mental' or

¹⁷ *An Outline of Philosophy*, p. 293.

'physical' in virtue of its being a member of mental or physical groups (i.e. minds or pieces of matter). That is why events are intrinsically 'neutral' as between mind and matter.

Oddly, despite Russell's clarity concerning the nature of his 'neutral stuff', some commentators have come up with theories of their own concerning what this stuff might be. Thus Robert E. Tully has rejected the idea that Russell's neutral stuff consists of 'events'.¹⁸ The ground on which he does this is that 'the effect of any such interpretation would be to transform Russell's basic stuff into something physicalistic, thereby robbing it of its neutrality.'¹⁹ Tully goes on to say that the view that treats Russell's basic stuff as events is only made possible by ignoring Russell's own warnings that his metaphysic is neither materialistic nor idealistic. Clearly, Tully thinks that taking 'events' as basic stuff is equivalent to 'something physicalistic', but it is difficult to see what his ground is for this attitude. It is true that Russell holds all events - or all knowable events at any rate - to be physical; but this is not a matter of their being *intrinsically* physical, but merely in their being elements of physical classes. There is no difficulty with an event being at once an element of a physical class and an element of a mental class, and this, indeed, happens precisely in the case of percepts.

In addition, Russell's view of 'events' is not physicalistic, since they have intrinsic qualities that cannot be known, except in the case of percepts. Physicalism maintains that the physical description of the world is 'complete'. Once all true propositions of physical science are stated nothing is left to be said. Russell's view is that physics describes the *structure* of events but says nothing about their intrinsic *quality*. I confess that I cannot see in what way taking the basic stuff as 'events', as Russell undoubtedly does, renders his philosophy physicalistic. In some ways his views might seem materialist. As he himself says in a passage quoted by Tully 'when I say that my percepts are in my head, I shall be thought materialistic; when I say that my head consists of my percepts and other similar events, I shall be thought idealistic.'²⁰ But this does not mean that Russell's philosophy is either one or the other. For this reason I think it is Tully who has ignored Russell's warnings and hopelessly misconstrued Russell's philosophy.

Tully's candidate for Russell's neutral stuff is 'sensible qualities'.²¹ There is absolutely nothing in Russell's entire *corpus* in which he says that sensible qualities are his basic stuff. It is difficult to see how, on such a view, Russell could have avoided a Berkeleyan idealism which he would certainly have found unpalatable. Tully says that Russell's neutral monism is 'epistemological in nature, not scientific'²² But in fact Russell's

18 See his essay on 'Russell's Neutral Monism', in *Bertrand Russell: Critical Assessments* III.

19 Tully, 'Russell's Neutral Monism', in *Bertrand Russell: Critical Assessments* III, ed. Andrew Irvine, p. 271.

20 Quoted in Tully, *op. cit.* p. 271.

21 Tully, *op. cit.* p. 273.

22 *Ibid.*

neutral monism, as we have seen, is fundamentally an ontological, or metaphysical, claim, and this is something that Russell himself makes clear (for example in the passage from *An Outline of Philosophy* quoted above).

The purpose of the last four chapters has been to explain Russell's metaphysics in outline and to trace its development precisely in order to counter misunderstandings such as Tully's. In pursuit of this end, I have been guided by two exegetical principles: firstly, that the only reliable guide to Russell's opinions are his own words, and secondly, that he is much more likely to have meant what he said than to have meant something else that he quite easily could have said, but in fact did not.²³ I hope that the account I have unfolded will enable the reader to sort out fact from fiction in any piece of Russell commentary that he or she should come across.

In the light of this exegesis I wish to return to Ayer's confusion over the nature of Russell's neutral monism that I alluded to above.²⁴ In his book on *Russell*, Ayer writes that:

The question arises whether the events which are common to mind and brain have the known qualities of percepts, images and feelings, or the unknown qualities of physical events, or both. The first answer is suggested by Russell's saying that 'The brain consists of thoughts – using "thought" in its widest sense, as it was used by Descartes', but this is hard to reconcile with his saying that we have no good reason to believe that the physical events which cause our experiences, are qualitatively similar to the experiences which they cause. Equally, the second answer is hard to reconcile with Russell's view that what I have called experiential propositions, the expressions of our judgements about the contents of our current experiences, come as near to being certain as any empirical propositions can. As for third answer, I do not see how it can well be true that one and the same occurrence can both, *qua* mental event, have the quality, say, of a mental image, and, *qua* physical event, have qualities which do no more than structurally correspond with the qualities of anything that actually enters into an experience. I have to confess, therefore, that I am unable to make sense of Russell's position on this point.²⁵

The correct answer to Ayer's initial query should now be pretty clear. The 'events which are common to mind and brain' are simply percepts, and have the known qualities of percepts. As for the claim that we have no good reason to believe that the physical events that cause our experiences are qualitatively similar to the

²³ These principles have been largely taken *verbatim* from Kirk and Raven. See their account of Anaxagoras in G. S. Kirk & J. E. Raven, *The Presocratic Philosophers*, p. 367.

²⁴ See p. 7.

²⁵ A. J. Ayer, *Russell*, pp. 114-5. The quotation from Russell is taken from Russell's *My Philosophical Development*, p 25.

experiences that they cause, this is clearly meant to apply to physical events that are *external* to the human body. In the highly exceptional case of a physiologist observing living nerve tissue it will indeed be the case that the matter he is observing will consist, in part, of percepts bearing the known qualities of percepts.

Of course Ayer hopelessly misconstrues Russell's development. Russell's 'neutral stuff', according to Ayer, 'was thought by him to consist in percepts which entered into the constitution of both minds and bodies, together with images and feelings, which entered only into the constitution of minds.'²⁶ This, of course, renders the earlier system completely phenomenalist. Ayer says that we find that by the late 1920s 'Russell gives up this position, which has come to be known as that of neutral monism, in favour of one in which physical objects are represented as inferred entities, rather than as logical constructions.'²⁷ Hence, for Ayer, the earlier system alone is neutral monism (perhaps because he associates the term 'neutral monism' with William James' more subjectivist theories), and the adoption of scientific realism is held to constitute an abandonment of this theory. It is not surprising, then, that Ayer is perplexed by Russell's continued adherence to neutral monism, and that he cannot make any sense out of his later metaphysic. I hope, however, that in this chapter I have succeeded in dispelling a number of myths concerning the course of Russell's development, and in so doing have made the nature of his mature metaphysical system clear.

This, then, completes my survey of Russell's neutral monist metaphysic. A great many of the criticisms of Russell were based on misunderstandings, and thus need not detain us. However, in 1928, the mathematician Maxwell Newman delivered an assault on Russell's philosophy which cannot be so easily dismissed. As we shall see, consideration of Newman's critique requires us to admit important modifications to Russell's neutral monism, modifications which Russell himself did not recognise as necessary.

26 Ibid, p. 113.

27 Ibid.

Chapter 5

Russell, Newman and the Structural Realism Controversy

I. NEWMAN'S CHALLENGE

One prominent feature of Russell's philosophy is presented by his oft-repeated insistence that the only features of external reality that can be justifiably inferred from our percepts are *structural* features. This point of view, as we have seen, was implicit in his earlier philosophy (pre-1913) but was then forgotten until the 1920s – first resurfacing in a short review published in 1923.¹

The 'structuralist' approach to physics is given particular emphasis in *The Analysis of Matter*. His argument is that we infer the structural characteristics of external events on the basis of some such maxim as 'same cause, same effect', with its corollary 'different effects, different causes'.² I shall argue later on that our knowledge of the external world is not based on an inference from effects to causes in quite the manner Russell supposes.³ Nevertheless, I still think that the 'structuralist' interpretation of physics must be correct. For, on the theory I shall expound in my final chapter, the justification for my belief in the physical world is that the positing of external physical objects is presupposed by any description of experience which enables us to anticipate the future course of our sense-experience. As a consequence, our knowledge of the character of physical objects is restricted to those properties that figure in physical theories. And I should argue that the only properties that have a genuine function in explanation are purely formal properties. Properties such as mass and charge are all 'dispositional' properties, in the sense that such properties are not merely contingently related to the behaviour of the particles they characterise. Rather, to credit a physical particle with a given charge or mass logically entails certain statements concerning how the particle would behave under certain circumstances. Thus, these physical properties are not what we might call 'intrinsic' or 'first-order' properties. We can 'cash' these properties in terms of the behaviour of particles, and the statements describing this behaviour will mention

1 Bertrand Russell, 'Science and Metaphysics', reprinted in *Collected Papers* 9, pp. 238-9.

2 For example, *The Analysis of Matter*, p. 400.

3 See below, Chapter 8, section IV, 'Percepts as signs' (pp. 136-42.)

properties of particles such as spatio-temporal location. Physical space itself is not something with which we are directly acquainted. Rather, whatever relation satisfies certain purely formal axioms can be taken as *being* the ‘space’ of physics. Since nothing else is required by physics of space except that it does satisfy certain purely formal axioms, any further characterisation of physical space would be quite unwarranted.

Science, therefore, seems to reduce to knowledge of purely formal properties, i.e. properties of structure. And it is difficult to see how we could know anything *more* than structure. The ‘structuralism’ of *The Analysis of Matter* is, therefore, a thesis that seems to rest on solid foundations.

However, only a year after the publication of *The Analysis of Matter*, the structural realist thesis that Russell had advanced in this book was subjected to a powerful challenge by the mathematician M. H. A. Newman in a paper published in *Mind*.⁴ Newman’s argument has sometimes been taken as a definitive refutation of Russell’s position in *The Analysis of Matter*⁵, and so it is important for us to show that it is no such thing, though it undoubtedly is a very important paper which requires that Russell’s metaphysic be modified in the light of the argument contained therein.

Newman’s argument in his 1928 paper is both subtle and brilliant. What Newman pointed out was that Russell’s own definition of structure in *Principia Mathematica* implied that a given aggregate possesses *every* structure compatible with its cardinality. It follows from this that to assert that a given aggregate has a certain structure with respect to *some* relation, without specifying what this relation is, amounts to no more than a trivial cardinality claim concerning the aggregate in question. However, natural science certainly tells us more about physical reality than simply the *cardinal number* of entities comprising it. Consequently, it tells us more about the world than simply its abstract structure, and Russell’s structural realism must be false.

In order to understand Newman’s argument, it is necessary first to be clear concerning the meanings of certain terms. Firstly, we must analyse the concept of ‘structure’. In *Principia Mathematica*, Russell and Whitehead pointed out that it is not a mere aggregate, or heap, of elements that has a structure, but rather a specific *relation*. The abstract structure of a given relation was referred to by the authors as its ‘relation-number’. This was defined in a way that paralleled the definition of cardinal number. Just as a cardinal number was a class of similar classes, so a relation-number was identified with a class of similar relations. Two relations, P and Q, are said to be ‘similar’ if and only if there is a relation S establishing a one-one correlation between the fields of P and Q such that, whenever any item has the relation P to another, the correlate of the one (by S) has the relation Q to the correlate of the other, and vice versa. A given relation-number is then defined as the class of

4 M. H. A. Newman, ‘Mr. Russell’s “Causal Theory of Perception”’, *Mind*, 37 (April 1928).

5 See, for example, Ray Monk, *Bertrand Russell 1921-1970: The Ghost of Madness*, p. 71.

relations similar to a given relation.

Newman's argument also lent on Russell and Whitehead's definition of 'relation'. In *Principia Mathematica* it is stated that 'A *relation*, as we shall use the word, will be understood in extension: it may be regarded as the class of couples (x, y) for which some function $\psi(x, y)$ is true.'⁶ As Newman remarks in his paper, this definition only applies to dyadic (or 'binary') relations. But it is clear that Russell meant his definition to apply to relation generally. Thus Newman defines a relation as a class of ordered sets of the form (x_1, \dots, x_n) satisfying a given propositional function $\varphi(x_1, \dots, x_n)$. It is important to note, as Newman insists, that a relation is not just a class of sets, but a class of *ordered* sets, since not all relations are symmetrical. Thus a relation such as 'tallness' is simply a class of ordered sets $\langle \text{Phaedo}, \text{Simmias} \rangle$, $\langle \text{Simmias}, \text{Socrates} \rangle$, etc; that is, it is the class of sets of the form $\langle x, y \rangle$ such that 'x is taller than y' is true.

From this purely 'extensional' definition of relation, combined with the previous definition of structure in terms of 'relation-number', it follows that any given aggregate constitutes the field of a relation with any structure we please, provided that the field has a sufficient cardinality. This can best be seen using an example. Suppose we have four entities, a, α, β and γ , and we wish to identify a relation between all and only the following ordered pairs: $\langle a, \alpha \rangle$, $\langle a, \beta \rangle$, $\langle a, \gamma \rangle$. Then we simply define a propositional function φ such that $\varphi \langle x, y \rangle$ is defined as

$$x=a \text{ and either } y=\alpha \text{ or } y=\beta \text{ or } y=\gamma.$$

This identifies a relation with the required structure. It is obvious that this example can be generalised, and we can collect together any entities we like in any combination we please, in order to identify relations with any relation-number, that is, structure, we desire. The only constraint in this process is that the field of the relation must have a sufficient number of entities.

Although both Russell and Newman take 'structure' to be synonymous with 'relation-number' it is clear that this cannot be taken as wholly satisfactory. For we might wish to define the structure of a *set* of relations on a given domain. To do this, we need to set up the following definitions. We say that a 'concrete structure' is simply a set of any relations (R_1, \dots, R_n) on a given field. Two concrete structures, P and Q , are said to be 'isomorphic' if and only if there is a relation S establishing a one-one correlation between the field of P and the field of Q , and a one-one relation T between the members of P and the members of Q (these members being *relations* remember) such that, whenever a given relation belonging to P holds between a given set of elements

6 A. N. Whitehead and Bertrand Russell, *Principia Mathematica*, Volume I, p. 200.

belonging to the field of P , the correlated elements (by S) in the field of Q are related by the correlated relation (by T) belonging to Q , and vice versa. An ‘abstract structure’, or ‘isomorphism class’, is then defined as the class of all concrete structures isomorphic to a given concrete structure.

It is obvious that this more sophisticated definition of structure does not introduce any new difficulties of principle into Newman’s central argument. His point remains that, for any aggregate, it is always possible to define some set of relations with the aggregate as field belonging to any abstract structure whatever, modulo cardinality constraints. Therefore, the only information contained in the assertion that a given aggregate *has* relations with such-and-such a structure is information about its cardinality.

In his paper, Newman deals with some of the more obvious objections that one might have concerning his argument. For example, we might conclude that there is something suspect about the original ‘extensional’ definition of relation. Perhaps the structural realist could modify his account in order to distinguish between ‘real’ and ‘fictitious’ relations. Here a ‘fictitious’ relation is one which is defined extensionally; that is, it is one whose *sole* property is that it holds between the terms between which it holds. A ‘real’ relation is thus one that is not fictitious. The structural realist might then assert that we know the abstract structure of a set of *real* relations characterising the physical world, but that we know nothing concerning the intrinsic character of these real relations.

Newman’s response to this is to show, rather ingeniously, that whenever a ‘fictitious’ relation is characterised by some abstract structure it is always possible to identify a ‘real’ relation holding between precisely the same entities as the fictitious relation, and isomorphic with it. Let us take the above case of four entities a , α , β and γ as our example. If these entities are to be distinguishable from each other at all, then they must each have some unique property not possessed by any of the others. Newman’s own example is that a has the unique property ‘denoted by “ a ”’, α has the unique property ‘denoted by “ α ”’, and so on. One could, if one wanted, also invoke a property ‘is different to α , β and γ ’ as uniquely characteristic of a , ‘is different to a , β and γ ’ as uniquely characteristic of α , and so on. Let ‘ E ’ stand for the property uniquely characteristic of a , ‘ A ’ stand for the property uniquely characteristic of α , ‘ B ’ stand for the property uniquely characteristic of β and ‘ Γ ’ stand for the property uniquely characteristic of γ . Then we can now define a relation R' , which is defined in the following way: two entities, x and y , are related by R' if and only if

Ex and either Ay or By or Γy .

Clearly the relation this generates has the same structure as our extensional relation, R , above. And clearly also

this is a technique that can be applied quite generally.

It follows from this that the attempt to avoid the thrust of Newman's critique by distinguishing between 'real' and 'fictitious' relations fails, for the assertion that a given aggregate has *real* relations with a certain structure follows as a matter of logic from the cardinality of the aggregate, and thus tells us nothing beyond this cardinality.

Still, it might be thought that there is something suspect about such 'real' relations as we constructed above. For instance, on Newman's account, 'x is red and y is white' would describe a 'relation' holding 'between' x and y; and we would not normally think of this propositional function as describing a 'relation' at all. Newman considers this objection, and suggests that we might wish to make a distinction between 'important' and 'trivial' relations. The criterion for distinguishing an important from a trivial relation is not entirely clear on Newman's account, but is nevertheless not perhaps important. For Newman argues that the structural realist can have no ground for believing that the structure-generating relation of the physical world is 'important' if *all* he knows about this relation is its structure.

Newman's point is well taken; although it perhaps requires further explanation. I think the central point is that such a conjunction as 'x is red and y is white' may have a *causal* efficacy which neither of the conjuncts has alone. Hence, *a priori*, we cannot rule out that it is this 'relation', or perhaps this complex fact, that causally underlies the sensible order and whose structure is identified by physics.

Thus it seems that Newman has brought a powerful challenge to bear on the structural realist interpretation of science that Russell espoused in 1927. Newman himself certainly thought so, and sent Russell a copy of his article.

II. RUSSELL'S ANSWER TO NEWMAN

Russell read Newman's article and replied to Newman's critique in a letter dated 24th April 1928, reprinted in his *Autobiography*. Given the importance of this letter, I think it worthwhile to quote in full:

Dear Newman

Many thanks for sending me the off-print of your article about me in *Mind*. I read it with great interest and some dismay. You make it entirely obvious that my statements to the effect that nothing is

known about the physical world except its structure are either false or trivial, and I am somewhat ashamed at not having noticed the point for myself.

It is obvious, as you point out, that the only effective assertion about the physical world involved in saying that it is susceptible to such and such a structure is an assertion about its cardinal number. (This by the way is not quite so trivial an assertion as it would seem to be, if, as is not improbable, the cardinal number involved is finite. This, however, is not a point upon which I wish to lay stress.) It was quite clear to me, as I read your article, that I had not really intended to say what in fact I did say, that *nothing* is known about the physical world except its structure. I had always assumed spacio-temporal continuity with the world of percepts, that is to say, I had assumed that there might be co-punctuality between percepts and non-percepts, and even that one could pass by a finite number of steps from one event to another compresent with it, from one end of the universe to the other. And co-punctuality I regarded as a relation which might exist among percepts and is itself perceptible.

I have not yet had the time to think out how far the admission of co-punctuality alone in addition to structure would protect me from your criticisms, nor yet how far it would weaken the plausibility of my metaphysic. What I did realise was that spacio-temporal continuity of percepts and non-percepts was so axiomatic in my thought that I failed to notice that my statements appeared to deny it.

I am at the moment much too busy to give the matter proper thought, but I should be grateful if you could find some time to let me know whether you have any ideas on the matter which are not merely negative, since it does not appear from your article what your own position is. I gathered in talking with you that you favoured phenomenalism, but I do not know how definitely you do so.

Yours sincerely

*Bertrand Russell*⁷

Russell's answer to Newman, then, is as follows: in fact, it is *not* the case that the only thing we know about the physical world is its structure. In addition to structure, we are also directly acquainted with one of the relations belonging to the structure physics describes. This relation is 'co-punctuality' In his letter, Russell tends to conflate co-punctuality with 'compresence', sliding between the two. Thus he writes that 'I had assumed that there might be co-punctuality between percepts and non-percepts, and even that one could pass by a finite number of steps from one event to another compresent with it, from one end of the universe to the other.'

⁷ Bertrand Russell, *Autobiography*, pp. 413-4. The eccentric spelling of 'spacio-temporal' is in the original.

‘Compresence’ is the relation that two or more events have to each other when I experience them at the same time. This, it should be noted, is an explanation designed to draw attention to the relation being identified. The definition of the relation is ostensive. There is thus no difficulty in extending it beyond our percepts and supposing that it relates percepts with non-percepts. Compresence is in fact the *same* relation as ‘overlapping in space-time’. This is taken for granted throughout Russell’s mature work. Thus, for example, in *The Analysis of Matter* Russell writes:

We assume that two events may have a relation which I will call ‘compresence’, which means, practically, that they overlap in space-time. Take, for instance, notes played by different instruments in orchestral music: if one is heard beginning before the other has ceased to be heard, the auditory percepts of the hearer have ‘compresence’. If a group of events in one biography are all compresent with each other, there will be some place in space-time which is occupied by all of them. This place will be a ‘point’ if there is no event outside the group which is compresent with all of them.⁸

This identification of compresence with overlapping in space-time is made possible by relativity theory, which holds that there is no relation of *absolute* simultaneity between events in separate regions of space-time, but that two events are absolutely simultaneous only when they happen at the same place.

In the passage quoted above the example Russell chose to illustrate compresence was that of one note beginning before another has ceased. In this instance we are dealing with a one-dimensional time sequence. However, the space-time of physics has four dimensions, not one. In *The Analysis of Matter*, Russell shows that ‘co-punctuality’, out of which four-dimensional space-time order is constructed, must be taken as a relation between *five* events. It will be equivalent to that relation between any five events in virtue of which they are said to share some common region (or, if not a finite region, then at least a *point* – hence the term ‘co-punctuality’).⁹

Nevertheless, if two events belong to a copunctual quintet then it follows logically that they overlap in space-time and thus that they are compresent as well. Co-punctuality, therefore, always implies compresence, and compresence is a perceptible relation. Thus Russell is quite right in insisting that he had never meant to say that *nothing* is known about the physical world except structure.

Despite some reservations expressed in the letter above (‘I have not yet had the time to think out how far the

8 Bertrand Russell, *The Analysis of Matter*, p. 294.

9 For the reason why co-punctuality is a relation between five events when constructing a four-dimensional space, see below, p. 167.

admission of co-punctuality alone in addition to structure would protect me from your criticisms, nor yet how far it would weaken the plausibility of my metaphysic’) Russell *did* in the end regard this as constituting an adequate rebuttal of Newman’s argument. No further attempt was made by Russell to answer Newman, which he surely would have made had he thought that the answer he had originally supplied was not, after all, successful. And the letter was reprinted in his *Autobiography*. To most readers the content of the letter would have been highly esoteric, if not downright unintelligible. I think the reason why it was reprinted is that Russell recognised that Newman’s criticism was important, and *prima facie* devastating, and so wanted his specific answer to it to be put into the public domain. If this is so, then it indicates his confidence in the answer he supplied.

It has to be said that some of the commentators who raise the Newman controversy are deeply muddled over Russell’s response. Thus Demopoulos and Friedman, after quoting Russell’s letter, write:

To our knowledge, Russell never discusses the puzzle in any of his later work. He seems to give up the idea that our knowledge of the physical world is purely structural, but there is no account of how, on his theory of knowledge (e.g. the theory developed in *Human Knowledge: Its Scope and Limits* [1948]), such non-structural knowledge can arise...in the earlier theory we could not assume acquaintance with (what Maxwell used to call) a cross category notion such as spatiotemporal contiguity or causality, but in light of the difficulties of that theory we now find that we *can* assume this. We are not saying that one cannot resolve the issue in this way. But it seems quite clear that without a considerable advance in the theoretical articulation of this rather elusive Russellian concept, no such resolution can be very compelling.¹⁰

There are several observations to be made about the authors’ perplexity here. Firstly, as we have seen, it is not as though Russell actually altered his metaphysic. He simply realised that he had *always* assumed that we had *some* non-structural knowledge, but took this so much for granted that he did not realise that his statements, interpreted strictly, were inconsistent with this. I say ‘interpreted strictly’ because Russell would continue to insist that our knowledge of the external world is *largely* structural. Demopoulos and Friedman express puzzlement over how, given Russell’s theory of knowledge, non-structural knowledge can arise. But it seems to me that Russell has answered that point in his letter. Our (non-structural) knowledge of the intrinsic character of ‘co-punctuality’ is obtained through direct acquaintance, since, as he puts it, ‘co-punctuality I regarded as a relation which might exist among percepts and is itself perceptible’. Perhaps the problem that

¹⁰ William Demopoulos and Michael Friedman, ‘The Concept of Structure in *The Analysis of Matter*’, reprinted in A. D. Irvine (ed), *Bertrand Russell: Critical Assessments, Volume III: Language, Knowledge and the World*, p. 287.

Demopoulos and Friedman have is that they do not see how, on Russell's theory, a relation between percepts which is itself perceptible can also be supposed to hold between external events. But there certainly seems to me to be no logical difficulty here. One must remember that although compresence (with which co-punctuality is identified in practice) is a relation with which we are directly acquainted it is not *defined* as a relation with which are directly acquainted. There is nothing intrinsically 'mental' about compresence. Thus there is no reason why the relation should not be extended into the physical world. Since the relation is one with which we are indeed directly acquainted, I cannot see the justification for Demopoulos and Friedman's assertion that the concept Russell employs is 'rather elusive'. On the contrary, the meaning of 'compresence' is transparent through attending to the relation as it figures in experience. And I do not see why such a concept cannot also apply to non-experienced events, except on the basis of some *a priori* assumption that all relations that figure in our experience are in some way existentially dependent on being experienced.

It does not follow from this that Russell's answer to Newman is correct; what I am trying to show is that it is perfectly intelligible, and that there is no ground for the sort of perplexity routinely evinced by those (admittedly very few) commentators who have discussed this issue. It remains to be seen whether Russell's response to Newman is in fact adequate.

III. CONCERNING RUSSELL'S ANSWER TO NEWMAN

If Russell could show that the relation of co-punctuality – or overlapping in space-time – is one with which we are directly acquainted (i.e. is 'compresence') I think that his answer to Newman would indeed be successful. However, I doubt the possibility of identifying compresence with overlapping. The reasons for this are somewhat technical, but I shall attempt to explain them here.

Russell defines the class comprising all my current percepts as what he calls a 'complete complex of compresence'. A 'complex of compresence' is a set of events which are all compresent with each other. A complex of compresence is 'complete' if it is not possible to enlarge the group through the addition of fresh events without the group ceasing to be a complex of compresence; that is, a 'complete complex of compresence' has the following two properties: (i) every member of the complex is compresent with every other member of the complex, (ii) nothing outside the complex is compresent with *every* member of it. Of course, something outside the complex might be compresent with *some* of the members of the complex, without the latter ceasing to be 'complete', so long as it isn't compresent with *all* its members. Two or more complete complexes of compresence can 'intersect', in the sense of sharing common members.

If a given complex of compresence lacks the second of the above two conditions then it is said to be ‘incomplete’.

These definitions are repeated in *Human Knowledge: Its Scope and Limits*, where Russell re-affirms the identity of compresence with ‘overlapping in space-time’.¹¹ But then, it would seem that a complete complex of compresence would count as a ‘point’ – or at least a spatially indivisible unit – in physical space-time. Technically, this might not be necessary, if ‘compresence’ is construed as a dyadic relation. For *A* can be compresent with *B*, *B* can be compresent with *C*, and *C* can be compresent with *A*, without all three sharing a common region. Nevertheless, Russell never invokes this point to distinguish complete complexes of compresence from space-time point-instants, and in practice treats copunctuality (the hyphen in ‘copunctuality’ having been dispensed with in *Human Knowledge*) and compresence as equivalent. Thus, for example, he writes that ‘A complete complex of compresence counts as a space-time point-instant.’¹²

At the same time, the sum-total of my percepts at any one moment is held to constitute a complete complex of compresence. Once Russell had abandoned the notion of a substantive self, it was necessary to identify the relation holding between my momentary experiential contents in virtue of which they all belonged to *me*. Russell’s answer to this was simply that all *my* experiences at a given moment are *simultaneous* with each other. Hence, it is possible to define my momentary experience as a class of entities simultaneous with ‘this’ where ‘this’ denotes some item in my experience. As a matter of fact, this definition would not secure that my total momentary experience constituted a complete complex of compresence, unless ‘simultaneity’ were regarded as a transitive relation. For otherwise a given item in my experience can be simultaneous with *A* and also with *B* without *A* and *B* being simultaneous, and thus without *A* and *B* satisfying the first condition for membership of the same complete complex of compresence. This may have not been a problem for Russell at the time when he wrote *The Analysis of Mind*, for he had written that real, as opposed to constructed, time relations divide the world into ‘mutually exclusive’ biographies, so in practice the possibility of an item in my experience being simultaneous with two items that are not simultaneous with each other would not arise.

However, when he wrote *The Analysis of Matter*, it was necessary to construct space out of a manifold of overlapping events. If overlapping in space-time was to be identified with some experienced relation then, since overlapping in space-time is *non-transitive*, it would be necessary to suppose that the experienced relation was non-transitive as well. This is why the replacement of ‘simultaneity’ by ‘compresence’ is felicitous, in so far as the former seems to imply transitivity whereas the latter expression, being unfamiliar,

¹¹ For example, *Human Knowledge*, pages 314 and 321.

¹² *Human Knowledge*, p. 322.

does not. My total momentary experience, then, constitutes a ‘complete complex of compresence’.

The difficulty with this definition is that, on Russell’s account of the construction of space-time out of compresence, it would follow that my total momentary experience occupies a literal point in space-time (or, if ‘points’ are thought to imply a mathematically continuous space for which we have no warrant, then a spatially indivisible unit).

Did Russell really think that the complex comprising my momentary mental contents occupied a mere point in physical space? I have already quoted Russell saying that a complete complex of compresence counts as a space-time point-instant. The astonishing thing about this quote is that, just a few lines before, on the same page, Russell asserts that “‘I-now’ denotes the complete complex of compresence which contains the present contents of my mind.’ The implication seems clear: the complex ‘I-now’ counts as a point-instant in space-time. This seems to be confirmed at other points in Russell’s exposition. Thus, Russell writes that ‘It will be found that what I call a “total momentary experience” has all the formal properties required of an “instant” in my biography. And it will be found that, where there is only matter, the “complete complex of compresence” may serve to define an instant of Einsteinian local time, or to define a “point-instant” in cosmic space-time.’¹³ Once again, the implication seems clear: an ‘instant’ in my biography is equivalent to an instant of Einsteinian ‘local time’ – presumably the ‘local time’ of my brain – which is in turn equivalent to a ‘point-instant’ in space-time. Again, this notion surfaces in *My Philosophical Development*. In the chapter on ‘The External World’ Russell writes that he came to the conclusion that ‘what, in the space of physics, counts as a point, or, more exactly, a ‘minimal region’, is really a three-dimensional complex of which the total of one man’s percepts is an instance.’¹⁴ There is no suggestion that this is a view he subsequently found unsatisfactory.

The reference to ‘minimal regions’ in the above quote does nothing to modify this aspect of his metaphysic. Russell takes reference to ‘points’ as implying a mathematically continuous space. Rightly regarding the existence of continuity in physical space as a doubtful empirical matter, he seeks to avoid committing himself by instead referring to spatially indivisible units, or ‘minimal regions’. Thus a minimal region is not a *finite* extended region of space. This is confirmed at the end of Russell’s chapter on ‘The External World’ when he explains that, although both he and Whitehead found ways of constructing ‘points’ out of finitely extended events, ‘both his method and mine will only work on certain assumptions. Without these assumptions, although one can arrive at very small regions, one may be unable to arrive at points. It is for this reason that in the above account I have spoken of “minimal regions” rather than points.’¹⁵ Obviously a ‘minimal region’ could not have

¹³ Ibid, p. 317.

¹⁴ *My Philosophical Development*, p. 79.

¹⁵ Ibid, p. 81.

spatial *parts*. If it did, then it would no longer be *minimal*, and it would be possible to define smaller spatial units after all.

So what is my difficulty with the notion that my total momentary experience occupies a minimal spatial unit in cosmic space-time? My chief problem is that it is inconsistent with Russell's locating percepts at regions of the brain on the basis of causal considerations. For these considerations will lead us to locate percepts at diverse and non-overlapping regions of the brain. Visual percepts will be located in the visual cortex – the site of their causal provenance; auditory percepts will be located at the auditory cortex, and so on. The brain is an extended object, not a point, and its route through space-time is more accurately regarded as a 'world-tube' than a 'world-line'. For this reason, I do not believe that any theory which implies that percepts all occupy a point can be considered sound.

It seems to me that there is a consistent Russellian metaphysic – the one outlined in the first chapter of this thesis – in which the cosmos comprises a vast number of overlapping events and in which the space that these events 'occupy' is itself constructed out of their relations of overlapping. There is also the characterisation of my total momentary experience as a 'complete complex of compresence', and this also seems to me to be sound. So far, everything about Russell's metaphysic is coherent, intelligible, even elegant. The difficulty arises when one *identifies* overlapping in space-time with the relation of compresence.

This identity may have been suggested by relativity, where 'absolute simultaneity' implies spatial overlap, and vice versa. But then, it is not clear that 'absolute simultaneity' as a physical relation should be identified with perceived compresence – this is exactly the question at issue. Again, my brain has its own 'local time'. But it does not follow that this 'biography' is to be identified with my 'biography' which comprises *only* my percepts, past, present and future. There is much more happening in the brain, on a microphysical level, than is ever represented in my consciousness. Therefore, the brain must comprise events that do not belong to the history of my consciousness but which will belong to the 'biography' of the piece of matter called the brain.

Incidentally, there is a passage in *The Analysis of Matter*, in Chapter XXXII, which *seems* to address the point I am making but, if I am not mistaken, does not quite succeed in defusing it. Earlier in the work, Russell had defined a 'causal unit' in the following manner. A group of events form a 'causal unit' if their joint effect is different to what each event would cause separately. One example of a causal unit is the totality of my percepts – or at least those of which I am conscious – at any one moment. Thus, I could be instructed by a psychologist to raise my arm if I hear *both* a given sound *and* a given visual signal, or if I perceive *neither* of these things, but not if I perceive either one or the other. The overall effect, then, of my experience, can only be calculated

from considering my experience as a whole, and not by considering each part of my experience separately. This shows that my conscious experience forms a ‘causal unit’, in Russell’s sense. Now, in Chapter XXXII, explaining why all my percepts must in some sense be ‘in the same place’, Russell writes:

The whole of our perceptual world is, for physics, in our heads, since otherwise there would be a spatio-temporal jump between stimulus and percept which would be quite unintelligible. Any two events which we experience together – e.g. a noise and a colour which we perceive to be simultaneous – are ‘compresent’. I should not say, however, that two percepts which are not both ‘conscious’ *must* be compresent. Two events are compresent when they form together one causal unit or part of one – this is a sufficient, but perhaps not a necessary, condition. When two percepts are experienced together, they are thus causally conjoined; but when either is ‘unconscious’ they may not be, and therefore we cannot be sure that they are compresent. It is not necessary, consequently, to suppose that the mind occupies a mere point in physical space.¹⁶

This is a very densely written passage. Reading through it carefully, it seems to me that Russell is saying that it is a *sufficient* condition for two percepts to be compresent that they form a causal unity. That is, that whenever two percepts form a ‘causal unity’ they are compresent, but not necessarily vice versa. Whenever two percepts are ‘experienced together’, i.e. are compresent, they form a causal unity. However, if one percept is ‘unconscious’ then it need not form a causal unit with a percept of which we are conscious, and thus need not be compresent with it. Since Russell takes compresence and overlapping in space-time to be equivalent terms, this means that it is not necessary for *all* my percepts to overlap.

However, what Russell does not address in this passage is that it would still be necessary for all the percepts of which I was *conscious* to overlap. Furthermore, if the complex ‘I-now’ were a complete complex of compresence, then it would seem that my conscious mind *would* have to occupy a ‘mere point’ in physical space. Thus, I do not think that Russell avoids the difficulty I have indicated through this argument about ‘unconscious’ percepts.

In any case, Russell’s argument implies that all my ‘conscious’ percepts overlap in physical space. This, on the face of it, does not seem compatible with the localisation of percepts to the diverse regions of the cerebral cortex with which they are causally associated. (And Russell is insistent that events are located in space-time through causal considerations.) Perhaps this conclusion could be avoided by sufficient theoretical adroitness. Thus, in the thought-experiment I outlined above, a subject is made to respond in a certain way if he receives

16 *The Analysis of Matter*, p. 336.

certain visual and auditory stimuli jointly, but not if he receives either stimulus without the other. This implies that there is some faculty which compares the stimuli from different senses, and this will presumably be located at some region of the brain. Perhaps, we might allow some latitude concerning the location of percepts so that they extend over this region. In this case, we might be able to conclude that all our percepts did overlap after all. But this still would not be enough to salvage Russell's position. For whatever region is responsible for collating, as it were, the inputs from the various sensory cortices, this will constitute a region and not a point. Consequently, on Russell's account, there will be events of which I am not conscious that are compresent with *all* my conscious percepts. But then this should be impossible on Russell's account, insofar as being simultaneously conscious of two events is equated with compresence, and the complex 'I-now' denotes a *complete* complex of compresence.

The only way of avoiding this impasse is to say that being simultaneously conscious of two events (what we might call 'co-consciousness') is not the same as compresence. This, however, would involve grave difficulties for Russell's neutral monism. Russell could not allow a simple relation of 'co-consciousness', since this is a 'mental' relation, and it is essential to Russell's position that there are no simple relations that are *intrinsically* mental. This is why it was so convenient to substitute 'compresence' for co-consciousness, since compresence, unlike co-consciousness, is not intrinsically mentalistic.

My conclusion, therefore, is that there is no ground for identifying overlapping in physical space with the perceptible relation of compresence, and that furthermore such an identification creates insuperable difficulties for a neutral monist metaphysic such as Russell's.

IV. AN ANSWER TO NEWMAN?

If Russell's answer to Newman fails, then does it follow that Russell's metaphysic stands refuted? I believe not, for two reasons. Firstly, it might still be possible to identify time relations within our experience with some physical relation.¹⁷ But secondly, putting aside considerations of this kind, it is possible, I think, to defend a pure structural realism from Newman's challenge, though the defence that I shall mount will result in a metaphysic that has a somewhat Kantian flavour in certain respects.

My defence runs as follows. It is indeed the case that if I know *nothing* about the relations comprising 'physical reality' then the assertion that these relations have a certain structure tells us nothing about the world

¹⁷ See below, pp. 91-93.

beyond its cardinality. However, what Newman forgets is that I *do* know something about the concrete structure that is the physical world even if I don't know its intrinsic nature: I know that it, and not some other concrete structure, is *causally responsible for percepts*. It is the connection with percepts that Newman has omitted from his account – or at least so it seems to me. The point is that I can uniquely identify the concrete structure that is the physical world without being directly acquainted with its constituents – essentially, via a definite description. The concrete structure whose abstract structure is identified by physics is *that concrete structure* (whatever the nature of its constituent relations) *whose abstract structure is 'mirrored' by percepts*. And this is certainly sufficient to rescue physics from 'triviality'. For the fact that our sense-experience mirrors, or supervenes on, a reality ordered in a certain way – rather than in some other way – is scarcely 'trivial' knowledge. On the contrary, it is the basis for all our predictions concerning the future course of our sense-experience. It is indeed true that the domain of physical objects will also comprise the domain of concrete structures with *every* abstract structure compatible with the cardinality of the domain. But this is irrelevant. These other concrete structures do not causally ground our sense perceptions. They have no bearing on our sense-experience and can be of no interest to us. Only *one* of these structures is of interest to us – the one on which percepts supervene – and this is the structure whose formal properties are described by science. For this reason I do not think that Newman's objection to structural realism is decisive.

In the above argument I have referred, somewhat vaguely, to percepts 'mirroring' physical reality. Clearly this requires further explanation, although it is clear that there is some lawlike relation between the qualities and relations that are given to us in our percepts and the formal properties of the physical world as described by science. This relation might be described as an approximate isomorphism between the relations amongst our sense-perceptions on the one hand and the relations comprising the physical world on the other. However, I think that a better characterisation of this relation is that percepts mirror the physical world in the sense that they (causally) *supervene* on it, or rather on some portion of it, namely the brain. In any case, I think that my argument above disposes of Newman's objection.

But now perhaps we have dismissed Newman too lightly. It might be argued that our account does indeed dispose of Newman, but only at a very high cost. For the fact that our percepts mirror external reality organised in a certain manner is more a statement about our percepts than about the external reality. In fact, what substantive information concerning external reality can we indeed deduce from the fact that our percepts supervene on a structure belonging to a certain isomorphism class? Surely the only information is information about the cardinality of external reality. This does not, by the way, land us where we were before. Physics still does not amount to a trivial cardinality claim, for it also identifies the formal properties of the concrete structure on which percepts supervene, and this is not at all trivial. However, *this*, it might be said, is

knowledge concerning the behaviour of percepts. It tells us nothing about the noumenal or metaphysical reality underlying Nature.

This is a price which, however, I am willing to pay if necessary. Physics tells us nothing about the physical world except for its abstract structure with respect to the causation of percepts, what we might, following Russell, call the ‘causal skeleton of reality’.¹⁸ The onus is on anyone who thinks that physics grants us non-structural knowledge to explain how this can be the case. Certainly, on the Russellian view of perception, all we are immediately acquainted with are the contents of our own sense-experience. Unless some relation figures in this experience that we can project beyond our experience, there seems no prospect of discovering more about the world besides its abstract structure. Russell himself, as we have seen, picked out copunctuality (which is the same as compresence for Russell) to fulfil exactly this role, and we have criticised this view as untenable. If the ‘structuralist’ account of science leads to the view that we can know nothing about external reality beyond its cardinality (without reducing physics itself to triviality) then this is a conclusion we ought to accept. It may seem painfully sceptical, but as philosophers we ought to be prepared to embrace painfully sceptical conclusions, and in any case I do not personally find it so irksome.

For a start, the view that I am proposing is certainly not the same as phenomenism. For the physical-object language cannot be reduced to the phenomenological language. Hence, to describe the content of experience in physical-object terms presupposes the existence of genuinely external entities, entities other than percepts. It might be supposed that if, as we have argued, we know *nothing* about the intrinsic nature of these entities then we have no reason to suppose that they are not themselves percepts, so that the ‘objects’ of our perception would, curiously, be our own percepts. This, however, can quite definitely be ruled out. We have already remarked that there is more going on, at the microphysical level, in any region of our brains than is ever reflected in phenomenology. Furthermore, our brains are only a tiny corner of the physical universe. Thus the physical universe is *immensely* more complex than our percepts and thus has a much greater cardinality. The cardinality of the universe is vast, and indeed quite possibly transfinite. There is thus no doubt that the applicability of physical-object terms to our sense-experience carries the implication that there exists a genuinely external reality.

But the outcome of our enquiry is perhaps somewhat Kantian. If my defence of structural realism is sound, then the entities that figure in the physical universe as ‘events’ are, in themselves, ‘noumenal’ entities, in the Kantian sense. Physics describes this noumenal reality *as it affects our experience*, rather than how it is ‘in itself’. What remains of the Russellian thesis is the identity of percepts with certain events occurring in the

18 *The Analysis of Matter*, p. 391.

brain. Interestingly, even this identity theory was prefigured in Kant. In the first edition of the *Critique of Pure Reason*, in the second paralogism, Kant considers the idea that the noumenal reality corresponding to our phenomenal bodies could be identified with a self – which for Kant is a ‘simple’, non-composite, entity. The passage is sufficiently interesting to be worth quoting in full:

If matter were a thing in itself, it would, as a composite being, be entirely different from the soul, as a simple being. But matter is mere outward appearance, the substratum of which cannot be known through any predicate that we can assign to it. I can therefore very well admit the possibility that it is in itself simple, although owing to the manner in which it affects our senses it produces in us the intuition of the extended and so of the composite. I may further assume that the substance which in relation to our outer sense possesses extension is in itself the possessor of thoughts, and that these thoughts can by means of its own inner sense be consciously represented. In this way, what in one relation is entitled corporeal would in another relation be at the same time a thinking being, whose thoughts we cannot intuit, although we can indeed intuit their signs in the [field of] appearance. Accordingly, the thesis that only souls (as particular kinds of substances) think, would have to be given up; and we should have to fall back on the common expression that men think, that is, that the very same being which, as outer appearance, is extended, is (in itself) internally a subject, and is not composite, but is simple and thinks.¹⁹

Of course, there is a crucial distinction between this Kantian speculation and the idea that I am suggesting above, a distinction which makes the idea I am proposing much more ‘Russellian’; namely, that Kant thinks the noumenon might be a ‘soul’, whereas I am suggesting that the ‘matter’ or ‘substratum’ of the brain comprises entities that include sensations or percepts (rather than a soul or souls) as a proper subset. In fact, if sensations are amongst the things in themselves that constitute the matter or substratum of the brain then, more generally, things in themselves will manifest themselves in the physical world as physical states (or processes) occupying small finite regions of space-time, that is, as ‘events’, in the Russellian sense.

I hinted at the start of this section that perhaps subjective time could be given a physical interpretation. To the extent that such an interpretation is possible, to that extent we would be able to claim knowledge not only of the abstract structure of the physical world but also of its character, at least in part. But first it is necessary for us to determine what are the fundamental relations that characterise the physical world *according to physics*. We must therefore investigate the nature of space and time as it figures in modern physical theory. Here, the most important physical theory is that of relativity. In addition, it would, I think, be useful to investigate the

¹⁹ Kant, *Critique of Pure Reason*, p. 339-40.

claims that are sometimes made with respect to the implications of quantum physics for our conception of physical reality. If, for example, quantum mechanics presupposes a fundamental physical distinction between the macroscopic and the microscopic, or if it implies that physical particles have no reality at all until they are observed, then this would have fundamental implications for our conception of reality and for the place of mind within this reality. It is to these matters, therefore, that we shall now turn.

Chapter 6

Philosophy and the Development of Twentieth Century Physics

I. INTRODUCTION

One of the things Russell insisted on was that philosophy was not a discipline distinct from science. In particular, he believed that philosophers need to be acquainted with science in order to make useful contributions to human knowledge. At the end of Russell's intellectual autobiography, *My Philosophical Development*, having reviewed Ryle's *The Concept of Mind* somewhat critically, Russell was to conclude by saying:

One very general conclusion to which I have been led by reading Professor Ryle's book is that philosophy cannot be fruitful if divorced from empirical science. And by this I do not mean only that the philosopher should 'get up' some science as a holiday task. I mean something much more intimate: that his imagination should be impregnated with the scientific outlook and that he should feel that science has presented us with a new world, new concepts and new methods, not known in earlier times...¹

This attitude is one that I would heartily endorse. The physics of the twentieth century is wholly incompatible with the common sense view of the world, as I hope to show in the following pages. Russell's outlook here stands in stark contrast, not only to the Oxford 'ordinary language' philosophers who were Russell's contemporaries, but also to some present-day philosophers who underestimate the effect that the scientific revolutions of the twentieth century have had on our view of the physical world.

In this chapter I want to explore the *philosophical* implications of twentieth century physics. What changes does modern physics imply concerning the nature of reality? Russell was particularly interested in this question, and I have found his discussion of these matters in *The Analysis of Matter* to be most illuminating. It

¹ Russell, *My Philosophical Development*, p. 187.

is a pity that *The Analysis of Matter* has not been the object of closer study by philosophers. No doubt this is because it presupposes a certain degree of scientific knowledge which all too often philosophers have not felt it worth their while to acquire.

I shall begin with the implications of relativity to our world-view before discussing quantum physics.

II. THE INTERPRETATION OF RELATIVITY

In pre-relativity physics, space and time were assumed to be absolute in the sense that between any two events there was an objective interval of space, r (where, for any suitable coordinate system, $r = \sqrt{(x^2+y^2+z^2)}$) and an objective interval of time, t . The first thing that relativity did was to abolish this assumption. Instead of a single cosmic time, there is now a plurality of 'local times'. The derivation of this from the invariance of the speed of light between different frames of reference is not difficult. Imagine a single pulse of light in a given inertial reference frame that begins at point P and ends at P' . This takes a certain time t . But now, let us suppose that this reference frame is moving relative to another reference frame in a direction perpendicular to the direction of the light-pulse. In this instance, the light begins at P and ends at P' , as in our initial reference frame. However, since this takes some time, and since in this reference frame our initial reference frame is in relative motion, when the light arrives at P' it has traced a diagonal path. Hence, it has traversed a longer spatial distance. However, its speed in this reference frame remains the same at c . Therefore, it has taken a greater interval of time. What takes place in a given interval of time in our first reference frame takes a slightly longer interval for our external observer. The time intervals between events (in this case, the pulse leaving P and the pulse arriving at P') is measured differently by different observers. Time, therefore, is broken up into the times of diverse observers, and there is no longer any one single all-encompassing time. The time interval that is observed between two events, therefore, does not represent anything objective. (There is an exception to this rule, namely with respect to a body's 'proper time', which I shall come to below.) However, the time *order* can represent something objective – though only if the spatial distance between the two events is not objective.

Consider two events which happen to one object at two different times. Suppose, for example, that a lightning bolt strikes the top of a granite monument, and then, six months later, a lightning-bolt strikes the monument again. Do these two events happen 'at the same place'? Initially, one might be inclined to say that they do on the ground that they both happen to the monument and the monument hasn't moved relative to its environment. However, the Earth is orbiting around the sun, the whole solar system is moving within the Milky Way, and the Milky Way is moving towards some galaxies and away from others. Hence, from other

points of view the lightning-bolt did not strike in the ‘same’ place at all. If I ask, ‘yes, but who is *really* correct here?’ one can see, I hope, that this question is meaningless. Until a frame of reference is specified, it makes no sense to say that the two events happen in either the same place or a different place. Some observers will observe the two events happening at the same place; others at different places. Similarly the time interval between the two events will be measured differently by diverse observers. However, their time *order* will be the same for all possible observers. Each will see event A *preceding* event B, and no observer can perceive event B as occurring before event A. The time-order between the two events is therefore an objective property of physical reality. In cases such as these it is possible for an observer to be *at* both events.

If we disregard one of the dimensions of space (i.e. take space to be two-dimensional) and take the third dimension to be that of time, then a pulse of light emitted from a given event in every spatial direction will describe a cone in space-time with its apex at the given event. Whatever event lies within this cone might be reached by an observer at the apex, or origin, and all such events have a definite time order with the original event; they are all *after* it. We can imagine a circle of light converging *on* to the event at the origin, and every event within this past light-cone is definitely *before* the origin event. Thus events within the ‘light-cone’ of a given event have a definite time-order with respect to this event. They are either in its ‘absolute past’ or its ‘absolute future’. Of such events it makes no sense, however, to say that they happen at either a different place or at the same place in space.

Events outside the light cone are different. Given the invariance of the speed of light, it is impossible for an observer to be at both the original event and at an event outside the original event’s light-cone. In this sense, the event outside the light-cone can be regarded as definitely and objectively ‘elsewhere’ in space – though this really amounts to no more than that no body can be at both events and thus no transference of energy can proceed between them. If an event is outside a given event’s light-cone then, although it is absolutely elsewhere, it makes no sense to say that (objectively speaking) one event precedes the other in time, nor that the two events are simultaneous. It is not so easy to see this as to see the fact that two events between which there is a definite time order have no absolute spatial interval, because we are inclined to think of events belonging to continuous objects that do not move about. So instead imagine that two pulses of radiation are spontaneously emitted from two points of empty space, where these two points are in distant galaxies. Furthermore, suppose that an observer cannot move so as to be at both events. Then for some observers, event A will precede B, for others B will precede A, and for yet others the two will be simultaneous. It might be thought that we could privilege the point of view of an observer who is spatially exactly between the two events. But how do we determine where this point is? Ordinarily, if I lay a ruler between two objects, I can find their mid-point, but only because the two objects exist simultaneously. If, however, the two events are not

‘simultaneous’, then there is no objective ‘mid-point’, and thus no way of using this as a means of privileging any observer over any other. Thus between two events that are spatially separate, as it were, there is no objective time-order.

Two events can be objectively at the same place *and* at the same time if and only if they *overlap* in space-time. Thus, overlapping in space-time must also be an ‘objective’ relation of physical reality. Overlapping in space-time is the same as absolute simultaneity. Two events can be absolutely simultaneous (as opposed to simultaneous from someone’s point of view) if, and only if, they happen ‘at the same place’. Thus ‘here’ and ‘now’ denote the same thing in relativity theory.

In relativity, there is a certain measure of time which, in a manner of speaking, is privileged, and this is the time along a given space-time route as measured by an object describing that route. This time – the time of a given object – is referred to as the object’s ‘proper time’. Thus intervals of time have an objective magnitude when we are dealing with the time along a given space-time route.

We have said that the spatial and temporal intervals between any two events will be measured differently by different observers, and that although the ordinal properties of events (i.e. their *order* in space-time) are objective, the spatial and temporal *distances* that are observed from outside do not correspond to anything objective. Is there then a *metrical* relation between events which is objective? (A ‘metrical’ relation is one that not only establishes an order amongst its terms but also has a certain numerical magnitude – i.e. can be greater or less.) According to relativity, the answer to this question is ‘yes’. There is a certain *proportion* between the spatial and temporal distance between two events which is the same for all observers no matter what precise spatial and temporal distances they measure. This is the space-time ‘interval’ between the two events. In the Special Theory of Relativity, which only deals with Euclidean space, the interval, s , is related to the observed spatial distances, x , y and z and time interval, t , such that:

$$s^2 = c^2 t^2 - x^2 - y^2 - z^2$$

This, at least, is the interval between an event and another within its light-cone. The $c^2 t^2$ is a way of converting time into a measure of space utilising the invariance of the speed of light. Where the one event lies within the light-cone of the other, $c^2 t^2 > x^2 + y^2 + z^2$. In this case, the interval is called ‘time-like’ (because there is a definite time-order between the two events). Where one event lies outside the light-cone of the other $c^2 t^2 < x^2 + y^2 + z^2$ and the interval, s , is such that:

$$s^2 = x^2 + y^2 + z^2 - c^2t^2$$

In this instance the interval, s , is said to be 'space-like'. We can simplify this equation, by putting:

$$x_1 = x$$

$$x_2 = y$$

$$x_3 = z$$

$$x_4 = ict$$

where $i^2 = -1$ (i.e. $i = \sqrt{-1}$). Then,

$$s^2 = \sum_i x_i^2 \quad (i = 1, 2, 3, 4)$$

More generally, any interval s , whether space-like or time-like, satisfies the equation,

$$s^2 = | \sum_i x_i^2 | \quad (i = 1, 2, 3, 4)$$

where, for any x , $|x|$ is the modulus of x , i.e. $|x| = +\sqrt{(x^2)}$ (the positive root of the square of x . This means that the modulus of a is itself, whereas the modulus of $-a$ is a).

There is a limiting case when one event lies along the surface of the light-cone of the other. This happens, for example, when we are considering two parts of a light-pulse. In this case, $c^2 t^2 = x^2 + y^2 + z^2$, and $s^2 = s = 0$ (i.e. the interval is zero). This kind of interval is, for obvious reasons, called a 'null interval'. Where one event is the seeing of the other then the interval between them is null.

The equations above are only for a Euclidean space and are a good approximation where the effects of gravity can be neglected. However, the presence of mass distorts the geometry of space, so that the above equations are not quite correct. The equations which are then required, which are specified in the General Theory of Relativity, involve rather more mathematics than is appropriate for this exposition, but introduce no new difficulties of principle. What we are interested in here is what relativity says concerning our conception of external reality. What sorts of relations are presupposed by relativity as actually characterising physical space-

time?

Relations of 'interval', of course, are what are real, but these coincide with relations that are known in our experience only in certain limiting cases. Thus, where the interval between two events is time-like there will be many space-time routes connecting the two. However, in one of these routes the measured time will be a maximum. This will be the time measured by an observer who is 'at' both events and whose path between the two events describes a 'geodesic'. A geodesic is the path described by a body in 'freefall', where it is subject to no forces (such as electromagnetic forces) other than gravitation. In this case (i.e. along a geodesic), the spatial distance, i.e. $\sqrt{x^2 + y^2 + z^2}$, is zero, and thus the interval can be taken as the measured *time* between the two events. Likewise, whenever the interval between two events is 'space-like', there will be some perspective within which they will be observed to happen simultaneously. In this case, the time measurement, c^2t^2 , is zero, and the 'interval' will be measured by the spatial distance observed between the two events in this perspective.

It would be a mistake, however, to regard 'interval' as either a spatial or a temporal relation, as we are acquainted with these in our experience. The two above cases are limiting cases. In most cases, the interval will not be measured by either a spatial or a temporal distance and will be calculated as a *function* of observed space and time.

As it so happens, a light ray follows a geodesic in space-time. Of course, here the interval between the two events is null, and so is the measured time along the light-ray's path (i.e. its 'proper time'). But there is no way of proceeding from one part of the light-ray to the other which would describe a path involving a non-zero time interval.

So, given relativity, which relations in fact characterise physical reality? Firstly, when two events are separated by a time-like interval, the time-order of the two events is objective. So 'before-and-after' is a real physical relation. It is, incidentally, a quite separate question whether the physical 'before-and-after' is the *same* relation as the before-and-after that figures within our experience. Russell indeed tacitly identifies the two, but this is not *implied* by anything in physics itself. Now, whenever A is absolutely before B, there will be several space-time routes connecting A and B, in all of whose proper time A precedes B. Thus 'before-and-after' can be reduced to proper time. It seems also to follow from this that all space-time routes comprise events (otherwise there would be nothing for the proper time to measure), and hence that space-time is a plenum.

When the interval is space-like, there can be no transference of energy between them. It is usually assumed that this means that the two events are causally isolated from each other, but this does not necessarily follow from

relativity by itself, and in any case seems inconsistent with quantum entanglement.² But it is a definite mistake to think of space-like separation as at all analogous to spatial separation as it figures in our experience. A spatial interval is only *perceived* between two percepts that are simultaneous. However, events that are related by a space-like interval are not simultaneous, and it is scarcely intelligible that they should be related by the sort of spatial relation exemplified in our visual or tactual experiences. For this reason, I should be inclined to say that all that is *meant* by saying that one event has a space-like separation to the other is that there can be no transference of energy between the two regions they are at. It follows from this that – other than the effects of quantum entanglement – there can be no causal interaction between them. In this sense, then, a space-like separation between two events is not a primitive relation in relativity theory. It is reducible to something else, namely, to the fact that the two events concerned do *not* have a physical time-order and that therefore it is impossible for them to interact (except insofar as the effects of quantum entanglement can be thought of as ‘interaction’).

In addition to before-and-after, there is an objective relation which characterises two events that occur at the same place in space-time – the absolute ‘here-and-now’ as it were. This relation can be referred to as ‘copunctuality’. In fact, Russell takes copunctuality as a *five-termed* (quintadic) relation, for reasons connected with the dimensionality of space. In a one-dimensional space, a point can be defined as a set of events that are such that any pair chosen from the set overlap. However, this is not adequate for defining a point in a two-dimensional space. For with two-dimensional figures it is possible that A can overlap with B, B with C, and A with C, without there being a region (or point) common to all three. If we wish to define points in a two-dimensional space we need a *triadic* relation of copunctuality, i.e. a relation which belongs to triads. Generally, in order to construct an adequate geometry for a space of N dimensions, we require a relation of copunctuality between N+1 terms. For four-dimensional space-time, therefore, point-instants are constructed out of copunctual quintets, and copunctuality is a quintadic relation. A ‘point-instant’ in space-time will be a set of events such that any quintet of events belonging to the set are copunctual and no four events within the set form a copunctual quintet with any event outside the set. Thus, relativity requires a five-termed relation of copunctuality.

Copunctuality and temporal succession can be used to define the ‘ordinal’ properties of events and point-instants, i.e. their space-time order. Obviously, time-order is an ordinal property. But even when events are separated by space-like intervals their ordinal properties can be defined by copunctuality. It is a necessary condition of two events belonging to a given copunctual quintet that they overlap in space-time. Now, if A overlaps with B and B with C, but A and C do not overlap, then we can say that B is ‘between’ A and C.

2 See Appendix.

Overlapping in space-time can thus be used to define an order amongst events quite independently of considerations of time. It is also possible to define similar relations amongst *points* in space using such techniques.³

The above assumes that the fundamental ‘stuff’ of the world consists of a manifold of ‘events’, each of which occupies some finite continuous region of space, but none of which occupy a mere point. It is not clear from relativity itself what constitutes an ‘event’. Sometimes, events are taken as extensionless ‘point-events’, but these can be regarded as an idealisation, so that they can be identified with certain groups or series of events. If point-instants (or point-events) are treated as fundamental, then it will still be necessary to define topologically continuous regions, and then these will have the properties of copunctual events; and some relation of ‘neighbourhood’ between point-instants will have to be posited which would allow for this. Thus even if copunctuality is not fundamental, some more or less equivalent relation is, and furthermore from such a relation the relation of copunctuality must be capable of being constructed. It is therefore convenient and philosophically legitimate to take copunctuality itself as fundamental.

Time-order (between events separated by a time-like interval) and copunctuality are thus the physical relations that are presupposed by relativity. These, as we noted above, are sufficient to define the ordinal properties of events. Relativity also allows the existence of a relation which defines the metrical properties of the manifold of events, namely ‘interval’. This is an objective relation which is inferred from the fact that $|\sum x_i^2|$ is

invariant between diverse observers. The quantity $|\sum x_i^2|$ is itself a measure of *space*; however interval itself is not a spatial relation, but a relation which is inferred from the invariance of this quantity.

So, according to relativity, the relations which are objective properties of the physical world are:

- proper time (before-and-after)
- overlapping in space-time (absolute simultaneity)
- copunctuality
- interval

Copunctuality, incidentally, always formally implies overlapping in space-time. That is, if two events belong to a copunctual group then they also overlap. The converse, however, need not hold. Overlapping in space-time is

³ See Russell, *The Analysis of Matter*, p. 305.

also the same relation as absolute simultaneity. Thus the first two entries in the above list are relations of *time*. Copunctuality – insofar as it implies overlapping in space-time and thus absolute simultaneity – can hardly be thought of as a spatial relation at all analogous to the spatial relations that figure within our visual or tactual data. Of the above relations all four supply ordinal properties of the manifold of events. Only the first and the fourth entries are metrical relations. Proper time is a real metrical relation for the following reason: although between two events separated by a time-like interval the *measure* of time will be different for different observers, the measure of time along a given space-time route connecting the two events is perfectly objective. Indeed, if it were not, no measurement of time would be possible at all.

The above is relatively uncontroversial. Few would deny that these relations do exist. A question, however, arises as to whether all the entries on this list are necessary. What do we really know about the character of these relations (if anything), and are any of them reducible to the others?

Now, it seems to me that copunctuality is simply an ordering of events into groups such that the resulting space-time structure is mirrored by percepts – subject to the constraint that whenever two events belong to a given copunctual group, they also overlap (are simultaneous). At least, I cannot see what else copunctuality can be. Copunctuality does not seem to be a relation with which we are directly acquainted. It is true that it always implies absolute simultaneity, and it may be argued that we are directly acquainted with this latter relation, but copunctuality itself is not identical with it; and so absolute simultaneity seems simply to be a constraint on the groups that can be regarded as copunctual. In the previous chapter we saw that an aggregate is the bearer of relations with every abstract structure compatible with its cardinality. Thus there will be some relation of ‘copunctuality’ which orders events in the necessary manner. Since, however, we know nothing about the intrinsic character of this relation, we fail to make a substantial assertion about the world when we assert the existence of this relation amongst events. In this sense, it is not a ‘real’ relation but a convenient way of collecting events into groups. Since it supplies no *substantive* information concerning external reality, we can, I think, remove it from our list of relations whose existence is presupposed by relativity. Its inclusion is otiose, for it is bound to exist so long as the manifold of events has a certain cardinality. Indeed, on this basis the only entries that we should keep on the list are those relations with which we are acquainted in experience. It remains to be seen whether any of the relations satisfy this criterion.

‘Interval’, too, is a relation with which we are not directly acquainted. In this case, however, it might be possible to reduce it to something else. In the case of time-like intervals, the interval can be identified with the proper time along a geodesic connecting the two events. This, however, cannot be applied to the case of space-like intervals. It might prove possible to construct these out of time-like intervals. Russell attempted such a

construction in *The Analysis of Matter*, but I do not think that the construction is technically correct.⁴ However, it is possible that interval can be derived from copunctuality, so long as interval is ‘quantized’, i.e. so long as all intervals are measured by some cardinal number. This would require that there is a minimum size to events; but, given the graininess of matter that has been introduced into physics by quantum theory, this is, I think, a reasonable assumption. Russell describes the quantization of space-time as follows:

Let us observe, to begin with, that events may be divided into zones with respect to a given event. There are first those that are compresent with [i.e. overlap] a given event, then those not compresent with it, but compresent with an event compresent with it, and so on. The n th zone will consist of events that can be reached in n steps, but not in $n-1$, a ‘step’ being taken as the passage from an event to another which is compresent with it. We will call two points ‘connected’ when there is an event which is a member of both. The passage from event to event by the relation of compresence may be replaced by the passage from point to point by the relation of connection. Thus points also can be collected into zones. If there is a minimum to the size of events, we may assume that it is always possible to pass from one event to another by a finite number of ‘steps’. If so, there must be a smallest number of steps in which the passage can be made; thus every event will belong to some definite zone with respect to a given event.⁵

Once space-time routes are thus quantized, ‘interval’ can be reduced to relations of connection between points which are in turn a function of overlapping, or copunctuality, between events. Since the proper time along a given route is equivalent to the integral of ds (infinitesimal changes of interval) along the route, the proper time along a route can be quantized as well. The only thing distinguishing a time-like from a space-like route is that along a time-like route there is a relation of before and after between any two events, which is not true for all pairs of events along a given space-like route. Since time is one-dimensional, overlapping in time can be considered equivalent to absolute simultaneity. Thus proper time intervals are reducible to absolute simultaneity and a relation of before and after. If copunctuality (unlike straightforward overlapping in space-time) is not to be regarded as anything more than a way of collecting events into bundles, and if interval can be reduced to copunctuality or overlapping, then we can amend our list of the relations presupposed by relativity. Given some plausible assumptions it now turns out that the relations presupposed by relativity are:

before-and-after

overlapping in space-time (absolute simultaneity)

Both these, it will be noted, are relations of *time*. Essentially, relativity is saying that only time exists. Space is

4 Ibid, pp. 370-1.

5 Ibid, p. 304.

simply an arrangement of events and local histories into a three dimensional manifold. 'Space' in the sense of private space – the space *within* points of view – still exists, but it is now wholly relativised to these points of view. The spatial relations that we perceive cannot be identified with any relation which physics employs to relate items in the physical world. This is indeed acknowledged by Russell who, having reduced space-like to time-like intervals, and the latter to rather complicated statements about an event's 'causal ancestry', notes that 'It will be observed that, in our theory, spatial distance does not represent any physical fact, but is a rather complicated way of speaking about the possibility of a common causal ancestry or posterity.'⁶

III. TIME IN PHYSICS AND PHENOMENOLOGY

But now, do we really know anything about the two relations of time that we listed above? We are accustomed to talk of time and simultaneity as relations that we know in our experience. It is therefore natural to think that the relations characterising 'proper time' in physics are identical with the relations of before and after with which we are acquainted in our experience. The localisation of times in relativity seems to make this a possibility. Given relativity theory, it is almost irresistible to identify my psychological time with the local time, or proper time, of my brain. Indeed, this is an identity that Russell takes almost for granted. In *The Analysis of Matter*, he writes:

I shall assume...that, when we are speaking of physical space, all our percepts are in our head. Consequently, psychological time is the same as time measured by our watches, assuming that we carry them on our person. Our head moves along a world-line, and our psychological time intervals are measured physically by integrating ds along this world-line. Thus there is no difficulty in adapting the statement that psychological and physical times are identical to the requirements on the theory of relativity.⁷

However, although Russell is prepared to identify subjective time with the physical 'local time' of my brain and body, he immediately adds an important qualification. He writes that 'the time-intervals between percepts are only to be obtained by means of inferences of the same sort as those which lead us to the physical world.'⁸ 'Perceived relations', he goes on to say, 'are not between events at different times', for 'all that we perceive is in the present, and the time-order of the original events is inferred from relations among the simultaneous events which constitute our present recollection.' Thus 'Psychological time may be identified with physical

6 Ibid, p. 380.

7 Ibid, p. 253.

8 Ibid.

time, because neither is a datum, but each is derived from data by inferences...which allow us to know only the logical or mathematical properties of what we infer.’⁹ If this is true then we can know nothing about the character of physical time from the fact that it is identical with subjective time.

I am not at all sure if Russell is right here. I incline to the view that time-relations can sometimes be directly perceived. But even if this is so, Russell is surely correct in saying that our inference to subjective time involves a large measure of inference. Take, for example, two periods of conscious experience separated by an interval of unconsciousness, such as deep sleep. When we wake up from sleep, we do not *perceive* that our earlier period of consciousness prior to falling asleep occurred before our current consciousness. We simply infer that the earlier period happened before the present period because we remember it. Thus, insofar as temporal succession is sometimes an immediately perceptible relation, it only relates items that are immediately successive. Consequently, we can have no knowledge of the character of any relation between two stretches of experience separated by an interval of unconsciousness. So far as we are concerned, the time relation here is solely the *physical* time relation – and this is inferred, not immediately known.

But now let us consider those time-relations, if any, which are ‘given’ in our experience. As we saw above, in *The Analysis of Matter*, Russell was to assert that there are no perceptible time relations, on the ground that all that we perceive is in the present. In fact, I do not think an account of this nature is capable of accounting for the phenomenology of time. I wish now to re-introduce the term ‘perspective’ into my account, but using it in a somewhat different way to the way in which the term was used when I first introduced it in chapter 1. There, I defined a perspective as all the events within a given small space-time region. Now, I shall instead use the term in such a way that the total contents of any current experience constitute a ‘perspective’. However, perspectives are not defined in terms of consciousness. Let us denote by ‘compresence’ that relation which, *when it figures in our experience*, is the relation that two percepts have to each other when they occur ‘at the same time’ to a given observer. Then we shall define a perspective as a class of compresent events such that (i) any two events belonging to the class are compresent, and (ii) no event outside the perspective is compresent with *every* member of it. Thus a ‘perspective’ is what Russell, in his later philosophy, calls a ‘complete complex of compresence’. (A class, or ‘complex’, which satisfies condition (i) but not condition (ii) Russell calls an ‘incomplete complex of compresence’.) Compresence is a symmetrical and non-transitive relation. This means that if A is compresent with B then B is compresent with A, but that if A is compresent with B and B with C, it does not automatically follow that A is compresent with C. Hence, it is quite possible for two perspectives to contain common members, and thus ‘intersect’.

9 Ibid, p. 253-4.

Now, the view I wish to propose is that a given perspective contains everything that forms part of what some philosophers like to call the ‘specious present’, and thus that a perspective is extended in *time*. Consider the following example. I hear a rapid clicking noise. Now, in this case, I hold that one can actually hear the *clicking*, not just separate notes separated by short intervals of silence. If my current perspective had no extension in time, then I could only hear one click at a time, and I would rely on memory to inform me that I was hearing a sequence of rapid clicks. But this does not seem to me to be an accurate description of the phenomenology in this case. I think it is possible for the clicking itself to be ‘given’, not just an isolated sound, so that to deny the clicking involves not merely supposing my memory to be mistaken (which is, after all, not that unusual an experience), but denying something immediately given and thus much more certain. If this account is true then in one specious present I might hear a number of clicks, each preceding the last in time.

Suppose that the sounds I hear are represented by bold letters, thusly:

a **b** **c** **d** **e** **f** **g**

Then, one perspective (let us call it C_1) might comprise the complex

a precedes **b** precedes **c**

Another (C_2) will be

b precedes **c** precedes **d**

and so on. As a result, each perspective includes relations of before and after *given* in the perspective itself. This would account for my perception of clicking in the case we considered above, as well as similar experiences (for example, I may immediately *know* that the sound I hear is continuous and does not exist merely at a single instant).

It is important to avoid certain fallacies. For example, it is *not* the case that C_1 precedes C_2 , or, more generally, that C_n precedes C_{n+1} . C_n and C_{n+1} intersect. In the above example, **b** is a member of both C_n and C_{n+1} . Hence, it is incorrect to say that C_n precedes C_{n+1} except in some artificial and ‘constructed’ sense. Otherwise, to say that C_n precedes C_{n+1} is to assimilate perspectives to the items (**a**, **b**, **c**, etc.) within the perspectives. C_{n+1} can be defined as the successor to C_n , but only in a ‘mathematical’ sense, i.e. we can define the successor relation so that C_n ‘precedes’ C_{n+1} if, and only if, C_n and C_{n+1} have common members, but C_n has at least one member

which precedes a member of C_{n+1} and which is not itself preceded by any member of C_{n+1} . But with regard to the relation of 'precedes' as it figures in our experience, it is quite unintelligible to say that C_n 'precedes' C_{n+1} .

In the light of this analysis of perspectives as bearing a temporal 'thickness', we can say that our experience is *not* like a cinematograph – a series of frames, as it were. Rather, the overlapping of perspectives allows us, I think, to account for our sense of the 'flow' of time.

Returning to the question of the relation of subjective time to physical time, I think we can say that subjective time *coincides with* the proper time of my brain, and in some degree merges with it (as I hope to show), so that subjective time can indeed be identified with the physical proper time of my brain.

Let us first take continuous, unbroken stretches of consciousness. Such continuous periods of conscious experience will comprise a series of percepts. We shall say that two percepts are directly continuous when they belong to a single perspective (as defined above). And we shall say that two percepts are indirectly continuous when they are not themselves directly continuous but are linked by a series of direct continuities, such that each item in the series precedes its successor (in the sense of 'precedes' in which it is an immediately perceptible relation). Then any two percepts which belong to a single continuous period of consciousness will be either directly or indirectly continuous.

Between two periods of consciousness separated by a period of unconsciousness, the relation is more complicated and indirect. I may recall an experience that happened to me yesterday, but I do not recall *everything* that happened to me yesterday. Nevertheless, for any experience I had yesterday that I do not currently recall, this experience is likely to be indirectly continuous with an experience I do recall. Still, the connection between my current experience and any past experience is mediated by memory.

Memory is essentially a form of causality, in the sense that for a putative memory to be genuine there has to be a causal link of a certain sort between the remembered event and my remembering it. It may happen that I do not recall an event in my early childhood, but that others who witnessed the event describe it to me so vividly that I eventually think that I do remember it and even have a putative 'memory'. However, although there really is a causal relation between my past experience and my current 'memory', it is a relation mediated by the experiences of others, and so does not constitute a genuine memory. For the memory to be genuine, the remembered experience must be one which I remember because it happened to me and not because others remember it. My purpose here is not to furnish a full-fledged analysis of memory, but simply to point out that the relation between an event and the memory of the event involves causality in its very definition.

Now between two experiences that are neither directly nor indirectly continuous, but belong to the same 'subjective time', there will be relations mediated by memory. However, the relation between *any* event and an event in its light-cone (i.e. to which it has a time-like interval) is a causal one. An event in the past light-cone of a given event *E* may exercise some causal influence on that event. And *E* may itself have some effect on any event within its future light-cone. Since we have no notion of what a time-like interval actually *is* intrinsically, it seems to me that the whole notion of time-like interval should be analysed in causal terms. Indeed, I suggested above that to say that two events are separated by a space-like interval is simply a way of saying that neither can have a causal influence on the other.

If this is the case, then the relation of recollection between an event and a past event is actually not dissimilar to time-like interval in general. This is what I mean when I say that subjective time 'merges' with physical time.

Still, even in the case of conscious states that are directly or indirectly continuous, the subjective time-order of these events will be equivalent to, or coincide with, the physical time-order of the same events. That is, if some percept P_1 precedes some other percept P_2 , either directly or indirectly, then P_1 will also be in the past light-cone of P_2 . And if a percept P_1 is simply remembered in a later stretch of consciousness comprising percept P_2 , then again P_1 will be in the past light-cone of P_2 . This latter is not just an equivalence but arguably an identity, since we have seen that both an event being remembered and an event being in a past light-cone may both be primarily statements about the causal influence of one event on another. 'Subjective time', then, comprises both relations of direct and indirect continuity, and also relations of recollection. Thus, at the very least, it is always *equivalent* to the proper time of the brain. That is, if percept P_1 is before percept P_2 in subjective time then P_1 is before P_2 in physical time (the proper time of the person's brain), and vice versa.

Thus, there is no obstacle to our identifying subjective time with physical time. The fact that the relation between present recollection and a past event recollected is practically the same as the time-like interval between two events is a very strong argument for this identity.

However, we should be careful about what we have established when we have made this identification. The essence of memory is causal, and, as Hume showed, causality is not a 'simple' or immediately perceived relation. So arguably, knowing that subjective time is the same as the proper time of my brain doesn't give me any insight into the essence of any physical relations.

What about the actually *perceived* relation of temporal precedence which, I have argued, links events

belonging to one and the same continuous period of consciousness? If we could infer such relations amongst non-percepts in the external world then clearly this would give us some insight into the nature of a physical relation. However, I do not see on what basis we could make this inference. I do not see that we have any ground for supposing that such relations of time as are *immediately perceived* relate anything beyond the terms that they are observed to relate. Similarly (as we have seen) the physical relation of copunctuality cannot be identified (as Russell thought) with the perceived relation of compresence. Hence, no immediately perceived relation reveals the intrinsic nature of time as a physical relation. It follows from this that, although subjective time is identical with the physical (proper) time of my brain, nothing can be inferred from this concerning the *nature* of any physical relations *outside* of my sense-experience (and the sense-experiences of others).

The conclusion is thus a rather austere one, and somewhat more austere than Russell's, who allowed that some physical time relations could also be immediately perceived in our experience (specifically the relation of compresence), and that the nature of some relation which relates events wholly outside our experience could be known in its inner essence. The need to maintain this view would, indeed, have been seen as even more pressing after Newman's criticism of Russell's initial stance in *The Analysis of Matter*. But I have argued above that it was not necessary for Russell to concede as much as he did to Newman in order to preserve his realism. If the above argument is correct, then we have no knowledge of the nature of *any* physical relations or relations (except those which happen to be percepts) and structural realism can be upheld in all its austere and pristine splendour.

Hence, perceived time has a physical significance. Of course, it is still the case that nearly all physical time relations are inferred and are thus known only with regard to their mathematical properties. In any case, this leads us back to the point I alluded to earlier, that relativity implies a more-or-less Leibnizian view of reality. What relativity is saying is that *time* is real (albeit broken up into local times along diverse space-time routes), but that *space* can hardly be thought of as real in the same sense. The relation of interval is either constructed out of proper times, or from copunctuality. Copunctuality can scarcely be identified with any relation we know in our experience, and must therefore be taken as merely a way of ordering events, subject to the constraint that copunctual events must overlap in space-time (i.e. be absolutely simultaneous), which is, again, a relation of time. It is true that Russell believed that overlapping in space-time *could* be identified with a perceptible relation, but, even if he was right, overlapping is not the *same* as copunctuality, since the latter is a five-termed relation, whereas overlapping is a dyadic relation. Thus the only relations with which we are acquainted which we *might* possibly regard as characterising physical events are absolute simultaneity and before-and-after, both of which are relations of time. The universe certainly is not characterised by spatial relations of the kind that figure in our experience. In practice physical space tends to become a mere arrangement of local spaces. Thus,

given relativity, at the very least our view of the world will be Leibnizian. Russell, of course, frequently drew attention to the similarity of Leibniz's metaphysic to his own.

Before leaving the topic of time I should say that I regard the whole question of subjective time, its character and its relation to physical time as very perplexing, and that I should treat what I have written above as no more than a set of suggestive ideas. Indeed, this holds good for virtually everything I write in this latter portion of my thesis.

IV. RELATIVITY AND MIND-BRAIN MONISM

There is perhaps one more important metaphysical implication of relativity, and that is that relativity renders any form of mind-body dualism wholly untenable. This might seem to be a very bold claim, but it seems to me difficult to avoid. It was Russell who first pointed out this implication. In *The Analysis of Matter*, he writes:

It has become difficult to hold that mental events, though in time, are not in space. The fact that their relations to each other can be viewed as only temporal is a fact which they share with any set of events forming the biography of one piece of matter. Relatively to axes moving with the percipient's brain, the interval between two percepts of his which are not compresent should always be temporal, if his percepts are in his head. But the interval between simultaneous percepts of different percipients is of a different kind; and their whole causal environment is such as to make us call this interval space-like.¹⁰

In dualism of the Cartesian variety, mental events were in physical time, but not in physical space. Relativity has made this notion impossible. Events which have a time-like interval to some events will have a space-like interval to others. The only obvious way of avoiding this conclusion would be to say that mental events have no relation of 'interval' to anything physical at all. This, however, would be to remove mind wholly out of physical time as well as physical space. As a consequence it would seem difficult to see how one could regard physical events as causes or effects of percepts, insofar as whenever one event causes another the former is before the other in physical time. And if there is no causal interaction between mind and the physical world then it is difficult to see how we could take our putative perceptions as furnishing us with evidence for the existence of an external world at all, given that they would be just what they in fact are even if there were no external reality which causally underlay them. Thus, if we are to avoid solipsism, we must suppose that there are time-like intervals between mental events and physical events. Time-like interval is an instance of interval;

¹⁰ p. 384.

therefore, mental events are related by the same relations that order events in physical space-time.

I suppose that a sufficiently determined dualist could maintain that although mental events have time-like intervals to physical events, they are not characterised by space-like intervals to anything. It is not clear to me what would be accomplished by this move, nor what conceivable ground there could be for allowing mental events to be exceptional in this regard. But, in any case, we have already seen that ‘space-like interval’ is not some fundamental relation which is directly perceived but is rather something constructed from other relations. Hence, when these other relations obtain, a space-like separation will obtain by definition. Thus, it might be that to say that there is a space-like separation between two events amounts to no more than to say that there is *no* direct temporal relation between them but that something is the joint causal ancestor or causal descendent of the two events. And in this case, that mental events have a space-like interval to purely physical events would be an unavoidable implication.

The relativistic argument for monism has been revived by Michael Lockwood in his *Mind, Brain and the Quantum*, who devotes a whole chapter to setting out the case.¹¹

The purpose of this chapter so far has been to show how relativity theory might have important implications for our conception of reality that philosophers cannot really afford to ignore. Russell devoted a great deal of attention to the philosophical implications of physical theory in *The Analysis of Matter*, and I can’t help thinking that it is something of a pity that few contemporary philosophers are acquainted with this work. For my part, I think that Russell’s discussion of relativity does a great deal to clarify and sharpen our ideas concerning the philosophical implications of relativity theory. Russell also discusses quantum mechanics in *The Analysis of Matter*, but, of course, the theory was still very much in flux at the time Russell was writing, and Russell frequently acknowledges the tentative nature of his speculations. In fact, by the end of the twentieth century, all sorts of claims had been made concerning the supposed philosophical implications of quantum physics. In the next section I shall seek to determine to what extent these claims were justified.

V. THE INTERPRETATION OF QUANTUM MECHANICS

The two great developments of the twentieth century in physics are, of course, relativity and quantum mechanics. Both these theories necessitate radical revisions to the common sense conception of reality. There is, however a crucial *philosophical* difference between the two theories. The world that relativity presents for

¹¹ See Lockwood’s *Mind, Brain and the Quantum*, chapter 5, ‘Einstein and the Identity Theory’, pp. 71-8.

our belief may be odd and unfamiliar in many respects, but it is perfectly intelligible and the outcome of relativity for our conception of physical reality has been thought to be relatively uncontroversial. I have suggested in the previous section how in fact relativity might require rather more radical revisions to our understanding of reality than even most physicists realise. Nevertheless, traditionally the implications of relativity have not been taken as problematic. The case stands differently with quantum mechanics. Here there is considerable controversy concerning the precise nature of the changes that acceptance of the quantum theory requires for our understanding of reality. This has led to a plethora of mutually incompatible ‘interpretations’ of quantum theory, beginning with Bohr’s ‘Copenhagen’ interpretation. Concerning the task of adequately interpreting quantum theory, the great physicist Murray Gell-Mann once wrote that ‘Niels Bohr brainwashed a whole generation of theorists into thinking that the job was done 50 years ago.’¹² This is perhaps unfair to Bohr, who can hardly be blamed for the fact that others after him chose not to think. Nevertheless, it is fair to say that the hardening of Copenhagen into an orthodoxy constituted a powerful obstacle to fresh thought on the subject for some decades after Bohr first developed his views.

In order to see our way through these philosophical issues, it might be useful to consider the matter historically and ask how these various interpretations first arose. Although quantum theory has revolutionised our understanding of atomic structure, the origins of quantum theory really lie in the investigation of the properties of *light*.

The first fact to note about light is that it is, of course, completely and absolutely invisible.¹³ We do not see light; we see the objects from which light is reflected. If we could see light itself then whenever we opened our eyes we would see nothing but an opaque fog, and the sense of sight would be useless for perceiving anything from which we were separated by an interval of space. Light *might* be perceptible through the sense of touch. For it is known that light manages the neat trick of having a certain momentum despite having no mass, and thus exerts a certain pressure on the surfaces on which it is incident. It is therefore a theoretical possibility that some being could have sufficiently sensitive touch perception as to feel this pressure on its skin. But although light might possibly be tangible, it certainly could never be *seen*. And in any case, the sense of touch in human beings is not sufficiently fine to detect the presence of light. As a consequence the only way for us to investigate light is through its effects on its environment, which makes it somewhat elusive.

It was Thomas Young who, at the turn of the nineteenth century, established through experiments involving interference that light is a wave. Or at least it *seemed* that this is what he had established, though, as we shall see, it may be that the results of his experiment were misinterpreted.

¹² Quoted in Karl Popper, *Quantum Theory and the Schism in Physics*, p. 10.

¹³ See John Lloyd, John Mitchinson & Stephen Fry, *The Book of General Ignorance*, p. 79.

In one of Young's most famous experiments, light was shone on a screen containing two small apertures, or slits, and the light that passed through these apertures was incident on a further screen which displayed the intensity of light at each point across its surface. The result was a series of light and dark bands such as is indicative of a wave phenomenon. Where the wave from each of the apertures arrived at the screen in phase the light was most intense. At portions of the screen where the light from one aperture was completely out of phase with the light from the other, the two waves cancelled each other out and the result was a band of darkness. Later in the century, Maxwell identified the nature of this wave as electromagnetic. It was felt that waves required a medium, and so the luminiferous aether was duly supplied. However, this medium turned out to be even more elusive than light. As Russell wrote:

the aether was never so comfortably material as 'gross' matter. It could vibrate, but it did not seem to consist of little bits each with its own individuality, or to be subject to any discoverable molar motions. No one knew whether it was a jelly or a gas. Its properties could not be inferred from those of billiard balls, but were merely those demanded by its functions. In fact, like a painfully good boy, it only did what it was told, and might therefore be expected to die young.¹⁴

At any rate, by the end of the nineteenth century physicists had a dualistic picture of physical reality: a wave picture of light and a corpuscular picture of matter. The first real cracks in this picture came with Max Planck's hypothesising that energy can only be transferred (emitted or absorbed) in discrete increments. Such an assumption seemed necessary to explain the observed frequencies of radiation in certain experiments involving 'black bodies' (objects that absorb all the radiation incident on them). We need not go into the details of this problem here, since in any case it is not clear to what extent Planck took the notion of 'quanta' – the indivisible units of energy – as anything more than a calculational device.

It was Einstein who really took the notion of quanta seriously, and in doing so originated quantum mechanics. When light is shone on certain substances, electrons are discharged from the atoms at the surface of the substance. It is possible to reduce the energy incident on the surface to such an extent that, on the assumption that the energy of the light were spread out in a wave, it would take a certain measurable interval of time for any atom to acquire sufficient energy to emit an electron. However, this is not what is in fact found experimentally. On the contrary, no matter how weak the light, electrons are emitted from the substance on which it is incident from the moment the light source begins emitting. This can only be explained if the light energy, far from being spread out, is concentrated at a point. Furthermore, the momentum of the emitted

¹⁴ *The Analysis of Matter*, pp. 19-20.

electron, far from being in any way related to the intensity of the light, is a function merely of its frequency. Again, this can only be explained if light consists of a stream of particles, each comprising a single quantum of energy. The ‘intensity’ of the light is the same as its energy content. The greater the intensity, the more quanta are being emitted. For a single unit or ‘photon’ of light, the energy is proportional to its frequency, ν :

$$E \propto \nu$$

For light generally,

$$E \propto N\nu$$

where N can take only (non-negative) integer values. This proportion represents what is actually observed. The introduction of the constant ‘ h ’ is designed merely to secure the conversion of a proportion into an equality. The left-hand side of the proportionality is measured in Joules (J). (Its ‘dimension’ – the specific physical quantity it measures – being energy.) ‘ N ’ is just a number and has no dimensionality. ‘ ν ’ measures the number of waves passing a point per unit of time, and so its dimension is the inverse of time. If this is measured in seconds we can say that the units of the right hand side of the proportionality are s^{-1} . In order to convert the right hand side of the proportionality into something equal to the left hand side we need simply to introduce a constant on the right-hand side whose dimension is the product of energy and time, measured in Joule-seconds (Js). Let us call this quantity ‘ h ’. Then the above equation implies

$$E = Nh\nu$$

And where $N=1$ (i.e. for a single quantum of light),

$$E = h\nu$$

The units of h , i.e. Joule-seconds, are units of energy multiplied by time, which in physics is called ‘action’. The point is that the proportionality is what is actually *observed*. Everything in quantum mechanics could be stated without h , provided physicists were content with statements of proportion rather than equations. ‘ h ’ is constructed essentially because physicists prefer statements of equality to statements of proportionality.

Einstein had succeeded in showing that the behaviour of light in certain circumstances could only be explained by assuming that light consisted of particle-like units. It was not easy to reconcile this with the supposed wave nature of light. It might be thought that the wave nature of light that was displayed in the two-slit experiment was perhaps a result of the interaction of photons with each other as they passed from emitter to screen.

However, in the twentieth century it became possible for the first time to set up the experiment in such a way that the incident light could be reduced in intensity until it comprised a single photon passing through the apparatus at any one time. There was therefore no possibility that any pattern that was subsequently built up could be the result of interactions between photons. When the experiment was performed, with the point at which each photon was absorbed being recorded, it was found that, over time, the absorption points formed an interference pattern just as when the light was of greater intensity. Furthermore, if either aperture was blocked, all the light that passed through the remaining aperture was absorbed opposite the aperture (allowing for the effects of diffraction) and no interference pattern such as is associated with both slits being opened was observed. All this was deeply puzzling, and it wasn't clear how these results were to be interpreted. What *had* been established was that the behaviour of the photons was not a result of their interaction with each other, but that the behaviour of each photon was a function of its total environment.

Similar properties were found to apply to matter. In 1924, de Broglie proposed the existence of 'matter waves'; that is, he hypothesised that just as light exhibited particle-like properties, so matter would exhibit wave-like properties. Experiments involving electrons confirmed that electrons exhibited interference phenomena as much as light, and this duality of properties has been confirmed with every particle or group of particles for which it is possible to perform the experiment. One consequence of this wave-particle duality is to overthrow the dualism of matter and radiation which had characterised nineteenth century physics: both matter and light exhibit both wave and particle properties.

This wave-particle duality is not to be confused with Bohr's notion of 'complementarity', which was an *explanation* for the phenomenon of wave-particle duality. The problem was this: how could light (or matter) be *both* a wave *and* a particle? On the face of it the two pictures were inconsistent with each other. For example, a wave is spread out in space whereas a particle occupies a point. Bohr's answer to this conundrum was to relativise the wave properties and the particle properties to experimental contexts. When we measure the position or wavelength of a photon, for example, the property we measure is not a property of the photon *simpliciter*, but rather a property of the photon relative to a given experimental context. One of the consequences of this idea is that such physical properties as position, momentum, wavelength, and so forth, cannot be correctly ascribed to the particle itself, but only to some whole comprising the particle and its 'classical' context. Since these contexts will be different according to whether we are measuring wave or particle properties, it follows that the apparent inconsistency of wave-particle duality is overcome. Instead of being inconsistent, waves and particles are now regarded as 'complementary' descriptions of the same object under different and mutually exclusive experimental contexts.

However, a very heavy price is paid for this resolution of the paradox, namely that a particle considered in itself has no measurable physical properties. It has neither position, nor momentum, nor wavelength, nor any other physical property. The particle thus becomes a ‘thing in itself’ about which nothing can be said. It is questionable whether this Kantian remnant of physical reality serves any further function in scientific explanation, and it is not surprising that, in practice, the ‘Copenhagen Interpretation’ which Bohr originated has tended to merge with instrumentalism.

A crucial stage in the further development of these ideas was supplied by Heisenberg, who formulated his famous Uncertainty Principle. This is essentially an equation which states that the accuracy with which the momentum of a particle can be determined is inversely proportional to the accuracy with which its position can be determined. Thus, the more precisely a measurement of position is made, the less precisely the momentum is known, and vice versa. The precise interpretation of this result is a matter of some controversy. In the earlier formulations of this principle, it was explained by saying that measuring the position of (say) an electron by shining a light on it causes a perturbation in its momentum as a result of the interaction. However, Heisenberg came to regard this as an inaccurate way of presenting his account. It is central to the Copenhagen Interpretation, developed by Bohr and Heisenberg, that the particle only has the properties that are measurable. Thus to the extent that the position of a particle is determined precisely, the momentum becomes indeterminate. And to say that the momentum becomes indeterminate here is not merely to say that we are unable to determine it but rather that the particle *has* no momentum.

It was discovered that momentum and position are only one example of pairs of ‘observables’ (physical quantities that are directly measurable) that are such that the more precisely one is determined the less precisely the other is determinable. Such pairs of observables are called ‘incompatible’. Observables that are not incompatible are called ‘compatible’. For compatible observables, the measurement of one does not affect the measurement of the other, but for incompatible observables the measurement of one precludes a similarly precise determination of the other.

Suppose we measure a given observable and then subsequently measure an incompatible observable. According to the orthodox interpretation of quantum theory due primarily to Niels Bohr, before the second observable is measured the particle does not have any property corresponding to the observable to be measured. The act of measuring the observable causes the particle to adopt a given value of the observable. Measurement, therefore, plays a crucial rôle. Properly speaking, measurement rarely records a pre-existing value for some quantity, but rather causes the particle to have that quantity. Quantum physicists like to say that measurement ‘prepares’ the state of a given particle and sometimes substitute the term ‘preparation’ for

‘measurement’.

During the mid-1920s, Heisenberg and Schrödinger developed the mathematics of quantum mechanics. The two approaches were different but were suspected of being mathematically equivalent, as indeed proved to be the case. Schrödinger’s approach is known as ‘wave mechanics’ and his equations determine how the wave associated with each particle evolves over time. This evolution occurs in a completely deterministic way, however it only determines the outcome of measurement in a probabilistic manner. Effectively, the wave determines the statistical distribution of the outcome of sets of measurements on a set (or ‘ensemble’) of similarly prepared particles. However, for any individual particle, in general no prediction concerning the outcome of a given measurement is possible. This is the principle of indeterminacy. Schrödinger himself thought of the waves as ‘real’. In this he was followed by de Broglie, who ascribed reality to both the wave and the particle, the former guiding the behaviour of the latter, an interpretation that came to be known as the ‘pilot wave’ idea. However, Max Born insisted, quite rightly, that the only thing that Schrödinger’s wave equations determine is the probability of finding a particle at a given place. The waves should thus be thought of as ‘waves of probability’, not as something ‘real’.

It is difficult to go any further without at least a brief acquaintance with some of the mathematics of quantum physics. For those unacquainted with the relevant mathematics I must apologise for the brevity of my account. But my purpose here is to chart the development of physics in the twentieth century, not to offer a primer in the mathematics of quantum mechanics. According to orthodox quantum mechanics, the physical state of a particle is wholly represented by a mathematical object known as the ‘state vector’. The state vector is a vector that inhabits an abstract space known as Hilbert space. Hilbert space is characterised by an infinite number of dimensions. Furthermore, the scalars in this space (the quantities which measure the ‘lengths’ of the vectors, as it were) are all *complex* numbers. This, along with the infinity of mutually orthogonal axes, makes Hilbert space essentially incapable of being visualised, but never mind. All vectors that ‘coincide’ in fact represent the same state (i.e. if two vectors differ from each other in magnitude alone then they correspond to the same physical state). For this reason a physical state is often thought of as a set of all vectors such that of any two the one is a scalar multiple of the other. Such a set is a one-dimensional subspace, or ‘ray’, in the vector space. A given set of orthogonal axes corresponds to a given ‘observable’. Each axis corresponds to a state in which the observable is determinate. Now according to quantum mechanics, the state of a given particle is normally represented by a vector that does not coincide with any axis corresponding to an observable. That is, ordinarily, neither the position, nor the wavelength nor any other observable is determinate. Instead, the state vector determines the *probability* that a certain result will be obtained if a measurement of a given observable is carried out. To find the probability of a given outcome one first takes the vector corresponding to the physical

state (i.e. belonging to a given ‘ray’) whose ‘norm’ is unity. The ‘norm’ of a vector can be thought of as a measure of its ‘length’. Remember, however, that the scalars in Hilbert space are complex numbers, so we cannot think of ‘lengths’ in quite the same way as we ordinarily think of lengths in Euclidean space. In fact, the norm of a vector is simply the positive square root of its ‘square modulus’. The ‘square modulus’ of a complex number, $a+ib$, is the product of the complex number and its ‘complex conjugate’, $a-ib$. Hence, the square modulus of $a+ib$ is simply a^2+b^2 . A vector whose norm is unity is said to be ‘normalised’. Once we have the normalised state vector corresponding to a given physical state, we can determine the probability of a particular outcome of observing a particular observable by finding the perpendicular projection of the vector on the appropriate axis. This projection represents the ‘probability amplitude’. To find the actual probability of this outcome one finds the square modulus of the amplitude.¹⁵

According to the Bohr-Heisenberg interpretation of quantum mechanics, there is a one-one correspondence between the state vector and the physical reality it represents. Thus, a particle has no position, momentum, etc. until it is actually observed. Measurement is equivalent to performing an ‘operation’ on the state vector as a result of which it coincides with an axis representing an observable. The resulting vector is called an ‘eigenvector’ of the associated operator and the measurement result it represents is its ‘eigenvalue’. The physical state of an object whose representation coincides with an eigenvector is an ‘eigenstate’. Thus measurement *changes* the state vector so that it coincides with an eigenvector. This is referred to as the ‘reduction’, or ‘collapse’ of the state vector (or wave-function). The projection of an eigenvector on itself does not, of course, change the vector. Thus, once a given measurement of an observable is performed and a result obtained, if the same observable is measured immediately afterwards the same result will be obtained with a probability of 1 (unity).

It is axiomatic to the Copenhagen interpretation of quantum mechanics that the state vector is a *complete* representation of the physical state it represents. This, however, leads to certain difficulties. For, unless the state vector is parallel to an eigenvector, the vector will not determine a definite value for any physical observable. But can we really conceive of a physical object that lacks position, momentum, wavelength, indeed every possible physical property? It might be said in response to this that the physical object *does* possess the objective physical property corresponding to its being represented as a specific vector in Hilbert space. But what physical property does this in fact represent? Merely the *probability* that the measurement of various observables will result in various eigenvalues. Thus it seems difficult to differentiate this position from instrumentalism. This fact is made even more explicit in von Neumann’s version of the Copenhagen interpretation. To some commentators, von Neumann’s philosophy represents a variation on Copenhagen. It

¹⁵ For further material on the mathematics of quantum mechanics, see R. I. G. Hughes, *The Structure and Interpretation of Quantum Mechanics*.

seems to me, however, only to make explicit what is already implicit in Bohr and Heisenberg.

Von Neumann distinguished between two types of occurrences, which he called Type 1 and Type 2. Type 2 occurrences are those physical processes that occur prior to ‘measurement’. They are completely described (according to the orthodox interpretation of quantum mechanics) by the wave-function and evolve through time in accordance with Schrödinger’s wave equations. This time evolution is wholly deterministic. The wave-function represents the object in a ‘superposition’ of states. If we consider a given state vector, we can see that every vector can be represented as a linear combination of eigenvectors, each corresponding to the state of the object subsequent to a definite measurement. However, when we observe an object we observe only one eigenvalue. Type 1 processes are measurement type events. They involve the collapse of the state vector and the selection of a single eigenvalue. Von Neumann reasoned that at some point between the quantum object described by the Schrödinger equation and our observation of the object there must be a transition from a type 2 to a type 1 occurrence. There is, in other words, a ‘cut’ in reality, though we cannot locate precisely where this cut is made. Von Neumann’s colleague, Eugene Wigner, went further and placed the ‘cut’ at the level of conscious awareness. For Wigner it is consciousness that collapses the wave-function. This, at least, has the virtue of making the subjectivism and idealism that is contained within the Copenhagen interpretation explicit.

The subjectivist implications of Copenhagen are now perhaps better understood, since there seem to be more and more physicists who reject the orthodox interpretation (to the extent that the Copenhagen Interpretation can no longer be regarded as the ‘standard’ view). An attempt was made by Hugh Everett III to avoid the subjectivism of Copenhagen by boldly stating that every eigenstate of a given physical state is real. Note, however, the assumption that this shares with Copenhagen, namely that the state vector is a complete description of the reality it represents. Only if one accepts this dogma (for it is a dogma) does one have to choose between idealism and a multiplication of worlds. And yet the idea that, prior to observation, an object is in an actual superposition of states is wholly unempirical. No object is ever observed in a superposition of states. Indeed, if such a thing were possible then it would be inconsistent with quantum mechanics. The notion of a real superposition of states is thus a piece of unwarranted metaphysics. The notion of a ‘cut’ in reality seems to me quite unwarranted and fantastical. It is an irony of the Copenhagen Interpretation, as developed by the Princeton physicists, that it claims to be ultra-empirical but in fact presupposes a highly tendentious metaphysic. By supposing that each component of a given superposition is ‘real’, Everett’s interpretation fails to be radical enough in its questioning of the assumptions behind the orthodox view which it (rightly) rejects. I think we can arrive at a more acceptable view by sticking to the observed *facts*, as I hope to show.

There is one matter, however, that Everett’s many worlds (or ‘relative-state’) interpretation perhaps has right,

namely that the whole notion of the collapse of the state vector as a result of a ‘measurement’ is a myth. The collapse of the state vector is not itself implied by anything within the mathematics of quantum theory itself. This is why its introduction leads to unedifying controversies as to where in fact the cut in reality occurs. For example, those who are sympathetic to Copenhagen, but want to avoid ascribing any cosmic significance to ‘consciousness’, have come up with the ingenious idea that what constitutes a measurement-type event is an event which is thermodynamically irreversible. However, besides being quite arbitrary, the theory relies on there being an absolute distinction between reversible and irreversible events, something that current physics does not admit.

Incidentally, for anyone who seeks to defend a Copenhagen, or ‘neo-Copenhagen’, view, this defence is quite inconsistent with the claim that quantum physics is a complete description. For, as I mentioned above, quantum mechanics does not in itself specify what circumstances constitute a measurement (or measurement type process). Hence, a neo-Copenhagenist must admit that physics is to this extent an incomplete theory of reality.

But there is a further problem with the notion of the collapse of the wave-function. Not only is it not implied by quantum mechanics, it is, strictly speaking, inconsistent with it. I remarked above that what constitutes a ‘measurement’ is not determined within the mathematics of quantum mechanics itself. When a particle whose state vector does not coincide with an eigenvector interacts with any measuring apparatus then, if we take quantum mechanics seriously, the measuring apparatus will be represented by a vector which is also not an eigenvector but a ‘superposition’ of eigenvectors, corresponding to various eigenvalues of the corresponding measurement. Theories which posit wave-function reduction all have an uncomfortably *ad hoc* nature, and it is surely preferable to get along without this metaphysical posit if we possibly can. Of course, there must *be* ‘measurements’. The state vector implies statements concerning the probabilities of measuring various values of observables and so measurement undoubtedly occurs. In order to reconcile this with the non-existence of wave-function collapse we need merely add that measurement does not affect the wave-function of the object measured. Instead, measurement can be taken to select the portion of the wave-function that is henceforth of interest to us.

This does not in the least imply the relative-state interpretation of quantum mechanics. We have yet to say anything concerning the precise nature of the wave-function. The relative-state interpretation takes the wave-function as a real entity. But there is no reason whatsoever to do this. Instead, we can adopt a purely statistical interpretation and regard the wave-function as referring to the hypothetical outcomes of measurements performed on an indefinitely numerous ensemble of particles (where an ‘ensemble’ is a set of similarly

‘prepared’ objects, i.e. particles that start off in the same state and within the same experimental set-up). This perspective involves taking Max Born’s statistical interpretation of the wave-function seriously and abandoning the last vestiges of the supposition that the wave is a ‘real’ entity associated with each individual particle. On this interpretation, the traditional ‘fuzziness’ of quantum mechanics has nothing to do with physical reality but rather with our knowledge of that reality.

To interpret quantum mechanics in such a ‘realist’ manner is certainly within the spirit of many of the greatest quantum physicists of the twentieth century. Schrödinger, de Broglie and Einstein were all ‘realists’ about quantum physics and insisted that reality itself cannot be ‘fuzzy’. Indeed, the point of Schrödinger’s famous cat was precisely to underline the absurdities of the anti-realist outlook which the realists saw as implicit in Bohr and Heisenberg’s interpretation.

Schrödinger’s paradoxical cat (Latin name, *Felis paradoxicalis Schrödingeri*) is a rather odd creature, existing as it does in a sort of limbo between life and death, forever waiting for someone to observe it and collapse its wave-function. It inhabits a sealed chamber within which is a contraption connected to a physics experiment which involves measuring the value of a given observable in such a manner that, for the time the cat is left inside the chamber, there is a precisely 0.5 chance that the apparatus will measure a certain eigenvalue. In the instance that this value is recorded the contraption to which the apparatus is connected releases a hammer which breaks a vial of cyanide, poisoning the cat. According to orthodox quantum mechanics, the particle is in a superposition of states prior to the observable being measured, and this superposition is communicated to the apparatus and ultimately to the cat, which is also in a superposition of being alive and being dead. Schrödinger took this latter notion as obviously unacceptable. By *reductio ad absurdum* one of the premises of the argument must be mistaken, and Schrödinger concluded that a particle is never in a ‘real’ superposition of states. Schrödinger distinguished between two kinds of ‘pictures’: a picture of something that is actually fuzzy or indistinct, such as a photo of clouds or fog, and a blurred, indistinct picture of something that is in itself perfectly sharp. Physicists seemed to be prepared to accept the idea that somehow reality itself is indistinct (like the fog) and the state vector a precise representation of it, but this was only because such notions, being confined to the quantum world of sub-atomic particles, are comfortably remote from everyday experience. Schrödinger’s thought-experiment connects the quantum realm with the everyday realm so as to bring into sharper focus the implications of the orthodox interpretation. For Schrödinger, an object cannot be ascribed incompatible qualities (such as being alive and being dead), and consequently we must reject the notion that the wave-function in quantum mechanics is a precise picture of something intrinsically indistinct. Instead, we should regard the wave-function as a blurry picture of something which in itself is perfectly well defined.

Schrödinger's example seems to me felicitous, and brings out what we have argued above, that the whole notion of the reduction of the wave-function is an unwarranted metaphysical posit.

The interpretation I propose for quantum mechanics is one inspired by Born and developed by Einstein, which is known as the 'Ensemble Interpretation'. This interpretation is tailored strictly to the facts. The wave-function is taken to be what empirically it is, namely a description of the behaviour of a *set* of similarly prepared objects ('ensembles'). The interpretation of the wave-function is thus purely statistical. Individual particles have definite trajectories at all times. However, the behaviour of any individual particle is not predictable. On the contrary, only the behaviour of the ensemble is predictable. Thus the ensemble interpretation is capable of retaining indeterminacy. It may be said that the interpretation I have just supplied does not *explain* the behaviour of the ensemble. This is indeed the case, for which reason this interpretation has sometimes been called a 'minimal explanation'. However, explanations must come to an end somewhere (at least provisionally) and nothing is gained by interpreting the wave-function in anything other than a statistical sense. For the properties of the wave-function are only capable of investigation by investigating the behaviour and properties of the ensembles of particles whose behaviour they determine. The Schrödinger 'wave' has no further properties. Like the aether its properties are restricted solely to its functions. No theoretical gain is thus accomplished through reifying it. (This was really the point made by Max Born.) There is therefore no such thing as a superposition or a collapse of the state vector. One might as well say that a dice, before being thrown, is in a 'superposition' of states corresponding to each of the six possible outcomes of the throw. There is no need to think of the dice as *physically* existing in a summed state of each possible eigenstate. The wave-function describes the behaviour of ensembles of particles, but does not describe a single particle.

On this basis, the paradox of wave-particle duality ceases to be mysterious – it is merely the distinction between whole and part. Ensembles are described by the Schrödinger wave equation and to this extent have wave-like properties. Insofar as, when we talk about 'light', we are referring to an ensemble, light is correctly described as a wave. The *constituents* of ensembles, however, have particle-like properties. On the level of individual quanta, light is correctly described as a particle. What quantum physics is telling us is that at the most fundamental physical level the world has an irreducible graininess.

In a manner of speaking, of course, the relative-state interpretation is also a 'statistical' interpretation of the wave-function, except that it goes quite beyond any empirical data in regarding the various eigenstates of a given wave-function as existing simultaneously rather than successively. There is thus no difficulty which the ensemble interpretation encounters which is not equally a difficulty for the relative-state interpretation, whereas the latter involves vast metaphysical posits which the ensemble interpretation avoids. It is therefore

preferable to accept the ensemble interpretation.

The ensemble interpretation is certainly compatible with deeper explanations in terms of ‘hidden variables’, but does not presuppose the success of these theories. I have so far not referred to hidden variable theories, which might seem an odd omission by someone intent on adopting a realist interpretation of quantum mechanics. After all, Bohm’s theory, which develops de Broglie’s ‘pilot wave’ idea that a physical wave guides the trajectory of an associated particle, resolves the paradox of wave-particle duality by positing both a wave and a particle. As a result, Bohm’s theory deftly avoids wave-function collapse. Certainly the grounds on which theories such as Bohm’s have been rejected have, in general, been vague and unsatisfactory, or based on highly subjective aesthetic criteria. As Euan Squires says in his book *The Mystery of the Quantum World*, ‘the whole hidden-variable enterprise was readily dismissed as arising from a desire, in the minds of those too conservative to accept change, to return to the determinism of classical physics; the significance of not requiring wavefunction reduction could only be appreciated when the problems associated with it had been accepted and, for most physicists, they were not, being lost in the mumbo-jumbo of the “Copenhagen” interpretation.’¹⁶ The fact remains that Bohm’s theory is consistent with all the predictions of quantum mechanics. Therefore, it can scarcely be denied that it might be true. And such a theory is surely preferable to the vast and fantastical metaphysical machinery of the relative-state interpretation with its branching universes or Copenhagen with its implicit subjective idealism.

Critics are on firmer ground when they point out that the theories of Bohm have proven resistant to experimental verification. And this may not be a mere historical contingency arising from our current technological or theoretical capacities. It may be that the sub-quantum world that Bohm posits must remain forever hidden. I think we should take seriously the possibility that there are limits to scientific investigation. It is, if you think about it, something of a miracle that we know as much as we do. Who would have thought, in the seventeenth century, that it might one day be possible for us to know the structure of matter on a sub-atomic level, so that we could explain the properties of chemical elements; or that we would one day describe the condition of the universe a thousandth of a second after its beginning, 13.7 billion years ago? In his *Enquiry Concerning Human Understanding*, Hume laments that we will surely never know ‘the origin of worlds, and the situation of nature, from, and to eternity.’¹⁷ And yet contemporary cosmology purports to tell us precisely this.

The reach of our knowledge is, indeed, extraordinary; but it may be that our luck is finally running out. The seeming impossibility of probing the sub-quantum world postulated by hidden variable theories is perhaps

¹⁶ Euan Squires, *The Mystery of the Quantum World*, pp. 81-2.

¹⁷ David Hume, *An Enquiry Concerning Human Understanding*, p.162 [130].

permanent. And if this is the case, a hidden variables type theory becomes metaphysical, rather than physical. I should make this concession to positivism, that if there is no way of empirically testing a theory then it ceases to be an hypothesis in *physics*. If this is the case, then we should stick close to the testable facts, and this leads us back to an interpretation in terms of ensembles.

In fact, the limitations of human knowledge is precisely the point I wish to emphasise. I take the view which has been made familiar by Hume and Kant that human beings have no privileged epistemic access to the reality. And the reason for this is that we ourselves are a part of this reality. Hence, we can only grasp the world in a manner adapted to our faculties. The fundamental problem with current interpretations of quantum mechanics is that they reject this postulate. Both Copenhagen and the relative-state interpretation assume that the wave-function is a complete description of reality, that is, that reality can extend no further than our best theories. Both these interpretations are philosophically pre-critical. If human beings are a part of nature then we should accept the epistemological consequences of this concerning the possible limits of human knowledge.

Thus it might be said that my account is unsatisfactory because I have left the explanation for the wave-function wholly mysterious. And this is indeed the case. Precisely the same argument was applied by the Cartesians to Newton's concept of 'gravitation' in the late seventeenth century.¹⁸ To the Cartesians, the notion of gravitation seemed obscurantist and scientifically reactionary. It was a reversion to the occult qualities of a pre-modern world view and contrasted strongly with the robust mechanistic explanations furnished by Descartes and his followers. But of course the Cartesians missed the point entirely. Whereas the Cartesians assumed that the human mind was adequate to completely disclose all the secrets of nature, Newton did not make this assumption. His account of gravitation was descriptive. As he famously said in another context, he framed no hypotheses. This, however, does not in the least mean that he rejected hypotheses as metaphysical, as some positivists like to think. He doesn't rule out the possibility that a successful hypothesis might be formulated; he merely refrains for the moment to do so. And in pursuing this methodology he is essentially revealing his approach as a naturalistic one, one which recognises the potential limitations of human knowledge. It was, of course, precisely the Newtonian approach which turned out to be scientifically fruitful. Similar considerations, I believe, apply to the wave-function. As with gravitation we should, for the moment at any rate, take the wave-function simply as a description of the facts.

Properly interpreted, then, the most important change that quantum physics necessitates with regard to our common sense conception of reality is a change as to the nature of causality. Causation, it seems, at least insofar as causal relations are known to us, operates on ensembles and not on individual quanta. The

18 See the first two chapters of H. O. Mounce's *Hume's Naturalism*.

fundamental laws of mechanics are statistical in nature and do not suffice to determine the outcome of an experiment in a *particular* case. This, in essence, is the much-vaunted 'principle of indeterminacy'. Whether it represents merely a limitation on our knowledge or whether individual events are in some absolute sense indeterminate is scarcely something we can know.

There is one further issue which I feel ought to be discussed when considering the philosophical issues arising from quantum mechanics, and that is the whole debate between Bohr and Einstein concerning the so-called 'EPR' thought-experiment. This has frequently been thought of as vindicating Bohr's interpretation of quantum mechanics and finally disposing of realism. I believe that this is a profound mistake. But since I have already showed that nothing in the remainder of quantum mechanics has such anti-realist implications, or is in any other way inconsistent with Russellian realism, I shall discuss this issue in the Appendix.

Chapter 7

The Russellian Approach to Intentionality

I. A PHILOSOPHICAL PSYCHOLOGY

If, as Russell believes, the events that constitute reality are intrinsically neither mental nor physical, then it would seem that none of them can be identical to intentional states such as beliefs, desires, etc. since these are paradigmatically mental occurrences. Mental states which are conscious states pose no great difficulties. My current visual percept of a desk and a clock, for example, comprise certain expanses of colour, and there is nothing intrinsically 'mental' about an expanse of colour. The difficulty, however, arises when we turn our attention to intentional states, such as beliefs, desires and expectations. The difficulty is that such 'propositional attitudes' are intrinsically characterised by a mental attitude directed towards a given 'content'. If Russell's neutral monism is to be tenable, then he must indicate how intentional states can be integrated into his overall theoretical framework.

In the course of presenting his account of intentionality, Russell was to develop ideas concerning the right methods for psychology, in contrast to both psychoanalysis and behaviourism, though leaning very much towards the latter. For Russell, philosophy was not an activity distinct from the sciences, and what Russell really develops in such works as *The Analysis of Mind*, and in *An Outline of Philosophy*, is the framework for a philosophical psychology.

Russell's overall approach is clearly very influenced by the behaviourism of Watson, to whose work he constantly refers in *The Analysis of Mind*. In this work he identifies behaviourism and psychoanalysis as the two most important theories of mind. Whilst he does not dispute Freud's theories in general, he criticises the Freudian view of desire and of the unconscious from a Watsonian point of view. Desire, Russell maintains 'like force in mechanics, is of the nature of a convenient fiction for describing shortly certain laws of behaviour.'¹ He elaborates this idea as follows: 'A hungry animal is restless until it finds food; then it becomes quiescent.

1 *The Analysis of Mind*, p. 32.

The thing which will bring a restless condition to an end is said to be what is desired. But only experience can show what will have this sedative effect, and it is easy to make mistakes.² As a consequence, self-knowledge is regarded by Russell as something quite rare, and definitely as something that is acquired. 'Most people', he writes, 'in thinking about punishment, have had no more need to hide their vindictive impulses from themselves than they have had to hide the exponential theorem. Our impulses are not patent to a casual observation, but are only to be discovered by a scientific study of our actions'.³ In particular, he thinks that the failure to see that desire is simply a kind of behavioural disposition leads the Freudians into theoretical errors in their model of the psyche:

[The Freudians] speak always as though it were more normal for a desire to be conscious, and as though a positive cause had to be assigned for its being unconscious. Thus 'the unconscious' becomes a sort of underground prisoner, living in a dungeon, breaking in at long intervals upon our daylight respectability with dark groans and maledictions and strange atavistic lusts. The ordinary reader, almost inevitably, thinks of this underground person as another consciousness, prevented by what Freud calls the 'censor' from making his voice heard in company, except on rare and dreadful occasions when he shouts so loud that every one hears him and there is a scandal.⁴

In contrast to this picture, Russell puts forward his theory that so-called 'unconscious' desire is the natural form of desire:

The unconscious desire [he writes] is...the natural primitive form of desire, from which the other has developed through our habit of observing and theorizing (often wrongly). It is not necessary to suppose, as Freud seems to do, that every unconscious wish was once conscious, and was then, in his terminology, 'repressed' because we disapproved of it. On the contrary, we shall suppose that, although Freudian 'repression' undoubtedly occurs and is important, it is not the usual reason for unconsciousness of our wishes. The usual reason is merely that wishes are all, to begin with, unconscious, and only become known when they are actively noticed. Usually, from laziness, people do not notice, but accept the theory of human nature which they find current, and attribute to themselves whatever wishes this theory would lead them to expect. We used to be full of virtuous wishes, but since Freud our wishes have become, in the words of the Prophet Jeremiah, 'deceitful above all things and desperately wicked'. Both these views...are the products of theory...⁵

2 Ibid.

3 Ibid, p. 61.

4 Ibid, pp. 37-8.

5 Ibid, p. 39.

Russell does not claim that this view of the unconscious is original, but ascribes it to Watson.

However, Russell is also deeply critical of certain aspects of Watsonian behaviourism. In particular, he is critical of Watson's denial of the existence of mental images, as opposed to sensations. Thus Russell writes that according to Watson when we think of a table 'we are making small movements of the throat and tongue' similar to those which we would make if we were saying the word 'table'. Hence, our 'thoughts' are a kind of sensation of our own bodily movements. On this issue, Russell chooses to remain agnostic. However, when it comes to visual images, such as a mental picture I might form of a friend, he is much more strident. 'It seems to me [he writes] that in this matter he has been betrayed into denying plain facts in the interests of a theory, namely, the supposed impossibility of introspection.'⁶

In *An Outline of Philosophy*, published six years later, Russell is even more strident. He rejects the notion that even verbal thoughts are sensations of the throat and larynx. In relation to this theory he makes an interesting and (I think) valid point concerning scientific methodology:

It should be realised that behaviourism loses much of its attractiveness if it is compelled to postulate movements that no one can observe and that there is no other reason to assume...Physics believes in a large number of phenomena which are too minute to be observed even with the strongest microscope, and if physics is at all correct, there must be minute movements in all parts of the human body, of a sort which we can never hope to see. We cannot reasonably demand of the behaviourist that he should abstain from an hypothesis which physics asserts for very good reasons...But when the behaviourist assumes small occurrences for which there is no ground in physics, and which are needed solely in order to safeguard his theory, he is in a less strong position. Dr. Watson asserts...that whenever we 'think' there are small movements in the larynx which are beginnings of the movements we should make if we spoke words out loud. It may be that this is true; certainly I am not prepared to deny it. But I am not prepared to say that it *must* be true merely because, if it were not, behaviourism would be false. We do not know in advance that behaviourism is true; we have to find out whether it will explain observed facts. Whenever it has to postulate something unobserved merely in order to avoid a refutation, it weakens its case.⁷

The point is that behaviourism ceases to be an 'economical' explanation if it has to resort to *ad hoc* hypotheses for which there is no evidence. In any case, given Russell's overall epistemology, the behaviourist attempt to eliminate images has little theoretical advantage. Sensations, for Russell, are just as 'internal' and subjective as

⁶ Ibid, p. 152.

⁷ *An Outline of Philosophy*, pp. 79-80.

images, since their character is affected by the sense-organs, nerves and brain. If sensations are admitted (as Watson concedes) then there seems little advantage in denying the existence of mental images that are not sensations.

It should be noted, however, that although Russell defends the notion of mental imagery, he does not, in general, overestimate its importance in accounting for intentional phenomena, a point that is sometimes overlooked. In *An Outline of Philosophy*, for example, with reference to the part imagery plays in memory, he writes:

As regards the part played by images, I do not think this is essential. Sometimes there are memory-images, sometimes not; sometimes when images come in connection with memory, we may nevertheless know that the images are incorrect, showing that we have also some other and more reliable source of memory.⁸

Surprisingly, even 'imagination', for Russell, need have nothing to do with mental imagery:

Imagination is not, as the word might suggest, essentially connected with images. No doubt images are often, even usually, present when we imagine, but they need not be. A man can improvise on the piano without first having images of the music he is going to make; a poet might write down a poem without first making it up in his head.⁹

This analysis, it should be noted, precedes Wittgenstein's *Blue Book*, in which similar ideas are expounded, by six years – though some of Wittgenstein's examples are, I think, particularly felicitous. The point is that the downgrading of images in the analysis of mental phenomena was by no means as novel, when Wittgenstein adumbrated it, as is customarily supposed.

When it comes to the analysis of memory in *An Outline of Philosophy*, Russell distinguishes two questions: firstly, 'What is happening now when I recollect?', and secondly, 'What is the relation of the present happening to the event remembered?'¹⁰

As to the first question, we have already seen that Russell thinks that images are not necessary to constitute a memory experience. However, where they do not occur it is at least necessary that there should be words,

8 Ibid, p. 195.

9 Ibid, p. 198.

10 Ibid, pp. 205-6.

either spoken aloud or merely said 'in my head'.¹¹ It may be objected that I can 'remember' a person (for example) without any words or images. Russell does recognise this point, but he prefers to call events of this kind 'recognition' rather than 'true recollection'.¹² 'True recollection' consists of the memory of specific past events. Russell notes that 'images are not enough to constitute recollection, even when they are accurate copies of a past occurrence. One may, in a dream, live over again a past experience; while one is dreaming, one does not seem to be recalling a previous occurrence, but living through a fresh experience. We cannot be said to be remembering, in the strict sense, unless we have a belief referring to the past.'¹³ Remember that Russell is still seeking to answer the *first* question he posed above concerning memory, namely, what is happening *now* when I recollect. The feeling which makes us 'refer the images to a past prototype' is simply the feeling of 'familiarity'.¹⁴ This analysis of all very well, but it is hard to see how it can be applied to memory experiences comprising words, where no feeling of familiarity need attach to the words used to express the recollection. But then, in this case, the simple use of the past tense is sufficient to refer the words to the past.

The really important question is the second one: what is the relation of the present happening to the event remembered? Here, I believe, Russell falls into a major error. He writes that 'If we recollect correctly, the several images will have that kind of resemblance of quality which images have to their prototypes, and their structure and relations will be identical with those of their prototypes.'¹⁵ But similarity of image to its prototype is insufficient to constitute genuine memory. It seems to me that the past occurrence constitutes a recollection if it expresses a belief about the past which is suitably related to the past event recollected. And this 'suitably related' must be some sort of causal connection. Thus I might know of some event in my childhood because I've been repeatedly told about it. This may lead me to form a visual image of the past event, which may be quite accurate, and which I might mistake for a genuine memory. But it would not constitute a genuine recollection because it is not caused directly by the past event's effect on me. Rather, it is only because the event had effects on external objects or persons (in this case, other people), who then affected me, that I know about it at all. It seems to me that a genuine memory has a particular kind of causal relationship to the past event remembered. Russell's omission of such considerations vitiates his analysis. He does not realise that memory may involve nothing but a belief that has a certain causal relation to the event remembered.

When, however, Russell comes to the consideration belief and knowledge, his analysis is altogether more satisfactory. With regard to knowledge he begins by adopting a behaviouristic perspective: 'We may say, broadly, that a response to a stimulus of the kind involving desire...shows "knowledge" if it leads by the

11 Ibid, p. 206.

12 Ibid, pp. 204-5.

13 Ibid, p. 206.

14 Ibid.

15 Ibid, p. 207.

quickest or easiest route to the state of affairs which...is behaviouristically the object of desire.'¹⁶ This is not altogether adequate as it stands, for the behaviour which is in fact the quickest or easiest route to the satisfaction of desire might be adopted purely by accident, rather than through knowledge; but still, this initial definition might form the basis for a more adequate definition. Indeed, a little later on, Russell moves a little beyond straightforward behaviourism, and adumbrates what might be called a 'proto-functionalist' position. Thus he writes that:

It should be observed...that knowledge is neutral as among different purposes. If you know that arsenic is poison, that enables you equally to avoid it if you wish to remain in health, and to take it if you wish to commit suicide. You cannot judge from a man's conduct in relation to arsenic whether he knows that it is a poison or not, unless you know his desires. He may be tired of life, but avoid arsenic because he has been told that it is a good medicine; in this case, his avoidance of it is evidence of *lack* of knowledge.¹⁷

Of course, Russell does not identify belief or knowledge with a *functional state* of the organism, but he comes close.

The above account of Russell's approach to questions of intentionality is very brief and inadequate. The question I wish to ask is: is Russell's general approach to intentionality capable of integrating intentional states into his neutral monism? I think we can answer this question in the affirmative, provided we recognise that Russell was fumbling towards functionalism.

II. A RUSSELLIAN THEORY OF INTENTIONALITY

But what ground have I for favouring functionalism?

The first thing to note about intentionality is that there simply *must* be some sort of logical connection between intentional states and behaviour. In his book, *Mind, Brain & the Quantum*, Lockwood illustrates this with an example taken from a radio talk given by the late Professor Richard Braithwaite:

Imagine [Lockwood writes] a man standing on a high diving board over a swimming pool containing just three inches of water...On the assumption that the man wanted to go for a swim, we should naturally take his action in diving from the board as indicating that he believed that the pool was full.

¹⁶ Ibid, p. 95.

¹⁷ Ibid, p. 97.

Conversely, on the assumption that he believed that the water in the pool was only three inches deep, we should naturally infer from his action in jumping from the board that he wanted to injure himself, perhaps to commit suicide. This is assuming a normal set of background beliefs; it would clearly make a difference if we knew that he believed he could fly, or was immortal. Beliefs, actions and desires form a kind of interlocking triad, such that a sufficient knowledge of any two enables us to infer the third.¹⁸

Hence, it seems necessary to identify a given intentional state – such a belief or desire – as a functional state. However, it should be noted that the functional state with which a given intentional state is identical is a functional state *against a background of other intentional states* which constitute the functional state's 'inputs'. Thus, to say that the man believes that the pool is full of water is to imply that he dives into the pool if he desires to dive into a water-filled pool, and also that he does not dive into the pool if he does not desire this. To say that the man believes the pool to be near-empty, on the other hand, is to imply that he dives into the pool if he desires to injure himself. Of course, I have represented this situation in highly schematic terms. However, the point is that the conditionals which are implied by a given attribution of an intentional state to a person are conditionals whose protases indicate the presence of *other* intentional states.

This has an important consequence. Although, in a given case, it is possible to identify an intentional state with a functional state, it is only possible to do this against a background of further intentional states. These are themselves identifiable with functional states, each against a further background of intentional states, and so on. However, in each case, the identification is only possible because there are other intentional states and each identity implies the existence of other intentional states. There is thus no question of reductionism. It is not possible to 'reduce' intentional states to non-intentional states, in the sense that it is not possible to rephrase intentional states in terms of functional states in such a manner as to exclude all reference to intentionality. In this sense, mind is irreducible. However, any specimen intentional state that you care to present *can* be identified with a functional state (albeit against the background of *further* intentional states).

There is a long-standing philosophical difficulty with functionalism which concerns the possibility of human-like automata. Functionalism identifies intentional states with functional states. The 'inputs' to these functional states are physical sensory inputs – impulses in afferent nerves – and the 'outputs' are behaviour – or impulses in efferent nerves which give rise to behaviour. But this seems to allow that there could be intentional states so long as there were purely physical causes and effects linking these intentional states. Hence, it would not be necessary to assume the existence of conscious states. But then it would be logically possible for there to exist a being which had beliefs, desires, and so forth but not only had no conscious states, but did not even possess

18 Michael Lockwood, *Mind, Brain and the Quantum*, pp. 43-4.

the capacity for conscious states. Such a possibility is surely paradoxical. An entity incapable of consciousness would not be an entity to which we could ascribe a mind.

I think the correct solution to this paradox has been provided by Michael Lockwood.¹⁹ He begins by noting, as we did above, that although we can intelligibly credit an unconscious being with beliefs and desires (for example, a man who happened to be asleep), it makes no sense to credit a being with beliefs and desires who is not even theoretically capable of conscious awareness. From this he concludes that the ‘inputs’ to the functional states with which we identify intentional states must *include* states of conscious awareness. The mistake of traditional functionalism was that it regarded the ‘inputs’ as essentially events, such as the stimulation of the optic nerve, that were *purely* physical and that occurred outside of the subject’s immediate conscious awareness. Instead, we should take as inputs the subject’s percepts (in addition to his other functional states). If we do this, then it ceases to be logically possible for a being to have intentional states unless it is capable of states of conscious awareness, which is exactly the outcome required.

The theory I have expounded in this chapter, whilst not reductionist, succeeds, I believe, in taking the ‘mystery’ out of the existence of mental processes. Mind no longer counts as an anomalous interloper in an otherwise physical world. That monism of a Russellian variety succeeds in removing the mystery out of conscious states is, I think, pretty evident. All events have intrinsic qualities; sensory qualities are merely the intrinsic qualities of events that happen to be sensed. As Russell says, there is no greater mystery to the transformation of impulses in afferent nerves into percepts than there is in the transformation of electromagnetic waves into sound waves in a radio receiver.²⁰ But now, with regard to intentional states, although they are irreducible, nevertheless each individual intentional state can be identified with a functional state (against a background of further intentional states). Hence, the existence of intentional states becomes no more mysterious than the existence of functional states, that is, the truth of conditional statements. (It is true that some philosophers think that conditional statements are quite mysterious and present philosophical difficulties, but to pursue this topic now would take us too far from our current concern.)

Just as there is a dualism between structure and intrinsic quality in the case of events, which accounts for the ‘mental’ side of things, so there is a dualism in the case of ‘states’, between facts describable in categorical terms and facts describable in conditional terms, which accounts for mentality in this case too. In each case, what would otherwise have been an unaccountable dualism of the mental and the physical is seen to be a mere by-product of a dualism which is not at all mysterious, but logically unavoidable.

¹⁹ See Lockwood, *op. cit.*, p.44.

²⁰ Russell, *My Philosophical Development*, p. 16.

And though this theory is not reductionist, it is monist. As we have already seen, an identity can be established between conscious states and brain-events. In the case of intentional states, the identity is between intentional states and functional states. These functional states are not strictly *identical* with brain-states. Rather the correct way to express the relationship is to say that brain-states *realise* the functional states with which intentional states are identified. But this is still clearly a monist theory. The functional states are realised by the brain-states which causally ground them and without which it would not be physically possible for them to exist.

Indeed, it cannot be said that the distinction between the 'mental' and the non-mental is a metaphysically fundamental distinction. The 'mental' includes all intentional states, as well as all 'events' which form part of the immediate 'input' to such states, and whose occurrence they therefore presuppose.

In the light of the account I have given, intentional states can be seen simply as a result of a certain degree of functional complexity on the part of living organisms, grounded in a corresponding degree of neuro-physical complexity. In this sense, we can regard mind as 'emergent', but only in a manner that makes its existence scarcely mysterious.

III. RUSSELL'S NEUTRAL MONISM AND CONTEMPORARY WORK ON THE MIND-BODY PROBLEM

It is sometimes said that Russell is coming back into fashion and that a lot of thinkers in the philosophy of mind are adumbrating 'Russellian' solutions to the mind-body problem. However, almost invariably I find that the characterisation of these positions as Russellian depends on a very inadequate or truncated view of Russell. Furthermore, I often find that it is their lack of understanding of *Russell's* philosophy which gets these thinkers into all sorts of conceptual difficulties – that Russell's actual metaphysic already clearly disposes of the problems that lead these thinkers into muddle, and that if these thinkers had a better understanding of Russell's actual philosophy then they would not have these difficulties. This is an instance where the understanding of Russell's neutral monism can help to illuminate contemporary discussions.

To illustrate this, I shall deal very briefly with a modern 'Russellian', David Chalmers. His ideas about mind and body are set out in the last portion of his book *The Conscious Mind*, published in 1996.

There is a lot of discussion by Chalmers of 'information', which is characterised informally as the 'difference

that makes a difference'.²¹ That is, the information embodied in a physical system refers to the causal-functional state of the physical system. A system with two possible effects (e.g. a light-switch that can turn a bulb either on or off) has many possible physical states, but many of these states will be identical in terms of their effects. In fact, there are only two possible states if these are identified by their effects, and it takes a single 'bit' of information (either 0 or 1) to represent the state of the light-switch in this regard. The information embodied in a physical system is represented by a series of numbers which are necessary and sufficient to completely specify the causal-functional state of the system. Chalmers notes that phenomenal qualities are isomorphic with the causal-functional state of certain regions of the brain. Assuming a Copernican principle that the brain is not a metaphysically unusual object in the universe he then suggests that we ought to suppose that 'all information is associated with experience'. From this he concludes that 'it is not just information that is ubiquitous. Experience is ubiquitous too.'²² This leads him into all sorts of difficulties, since this would *seem* to commit him to panpsychism, a philosophical position from which he seeks to dissociate himself.

Now it is true that causal-functional states of the brain are associated with phenomenal qualities. What Chalmers never recognises is that the qualities that figure in our experience are not *intrinsically* 'phenomenal'. Take, for example, a region of red within the visual field. Why should a region of red be regarded as *intrinsically* mental? Naïve realism ascribes colours to physical objects and certainly does not regard the surfaces of unobserved physical objects as 'mental'. Qualities which are individuated to particular occasions and places can count as events. Now what makes events mental is, on the Russellian view, nothing intrinsic to the events themselves. Rather it consists in the contingent causal relations which events have to each other. Essentially, we credit an entity with a 'mind' to the extent that we think it capable of learned responses. Humans learn from experience. In the case of lower lifeforms things are not so clear and thus we might be uncertain whether to credit them with minds or not. Since, however, mentality concerns a set of causal properties of events there need be no absolutely right or wrong answer as to whether some lifeforms has a mind. There is a vagueness about the concept of mind, just as there is about the concept of baldness.

There is therefore no need for Chalmers' unedifying discussions concerning the experiences of thermostats. Since a thermostat has no learned responses, the events which serve to constitute it are not 'experiences', and the qualities characterising these events are not 'phenomenal'. It is not 'experience' which is ubiquitous; *qualities* are ubiquitous. At one point Chalmers canvasses the idea that non-mental events do not have phenomenal qualities but 'protophenomenal' qualities. This sounds promising, but the concept is never well-defined. Furthermore, he says that the cost of admitting protophenomenal qualities 'is the postulation of a class

21 Chalmers, *The Conscious Mind*, p. 281.

22 Ibid, p. 293.

of unfamiliar properties that we do not understand'.²³ It is not easy to understand Chalmers' difficulties here. Certainly, we are not acquainted with the qualities characterising events that are not experiences, and to that extent they would indeed be 'unfamiliar', just as 'colours' would be unfamiliar to a blind man who has never experienced colour. But why this would pose any theoretical difficulties, or why such a notion is not one we 'understand', is not something that Chalmers ever explains.

At one point Chalmers considers the possibility that 'the world might as well be [regarded as] *exhausted* by an informational characterisation.'²⁴ This is the idea that the world has a structure but no intrinsic qualities. The problem with this view is that it is incoherent. An abstract structure is not a concrete structure but a *class* of concrete structures. Hence, if any actual objects (as opposed to sets) exist at all, then they will form a concrete structure which comprises a certain set of relations and qualities, whose description is not exhausted by their purely formal properties, for this concerns merely the isomorphism class to which they belong.

Chalmers himself rejects the view that information alone exists, and thus returns to the problem of how the qualities of physical reality are related to physical states. His suggestion is that, if phenomenal qualities are indeed ubiquitous, then the unknown qualities of the world are precisely the phenomenal qualities.

He characterises this position as Russellian, and there are important Russellian elements to it, but in truth he has completely failed to understand Russell's philosophy, and this failure leads him into all sorts of muddles. His main problem is that phenomenal properties – at least those associated with brains – correspond to the states of *macroscopic* objects. But in physics the fundamental stuff comprises entities on the *microscopic* level. How can an experience be identical with a vast number of microphysical occurrences, given the relative homogeneity of experience and the relative 'fine-grain' of physical reality? This is a version of 'the grain problem'.

He considers three answers. The first answer is that functional states are realised by phenomenal states at all levels, macroscopic as well as microscopic. He rejects this on the ground that the macroscopic functional states are fully grounded in the microscopic physical states. So once the microscopic states are realised by phenomenal states, any realisation of the macroscopic functional states would in fact *duplicate* these states.

The second possibility is that 'macroscopic phenomenology might be *constituted* by these microphenomenal properties'²⁵, though this would surely lead us once again back to the grain problem. How this can be avoided

23 Ibid, p. 298.

24 Ibid, p. 303.

25 Ibid, p. 307.

is, as Chalmers admits, 'not *easy* to understand'.²⁶ The third option is simply to regard the macrophenomenology as supervenient on the microphenomenology – the two are related by laws. This, however, diminishes the attractiveness of the proposal, since the macrophenomenology would be quite arbitrarily related to the more fundamental microphenomenology. In contemporary parlance, the macrophenomenology would constitute a set of 'nomological danglers'.

Chalmers' difficulties arise entirely from the assumption that the micro level is ontologically fundamental. But why make this assumption? If our percepts are related to the functional states of macroscopic physical structures, then why not assume that macroscopic 'events' are fundamental, and that the micro level is constituted from them. This would eliminate all the problems Chalmers considers.

For example, percepts would no longer be arbitrarily related to the physical structures on which they supervene. Rather they would serve to constitute (along with other events) these physical structures. It would then follow *as a matter of logic* that they 'supervene' on the physical structures. For if a given physical structure comprises a given set of events, (A, B, C, D,...) then, if a given event belonging to the set alters, we can say that the physical structure is thereby altered. If, however, the physical structure alters (i.e. one of its constituents is altered), then a percept belonging to the set need not alter since it is not necessary that *every* element of the set alters for us to say that the set alters, but merely that at least one event alters. Thus, two brains which were in precisely the same physical state would necessarily be associated with the same percepts, but two sets of identical percepts need not be associated with precisely the same physical state on the microphysical level. And this is precisely what is implied by supervenience. Hence, on the Russellian view, the 'supervenience' of percepts on the brain is deducible from the metaphysic, and is not longer just a brute fact. Percepts, on the Russellian view, are no longer anomalous 'nomological danglers'. Rather the supervenience of percepts on the brain would be something that we could deduce from the metaphysic even if we did not know of it beforehand. The fact that the supervenience of percepts on the brain is completely explicable is surely a point in favour of neutral monism.

To be fair, Chalmers' account does contain one tiny reference to the possibility that macroscopic 'events' should be taken as fundamental. He writes: 'One could try...making macroscopic grounding *primary*, but it would then be hard to deal with cases of isolated microscopic systems and the like.'²⁷ And this is all he says about this possibility. The objection he raises here seems to be that if we represent a particle by an event, then (since this event occupies a region), the event could equally well represent a particle within the same region but occupying a slightly different point. Making the macroscopic primary fails to give the physical world the fine-

²⁶ Ibid.

²⁷ Ibid, p. 306.

grain that we are seeking. But of course if we take the macroscopic level as primary then the microscopic level will be constituted out of *groups* of events, not single events. A given particle, or point, will be a whole set of events. This is not a possibility that seems even to occur to Chalmers. But it is precisely the Russellian theory.

The point I want to make here is that Russell has only been very partially appreciated and this is leading to thinkers who consider themselves 'Russellian' from failing to consider the very elegant solutions to metaphysical problems which Russell's theoretical approach already supplies. This in turn serves to demonstrate how a better understanding of Russell's neutral monism could greatly assist contemporary discussions, and I hope that in the course of this thesis I have furthered this objective of understanding.

Chapter 8

Theory of Knowledge: The Transformation of Empiricism

I. EPISTEMOLOGICAL PREMISES: THE PRIVATE LANGUAGE ARGUMENT

In 1948, Russell published his *Human Knowledge*, a work which (like Hume's *Treatise*) 'fell dead-born from the press'. In part this was because, by the time this book was published, philosophers had largely come to the conclusion that any epistemology which begins from a starting-point of private 'percepts' was untenable. Such an epistemology, it was thought, had been revealed as radically mistaken due to the work of Wittgenstein, in particular by the 'private language argument'. It was furthermore thought that starting out from percepts would lead to solipsism, imprisoning the subject within the circle of his own experiences. We shall later on show how this is not true, and does not follow from Russellian premises. But for now, I wish to defend Russell's epistemological starting point by examining the private language argument.

I have, earlier on, offered a very brief defence of the terminology of percepts.¹ If the terminology of percepts can be made intelligible, as I think it can, then it seems to me that the introduction of this vocabulary is (as I think Ayer once said about sense-data) legitimate and advantageous. It is most useful to have some way of describing the character of my phenomenology which is strictly tailored to the phenomenology itself in the sense that it does not go beyond it. No doubt such a vocabulary would not be useful in everyday life, for in everyday life we are rarely concerned with the precise character of our current experience and are more concerned with the physical objects of which the current experience is taken to be a sign. Nevertheless, it seems to me that it is perfectly possible to describe the colours, sounds and other qualities of my experience without implying any existences other than the experience.

This conclusion was precisely what Wittgenstein and his followers sought to refute on the basis of the 'private language argument'. The precise structure of this argument is a matter of some contention, so if I set out what I

1 See above, p. 10.

take to be a refutation of Wittgenstein's argument it is vulnerable to the charge that I have misinterpreted him. Nevertheless, the gist of the argument goes something like this. Suppose that I use the word 'red' to describe, not a publicly observable quality of physical objects, but the character of a private sensation. The meaning of the term 'red' is thus directly known only to me. Now, all words, if they are meaningful, must be governed by some criterion of correct usage. But how do I know, in the present instance, that I am using the word 'red' correctly if I use it to describe something purely private? It is not as though I can produce the previous sensation to which I ascribed redness and compare it with my present sensation. To rely on memory is no use, for I have no way of independently checking my memory. Hence, there simply is no criterion of 'correctness' here, which is to say that the word 'red' is meaningless.

If, however, this is Wittgenstein's argument, then I think it is certainly fallacious. For a start, it conflates two quite separate issues: on the one hand, whether there is a criterion for the correct use of a given word, and on the other, how we can know, in a given instance, that this criterion is satisfied. I see no reason why we shouldn't be able to answer the first question in the affirmative, and even say what the criterion is, without being able to answer the second question. Thus, a word such as 'red' is used correctly if it is used consistently, i.e. if it is used to denote the same colour on every occasion of its use. In a given instance it might well be the case that this criterion is satisfied, and thus the word used correctly, without the user of the word even knowing whether or not he has used the word correctly. Hence, since a criterion for correct usage is capable of being satisfied quite independently of whether it is known to be satisfied, Wittgenstein fails to show that there is a difficulty here. Wittgenstein's argument slides between semantic and epistemological issues quite unwarrantably. In fact, the problem of how we know that we have used a word consistently is just a special instance of the more general problem of justifying our claims to knowledge concerning the past. This is, indeed, a difficult problem in epistemology, but I don't think that Wittgenstein contributed much to its solution.

In case my presentation of Wittgenstein's private language argument is taken to be a caricature, I shall refer to the account supplied by Anthony Kenny, whom I take to be a faithful expositor of his master's work.² Kenny identifies the heart of the private language argument as aimed against the claim that one can meaningfully say 'this is S again', where 'S' stands for the character of a sensation that I had previously noted as occurring in my experience. Suppose someone says 'this is S again' about such a sensation. Kenny says that if we asked the person 'what do you mean by S?' then three answers would be possible: 'he may say "I mean this"; he may appeal to a private memory-sample of S; he may mention a public correlate of S'.³ Kenny (interpreting Wittgenstein) rightly rejects the first alternative on the ground that this would strip the utterance of any descriptive content.

² See his book *Wittgenstein*, published in 1973.

³ Anthony Kenny, *Wittgenstein*, p. 193.

It is the second alternative that is the crucial one. In this alternative, 'S' stands for the same sensation (in terms of character) as occurred in the past. Kenny says that in order to be able to make the claim that 'S' has the same phenomenal character as a past sensation the person making this claim must rely on memory. 'But', Kenny writes, 'he must call up the right memory.' Now is it possible that the person will call up the wrong memory? If not, then 'whatever seems right is right' which means that there is no criterion of correctness here, and 'S' is meaningless (this part of the argument can be accepted as sound). But if it is possible that the person might call up the wrong memory then, Kenny argues, the claim that S is the same sensation becomes meaningless. I cannot check the accuracy of my memory by calling to mind a memory-table as it were. For there can be no real looking up of which sample goes with 'S'; all that I can do is try to remember which sample goes with S, and for this I shall need once again to rely on my original memory. This is why the appeal to a memory-sample is 'As if someone were to buy several copies of the morning paper to assure himself that what it said was true.'⁴ This, it seems to me, is an apposite analogy, and shows that a given instance of recollection can gain no additional security by being checked against a mental memory-sample. However, it is not clear to me why such an appeal to a memory-sample is necessary. The fact that my memory is fallible can be admitted without it following that any claims made purely on the basis of memory are actually devoid of literal significance. It seems to me that Wittgenstein, perhaps unconsciously, is presupposing a verificationist account of meaning. For only on such a basis could one conflate being unable to check a given memory by literally resurrecting the past with the statement about the past being meaningless. Kenny himself, by his attempts to dissociate Wittgenstein from positivist assumptions, reveals that he is aware that Wittgenstein's argument is vulnerable to the charge of presupposing verificationism. However, I do not think his attempt to decouple the private language argument from positivism is wholly successful. The question Wittgenstein asks is not, Kenny maintains, 'how would you ever find out?' but 'what possible difference would it make?'⁵ But besides the fact that these questions are not, after all, so very far apart (except that the latter question has a curiously pragmatist ring to it), I would maintain that it is possible for a proposition to be true without it making any 'difference' to the course of my experience. For this reason, I do not think Kenny is altogether successful in differentiating Wittgenstein's philosophy from verificationism.

In the example above, I mentioned that, when asked what the private sensation S stood for, there was a third reply that the person could make, according to Kenny, namely, that he could mention a 'public correlate' of S. Suppose, for example, that whenever I experience the sensation S my blood pressure rises. Then I could identify 'S' as the correlate of blood pressure rise. But if this is how the sensation is identified then its character would seem to be irrelevant. Effectively, 'S' has become synonymous with 'sensation causing a rise

4 Ludwig Wittgenstein, *Philosophical Investigations*, p. 265, quoted in Anthony Kenny, op. cit, p. 192.

5 Anthony Kenny, op cit, p. 195.

in blood pressure'. Of course, I could deny this last step. Just because I identify S through the rise in my blood pressure it does not follow that 'S' means 'sensation causing a rise in blood pressure'. I can allow that the criterion of similarity takes precedence over any of its physiological effects and that where the sensation is qualitatively similar then it is an instance of S, even if it does not cause a rise in blood pressure. However, Kenny denies this possibility. He writes 'Suppose that I say "S" and the blood pressure does not rise: what reasons have I to say that I have misidentified the sensation rather than misremembered which kind of sensation goes with the rise?' Because I have no independent way of checking my memory in this instance, Kenny concludes that there is no difference between these two cases. Hence, to talk of a supposed qualitative character of S accessible only to myself is meaningless. But again, this argument depends on verificationist assumptions. Because there is no independent way of checking my memory, Kenny assumes that the appeal to memory is somehow suspect, and this is an assumption for which he (along with Wittgenstein) has failed to provide argumentative support.

II. RUSSELL'S ANSWER TO HUME

Having disposed of one objection to Russell's epistemology, we are in a position to explore his ideas more sympathetically. In particular, I want in the remainder of this chapter to show how the fact that we begin with private sensations in no way implies scepticism about the external world. On the contrary, by developing a form of epistemological naturalism, Russell was able to transcend Humean empiricism and set out an account of human knowledge which is based on human beings already being in a world with which they are connected. I shall begin my exposition by showing how, in *Human Knowledge*, Russell answered Hume's scepticism derived from the latter's analysis of causation. Nowhere in *Human Knowledge* does Russell tackle this directly. His remarks are spread throughout the work. But I believe that they add up to a very significant and important theory.

For Russell, causality, or cause-and-effect, is nothing but nearly invariable sequence. I say 'nearly' invariable sequence, because no laws of this form are entirely invariable. If I strike a match, it will light, but this does not always happen, since sometimes I do not strike the match hard enough, or the match is wet. Thus no causal sequence is in fact completely invariable. The fundamental laws of physics - those which are in fact invariable - are expressed in the form of differential equations in which 'cause' and 'effect' are not distinguished. Schrödinger's wave equations might be examples of fundamental causal laws. Nevertheless, the traditional concept of causality as consisting of 'cause and effect' is still important in science since it is from generalisations of this sort that science is built up and which eventually yield the more exact and invariable

laws of physics. Since, then, science rests on generalisations of the cause-and-effect variety, it must be legitimate for us to talk of cause and effect and apply these terms to real events. However, if statements of this kind are to be true, then cause and effect must stand, not for invariable sequence, but for nearly invariable sequence.

The fact that causal sequences are not invariable is a further nail in the coffin of the notion that there is some sort of necessary connection between cause and effect. Russell accepts the empiricist doctrine, derived from Hume, that we have no genuine concept of necessary connection. But if we have no insight into any genuine necessary connection between cause and effect then on what basis can we legitimately infer the effect from the cause? This is Hume's problem. He demonstrated that there is no logically (deductively) valid inference from cause to effect. It is not contradictory to suppose that what we have hitherto taken as causal laws should henceforth cease to be applicable. It is no use appealing to experience to support our belief in causal laws since all arguments from experience presuppose their existence.

Russell, as I shall now show, solved this problem, and he solved it definitively. His discussion of these topics in *Human Knowledge* is the most sophisticated discussion of non-demonstrative inference in the history of philosophy, and it is a shame that it has gone largely unnoticed, even to this day. (We shall examine later on the reasons for this ignorance.)

Russell's strategy is to first construct a definition of knowledge which anticipates, by nearly twenty years, the externalist and reliabilist account of knowledge of Alvin Goldman. In the chapter on 'Kinds of Knowledge' he first distinguishes between data and inferential knowledge. Interestingly, he takes inferential knowledge to include 'perception'. When, for example, I perceive a table, I perceive something which arouses certain expectations (e.g. that it will be hard to the touch), and these expectations are essential to my perception of the object as a table. These expectations amount to inferential beliefs which are a result of prior experiences. Consequently, most of what passes for 'experience' involves a considerable degree of inference. There is, indeed, a sensational core to my experiences, but only philosophers are interested in this core. When I do not misperceive something, then, so long as there is the appropriate causal connection between my perception and the object of my perception, my perception counts as a piece of knowledge. Sensation, however (the 'core' of the perception which does not involve any inference), does not itself amount to knowledge. If I become aware of a sensation then this awareness can count as knowledge. Knowledge that does not involve inferences is said to be knowledge of 'data'.

Besides the data of sensation, the other source of data arises from memory. In *Human Knowledge*, Russell

reiterates his claim that remembering occurs now whereas what is remembered is in the past, and thus that there is nothing logically inconsistent in supposing that I have the 'memories' that I have even if there were no past at all. Of course, in this case we must put the word 'memory' in scare quotes because the putative memories will not be genuine. But I cannot distinguish a genuine from a delusive memory-experience from any mark within the experience itself. However, it is important to realise that Russell does not think that our knowledge of the past is inferred from present memory-experiences. On the contrary, where a putative memory is genuine the 'data' concerns past events themselves, not present occurrences. We look through the memory, as it were, and epistemically grasp a past event. There is thus no question of 'justifying' our claims to knowledge about the past on the basis of inference from some present occurrence.

All our data, both that of sensation and of memory, are particular facts. In order to infer any further facts from this data we must rely on general principles that are not themselves data. But now this is precisely where Hume's problem supervenes. Any general principles which can enable us to infer particular facts from a wholly separate set of particular facts cannot be analytic. Nor can such general principles be given in experience, which is confined to particular facts. Nor, finally, do we have any insight into a supposed relation of necessary connection between separate events which could ground our inferences. So how can beliefs which are based on such principles count as knowledge?

Russell's answer is to posit a radically externalist account of inferential knowledge. Discussing the case of expectation, he begins by pointing out that 'Since every case of knowledge is a case of true belief, but not vice versa, we have to inquire what must be added to truth to make a true expectation count as "knowledge".'⁶ Russell provides several examples of cases of true belief that are not knowledge. For example, 'suppose you are expecting Mr. X to ring you up on the telephone. The telephone bell rings, but it is not Mr. X. In this case your expectation that the bell would ring, though true, was not knowledge.'⁷ The examples are similar, in essence, to those given in *The Problems of Philosophy* back in 1912,⁸ and the same conclusion is drawn, namely that an expectation is not knowledge if it is based on an argument with false premises. In the telephone case, my expectation that the telephone would ring was a consequence of my belief that Mr. X would ring. If in fact Mr. X was not going to attempt to ring me this afternoon then my expectation that the telephone would ring, though true, would not amount to knowledge.

It is perhaps of interest to note that this argument would also apply to Gettier's examples of justified true belief that were not knowledge in his famous paper on the definition of knowledge. Thus his 'Case 1' involves Smith

6 *Human Knowledge*, p. 445.

7 *Ibid*, p. 446.

8 See *The Problems of Philosophy*, p. 76.

having a justified belief that 'Jones is the man who will get the job, and Jones has ten coins in his pocket', on the basis of his justified belief in each of the conjuncts. From this proposition he concludes that 'The man who will get the job has ten coins in his pocket'. This latter proposition turns out to be true, but only because it is Smith who will get the job and (unknown to Smith) Smith has ten coins in his pocket. It cannot be said that Smith knows the conclusion which he believes and which he seems justified in believing. The reason for this is that his belief in this conclusion is derived solely from his belief in the conjunction, and the conjunctive proposition is false. Similarly, in Gettier's 'Case 2', Smith has good reason to believe that Jones owns a Ford but has no idea of the whereabouts of his friend Brown. Realising that 'Jones owns a Ford' entails 'Either Jones owns a Ford or Brown is in Barcelona', Smith accepts this disjunction on the basis of this entailment. But now it turns out that Jones does not own a Ford, and, by sheer coincidence, Brown is in Barcelona. Again, Smith's belief in the disjunctive proposition can hardly be admitted to count as knowledge, even though it is justified and true. The reason again is that the disjunction is only accepted on the basis of a false disjunct.

Russell does not discuss the question of whether knowledge is justified true belief (and thus I do not think that it can accurately be said that he 'anticipated' Gettier), but it is clear that his own account of knowledge does not fall prey to the sorts of Gettier-type counter-examples to which (for example) Ayer's account is vulnerable, since Russell is clear that valid claims to knowledge cannot rest on arguments with false premises.

In Russell's case, the 'false premises' which he particularly has in mind as invalidating a claim to knowledge are not so much premises regarding particular facts as premises embodying general propositions. He writes that 'If I think that A is almost always followed by B, and therefore, having seen A, I expect B; if, in fact, A is very seldom followed by B, but this happens to be one of the rare cases where it is so followed, then my true expectation of B cannot count as knowledge.'⁹

Russell considers the case of a dog which becomes excited in expectation of being taken for a walk when her owner takes out its lead. Here, taking out the lead has invariably been followed by a walk. Therefore, the dog comes to expect that taking out the lead will be followed by a walk on this occasion. 'The dog', Russell writes, 'goes through no such process of reasoning. But the dog is so constituted that, if A has been frequently followed by B in her experience, and B is emotionally interesting, A causes her to expect B. Sometimes the dog is right in this expectation, sometimes wrong. Suppose that, in fact, A is always, or nearly always, followed by B; can we say, in that case, that the dog is right to expect B?'¹⁰ To answer this question Russell first invites us to consider the situation where 'although A is in fact always followed by B, this generalization only happens to be right, and most logically similar generalizations are wrong. In that case we must regard it as

⁹ Russell, *Human Knowledge*, p. 446.

¹⁰ Ibid.

a stroke of luck for the dog that she has hit on a case in which a fallacious process, by chance, leads to a true result.' Russell concludes that 'I do not think that in such a case the dog's expectation can be regarded as "knowledge".'¹¹ But now Russell invites us to consider the contrary case:

suppose [he writes], not only that A is, in fact, almost always followed by B, but further that the experienced cases of A being followed by B belong to a definable class of cases in which generalization is nearly always in fact true. Shall we, now, admit the dog's expectation as 'knowledge'? I am assuming that, although generalizations of the kind considered are in fact almost always true, we know of no reason why they should be. My own view is that, in such a case, the dog's expectation should be admitted as 'knowledge'. And, if so, scientific inductions also are 'knowledge', provided the world has certain characteristics.¹²

The crucial line here is the remark that 'although generalizations of the kind considered are in fact almost always true, we know of no reason why they should be so.' Thus the fact that we have no reason or ground for assuming that a given class of generalisations is true does not prevent generalisations belonging to this class counting as knowledge so long as they are nearly always true in fact. This, then, completely answers Hume. We have genuine knowledge of the world not because we have any rational insight into a relation between cause and effect which could ground the inference we make from one to the other. As Hume conclusively showed, we have no such insight. But this is besides the point. For we still have knowledge of the world so long as nature is a certain way and so long as our nature is such that our propensities to certain sorts of inferences appropriately mirrors the way nature is.

Russell concludes his chapter on 'Kinds of Knowledge' by setting out a set of necessary and sufficient conditions for knowledge of a certain important class of general propositions:

I shall say that an animal 'knows' the general proposition 'A is usually followed by B' if the following conditions are fulfilled:

- (1) The animal has had repeated experience of A being followed by B.
- (2) This experience has caused the animal to behave in the presence of A more or less as it previously behaved in the presence of B.
- (3) A is in fact usually followed by B.
- (4) A and B are of such a character, or are so related, that, in most cases where this character or relation exists, the frequency of the observed sequences is evidence of the probability of a general if not

¹¹ Ibid.

¹² Ibid, p. 447.

invariable law of sequence.¹³

By implication, beliefs in particular facts are also knowledge if they are based on a conjunction of known general propositions and data. This reliabilist definition of knowledge provides an answer to Hume which is completely definitive and completely satisfying. Instead of seeing man as a Cartesian subject who starts out imprisoned within his own private world and then has to find some epistemic route out of it, Russell's account sees human beings as already related to a physical world of which they are a tiny part. Our knowledge is based on propensities to belief that have been given to us by nature. Provided nature is a certain way, these beliefs will count as knowledge. Thus a correct account of knowledge is only possible if we see human beings as in the world and, as natural creatures, having certain innate propensities. As Russell writes, 'Owing to the world being such as it is, certain occurrences are sometimes, in fact, evidence for certain others; and owing to animals being adapted to their environments, occurrences which are, in fact, evidence of others tend to arouse expectation of those others.'¹⁴

This is a particularly important point because Russell is sometimes charged, quite falsely, with adopting the standpoint of 'methodological solipsism', which tries to construct all our knowledge on the basis of private data alone. It is difficult to see, on such a basis, how actual solipsism could be avoided. But far from endorsing such a view, in his later work Russell is always scathing and dismissive of it. Thus in the chapter on 'Solipsism' in *Human Knowledge*, Russell relates that he 'once received a letter from an eminent logician, Mrs. Christine Ladd Franklin, saying that she was a solipsist, and was surprised that there were no others. Coming from a logician, this surprise surprised me.'¹⁵ Of course, if Mrs. Franklin believed the solipsist hypothesis then the non-existence of other solipsists, far from being surprising, would have been a logical consequence of her beliefs which such an eminent logician could scarcely have overlooked. The point is, of course, that Mrs. Franklin could not in fact have believed what she professed to believe, at least if her surprise at there being no other solipsists was genuine. As Russell writes:

The fact that I cannot believe something does not prove that it is false, but it does prove that I am insincere and frivolous if I pretend to believe it. Cartesian doubt has value as a means of articulating our knowledge and showing what depends on what, but if carried too far it becomes a mere technical game in which philosophy loses seriousness.¹⁶

13 Ibid, p. 450.

14 Ibid, pp. 514-5.

15 Ibid, p. 196.

16 Ibid.

Rejecting, then, the standpoint of methodological solipsism, Russell's account instead anticipates by several years the 'naturalised epistemology' of Quine. Explaining his method in *My Philosophical Development*, Russell writes that 'I reverse the process which has been common in philosophy since Kant. It has been common among philosophers to begin with how we know and proceed afterwards to what we know. I think this is a mistake, because knowing how we know is one small department of knowing what we know.'¹⁷

One should be careful as to what Russell's epistemological naturalism means. Jaegwon Kim, for example, criticised Quine's version of this thesis for effectively destroying epistemology entirely.¹⁸ If Quine is correct, Kim argues, then the only thing to investigate is the causation of belief. Questions of whether or not a belief is justified have no place, and thus the term 'knowledge' should have to be jettisoned as lacking application. Russell's views are not vulnerable to this criticism - and it could be considered an uncharitable way of interpreting Quine. Certainly for Russell, the point is not that normative notions such as justification have no place in philosophy or science but rather that any account of how our beliefs are justified must appeal to knowledge that is already supplied by science. This is viciously 'circular' only if the aim is to justify knowledge on an indubitable foundation - an aim to some extent shared by both Descartes and Hume, but repudiated by Russell (and by Quine).

The similarities between Russell and Quine should not, however, be exaggerated. One important difference is as to what Quine calls 'observation statements', which Quine construes in terms of symbols referring to material 'bodies'. But if observation statements are to ground inferences then they cannot themselves be the result of inferences. Hence, they cannot embody the influence of past experience. Now talk of 'bodies' does embody inferences which are the result of experience - this is why Russell felt the need to distinguish between sensation and perception, and why 'observation statements', pace Quine, must refer to sensation alone, and thus omit all reference to 'bodies'. I cannot help thinking, therefore, that Russell's account is greatly superior to that of Quine's, both theoretically and in terms of clarity of exposition.

III. THE REJECTION OF INDUCTION

Our scientific beliefs amount to knowledge, then, if the world has certain characteristics - characteristics which are mirrored by our inferential habits. The statements embodying these characteristics cannot be further

¹⁷ *My Philosophical Development*, p. 12.

¹⁸ See his paper on 'What is "Naturalized Epistemology"?', in J. E. Tomberlin (ed.), *Philosophical Perspectives 2: Epistemology*, pp. 381-405, reprinted in Sven Bernecker and Fred Dretske (eds.), *Knowledge: Contemporary Readings in Epistemology*, pp. 279-97.

justified, because they are presupposed by all justification. Nevertheless, if they are true then we do have knowledge, and beliefs that are validly derived from them (in conjunction with data) are justified.

It is normally thought that in order for our non-demonstrative inferences to be justified we need to assume a principle such as the 'uniformity of nature' or a principle to the effect that every event has some preceding event which always precedes events of this kind. In other words, it is assumed that the principle required is something that would validate inductive inference. One of the most interesting features of Russell's account of scientific inference is his uncompromising rejection, from 1944 onwards, of induction as a valid method of inference. Induction can sometimes be of service to science, but only in certain limited circumstances. On the whole, science cannot rest on inductions for the simple reason that induction more often leads to false conclusions than to true ones. The induction which Russell is talking about here is what he calls 'induction by simple enumeration'. We observe that A has always been accompanied by, or followed by, B, and we have never observed A not being accompanied by, or followed by, B. When we have observed this conjunction enough times we conclude that As are always accompanied by, or followed by, Bs, and we are entitled to feel more confident in this conclusion the more times we observe A accompanied by, or followed by, B.

Russell's criticism of induction is first set out in the chapter on 'Causal Laws' in Part IV of *Human Knowledge* and is further elaborated in the remainder of the book. He begins with a felicitous example:

If there is no limit to the complexity of possible laws [he writes], every imaginable course of events will be subject to laws, and therefore the assumption that there are laws will become a tautology. Take, for example, the numbers of all the taxis that I have hired in the course of my life, and the times when I have hired them. We have here a finite set of integers and a finite number of corresponding times. If n is the number of the taxi that I hired at the time t , it is certainly possible, in an infinite number of ways, to find a function f such that the formula

$$n = f(t)$$

is true for all values of n and t that have hitherto occurred. An infinite number of these formulae will fail for the next taxi that I hire, but there will still be an infinite number that remain true. By the time I die, it will be possible to close the account, and there will still remain an infinite number of possible formulae, each of which might claim to be a law connecting the number of a taxi with the time when I hire it.¹⁹

19 *Human Knowledge*, pp. 229-30.

On this ground, Russell concludes that it is not induction that makes scientific laws probable, but some other principle or principles. It should be noted that Russell's criticism of induction clearly anticipates Nelson Goodman's 'New Riddle of Induction'. It is true that Russell doesn't come up with predicates such as 'grue' to illustrate his thesis, but in fact such adjectives are unnecessary to set out the central point, which is that unless some restriction is placed on the regularities which we project to unobserved instances, every observed regularity which serves to justify a given generalisation will equally justify generalisations which are logically incompatible with this first one. As Russell says, referring to the taxi example above:

All past observations as to these numbers are compatible with a number of laws of the form $n = f(t)$, and these will, as a rule, give different values for the next n . We cannot therefore use them for prediction, and in fact we have no inclination to believe in any of them. Generalizing, we may say: Every finite set of observations is compatible with a number of mutually inconsistent laws, all of which have exactly the same inductive evidence in their favour.²⁰

Russell's conclusion is uncompromising: 'pure induction is invalid, and is, moreover, not what we in fact believe.'²¹

Russell's argument is stated somewhat more formally later on. Suppose that all hitherto observed members of the class α have been found to belong to the class β , and we infer either that the next α will be a β or that all α 's are β 's. 'It is obvious', Russell writes, 'that, if we are allowed to select our class β as we choose, we can easily make sure that our induction shall fail.'²² This is demonstrated in the following manner:

Let a_1, a_2, \dots, a_n be the hitherto observed members of α , all of which have been found to be members of β , and let a_{n+1} be the next member of α . So far as pure logic is concerned, β might consist only of the terms a_1, a_2, \dots, a_n ; or it might consist of everything in the universe except a_{n+1} ; or it might consist of any class intermediate between these two. In any of these cases the induction to a_{n+1} would be false.²³

In fact, most inductions are certain to be invalid, and to yield false conclusions. Thus, from the fact that all the sheep Kant ever saw were in Königsberg, he might have inferred inductively that all sheep are in Königsberg. This conclusion would, however, be false. Russell is adept at supplying other examples of inductions which have false conclusions. Thus, in an unpublished paper, he writes that:

20 Ibid, p. 330.

21 Ibid.

22 Ibid, p. 422.

23 Ibid.

You have, let us suppose, a growing boy whose height you measure on the first of every month. You may find that, for a certain period, his rate of growth is constant. If you knew nothing about human growth, you might infer by induction that he would continue to grow at this rate until his head strikes the stars. There are, in fact, an infinite number of formulae which will fit any finite set of facts as to your boy's growth. Pure induction, if valid, would lead you to regard all these formulae as probable, although they contradict each other.²⁴

Such examples can be multiplied indefinitely. In another unpublished paper, Russell pointed out that if in one year all the murderers in France had surnames beginning with letters belonging to the second half of the alphabet, you would not draw any conclusion from this concerning the names of future murderers.²⁵ This is because we do not believe that there is any causal connection between a person's surname and their moral character. In practice we know that such an induction is invalid and we have an instinctive feel for which inductions are valid and which are not, but Russell's point is that pure induction itself does not place limits on its own applicability. Thus some further principle or principles must be presupposed in non-demonstrative inference besides (or instead of) induction.

Induction is also held to be inadequate for other reasons. Russell argues that when a number of observers hear a sound we believe that their experiences have a common external source which is propagated through the intervening medium by sound waves. But, Russell insists, 'there cannot be inductive evidence (unless in some extended sense) for something outside human experience, such as a sound wave.'²⁶ The reason for this is that:

Our experience will be the same whether there really are sound-waves, or, though there are none, auditory sensations occur as they would if there were sound-waves; no inductive evidence can ever favour any one of these hypotheses rather than the other. Nevertheless, everyone in fact accepts the realist alternative...We do this on grounds that have nothing to do with induction - partly because we like laws to be as simple as possible, partly because we believe that causal laws must have spatio-temporal continuity, i.e. must not involve action at a distance.²⁷

So what is needed are a set of principles, such as that embodied in the denial of action at a distance, which both give warrant to the inferences which are necessary to science and also will show which observed regularities

24 'Note on Non-Demonstrative Inference and Induction [1959]', reproduced in *Collected Papers* 11, p. 139.

25 'Non-Deductive Inference [1945?]', reproduced in *Collected Papers* 11, p. 123.

26 *Human Knowledge*, p. 331.

27 *Ibid*, p. 330.

are in fact projectable. This is precisely the point of Russell's 'Postulates of Scientific Inference'.

Before getting on to this topic, however, it might be worthwhile to note that such a principle as 'same cause, same effect', which Russell had invoked in an earlier part of his career, also suffers from the vagueness of 'induction'. As we have seen, Russell himself had noted in his paper 'On Matter' that the principle is not exact as it stands; for he pointed out that the totality of my sense-data at any moment is almost certain to be different to the totality of my sense-data at any subsequent moment. Thus, all I can infer from the principle, strictly interpreted, is that the total state of the universe is never precisely duplicated. In order to derive anything of greater significance from the principle it is necessary to break up our sensory experience into groups and consider these groups separately. The principle of 'same cause, same effect' doesn't itself tell us how to go about this. This is not to say that it cannot be a useful and important, even an indispensable, principle, merely that - like 'induction' - it is not genuinely fundamental, but presupposes other principles for its effective application.

IV. PERCEPTS AS SIGNS

The principles of non-demonstrative inference which we are to frame must also embody our belief in an external physical world. That is, it is not the case that any principles of non-demonstrative inference could serve to justify our belief in the physical world as an inference from experience on the same basis as an ordinary scientific hypothesis. Our belief in an external world is simply not of the nature of an empirical hypothesis which could be justified by the raw material of experience. It was Hume who first saw clearly that this was case in the section entitled 'On Scepticism with Regard to the Senses' in his Treatise.

Hume proceeded by describing how we come to believe in an external world. Experience, he thinks, has two important characteristics in this regard, which he called its 'constancy' and its 'coherence'. By the 'constancy' of my sense-experience he simply meant that similar sense impressions are obtainable at the end of similar sensory routes. Whenever I have the experience of returning to my apartment via the front entrance of my apartment block, taking the elevator up to the seventh floor, turning the lock of my front door with my keys, and entering the hallway of my flat, I find everything just where I had previously left it. I therefore imagine that these same objects that I saw when I was last here persisted unchanged during the period of time when I was not observing them. Similarly, when things do change, they frequently change in a given interval of time in the same way as they would have changed had they been observed throughout this interval. If I put a pie in the oven and watch it over a certain period I see the pastry gradually turn a golden brown. If, however, instead

of observing it, I leave the kitchen and return to the pie later on, I see that it has turned golden brown, just as it would have done had I observed it continuously throughout the interval when it was in fact unobserved. I therefore easily imagine that it continued to gradually turn brown whilst unobserved just as it would have done had I continuously observed it. This is what Hume called the 'coherence' of my experience. Thus it is the constancy and coherence of my sense impressions which leads me to construct a physical world which exists independently of my experience.

But now, says Hume, we encounter a problem. Having constructed this world we discover that the qualities we actually observe are dependent on the state of our bodily organs, not the objects we imagine that we are observing. We thus transfer the perceptible qualities of things to the observer's account and replace the 'vulgar' system of common sense with a 'philosophical' system, such as that of Locke. But Hume holds that such a move is actually disastrous for any claim we might have concerning knowledge of the physical world. For the credibility of the philosophical system rests entirely on the vulgar system which it has displaced. Had the qualities we perceived been admitted from the outset to be fleeting we should never have constructed the vulgar system without which the philosophical system loses its credibility. What the philosophers such as Locke, who create the philosophical system, in fact do is in effect to create a duplicate set of percepts which can be ascribed the permanence that our actual percepts lack. But this only needs to be stated in order for it to be seen to be a cheat. Once it is admitted that the philosophical system can derive no support from our ordinary imaginative inferences (since we are mistaken in ascribing to our percepts a continuous and uninterrupted existence), there remains no further source of support. We could never straightforwardly infer physical objects from our transient percepts, since by the nature of the case we only have perceptual access to one term in the causal connection - our percepts. We could scarcely be warranted in inferring from this something which by its very nature could never be observed. Hume's conclusion was that our inference to an external world is in fact unwarranted. And yet he, along with everyone else, would continue to believe in such a world. Nature is too strong for philosophical reflection, in this regard. What Hume has in fact shown, I believe, is that our belief in the physical world is not justified as some sort of inference from percepts on the same level as an ordinary empirical hypothesis.

There is, however, another important point, namely that the physical world is presupposed by all (or nearly all) hypotheses or statements of causal connection. There may be some 'laws of association' which are sufficiently reliable that they can be taken as actual causal laws, and which relate sensations with (say) mental images. Such laws would then only presuppose the data of introspection. However, this is obviously a very special case. All the laws that are of any interest to us link physical events, and require the terminology of physical objects. Hence (with the trivial exception described above) all causal laws presuppose the existence of a

physical world. Thus, the physical world is not inferred on the basis of some causal law. Rather, the existence of the physical world is itself presupposed by causal statements. And in this sense, our knowledge of the physical world can be said to be a priori. If we did not already interpret our percepts as signs of physical objects then we could never come to this belief in an external world - or at least we could never justify it. But in fact our knowledge of the physical world is not itself the outcome of empirical enquiry; rather (as we have seen) it is presupposed by empirical enquiry, since without this knowledge there could be no causal laws (apart, perhaps, from the most trivial laws of association).

The neglect of this point is apt to lead to all sorts of difficulties for the theory of knowledge. Thus Howard Robinson in his book on *Perception* argues that causal laws do not presuppose the existence of physical objects. All they require is that sense-experience behaves as though the physical objects or events which figure in causal hypotheses exist. This, however, seems to me a muddled position.

For what could possibly be the explanation for sense-experience behaving as though physical objects existed except that they did in fact exist? Robinson maintains that this question is misplaced, since the order and regularity of sense-experience that is embodied in the physical-object language does not stand in need of any further explanation. This, it seems to me, must be mistaken. The crucial concession on Robinson's part is his concession that the physical-object language cannot be dispensed with if one is to describe the order and regularity of one's sense-experience in a manner that is projectable. If this is granted, then it follows that the description of the (projectable) pattern in sense-experience presupposes the existence of physical objects if such descriptions are to be true. If I maintain, with Robinson, not that the physical world exists but merely that experience behaves as though it exists, I can legitimately ask why this is the case. For the fact that experience behaves in a certain manner would, I think, stand in need of explanation. To say that experience behaves as though the physical world exists does not itself constitute an explanation of the course of our experience - merely a description. But without an explanation it seems that we have no basis for supposing that the pattern hitherto exhibited by our experience will continue to hold. If we are inclined to suppose that it will, this is only because we implicitly assume that some causal explanation for this pattern exists which can therefore be relied on. But what explanation could there be for the fact that experience behaves as though physical entities exist except that such entities do exist?

Robinson concedes that what he calls 'analytical' phenomenalism - which holds that statements about physical objects can be translated into statements about sense-data - is untenable. The terminology of physical objects is indispensable to any description of our experience which could warrant factual inferences. But if the above argument is correct, then the failure of analytical phenomenalism should spell the end of phenomenalism

generally. If there is no physical world then there is nothing to ground the regularities that we observe in our experience, and no reason to suppose that these regularities will continue. To say this is not to suppose that every instance of order or regularity stands in need of explanation (a position which would seem to threaten an infinite regress). Rather the point is that the order and regularity exhibited by our sense-experience cannot even be adequately characterised without presupposing the existence of physical entities. We cannot describe the pattern in experience in a manner that is projectable without employing the terminology of physical science; and this means that we cannot describe the pattern in experience in a manner that is projectable without implying the existence of physical entities. Since we all as a matter of fact believe that the sun will rise tomorrow, Robinson's phenomenalism turns out to be a position that none of us could ever sincerely hold. And if we know that the sun will rise tomorrow then it follows that we know that the sun belongs to a mind-independent reality, and that phenomenalism and idealism are false.

The upshot of this discussion is that analytical phenomenalism was the only intellectually respectable form of phenomenalism. If it fails, then phenomenalism fails. Had analytical phenomenalism turned out to be tenable - had statements about physical objects been susceptible to translation into statements about sense-data - then Ockham's Razor would have allowed us to dispense with physical entities. As it is, analytical phenomenalism is not tenable (as Robinson concedes), and this entails that phenomenalism generally is untenable as well. In practice, a position such as Robinson's is indistinguishable from the sort of instrumentalist approach which says that experience behaves as though certain entities are real when in fact they are not; and the objection to this approach is that it fails to supply an explanation for this fact in a manner that would warrant inferences which all of us, including Robinson, in fact make.

Turning to the realist alternative to phenomenalism, Robinson discerns certain epistemological difficulties with representative realism. These difficulties, however, seem to me more apparent than real. The problem he is particularly concerned with is why the order and regularity of our experience should stand in need of explanation at all. The answer to this is that without such explanation we should be unable to characterise the pattern within sensory experience and thus would be unable to project it to future instances. However, Robinson mistakenly takes our belief in the physical world as an instance of an ordinary scientific theory. This leads him to think that the realist is committed to justifying our belief in the physical world by resort to the mathematical calculus of chances.

He begins his account by claiming that 'A postulated physical world would not...bring order to our ideas, for the whole point of it is that it seeks to relate ideas to things that wholly transcend our minds.'²⁸ If, however, the

28 Howard Robinson, *Perception*, p. 216.

order we discern in experience cannot be identified without resort to the language of physical objects - a point that Robinson himself is prepared to concede - then it seems to me that the postulation of a physical world can bring order to our ideas, and that nothing else can. Robinson goes on to say that 'Any search for an explanation presupposes that there is something in need of explanation - that is, something which is improbable unless explained. In this case, this would be so only if it were improbable that it should be a brute fact, without any explanation, that our experience should be highly ordered.'²⁹ This statement appears to me to be mistaken. It seems to me that, in the absence of a postulated order or pattern, it is meaningless to say that a given event or sequence of events is either 'probable' or 'improbable'. Such adjectives presuppose projectable regularities in experience; in the absence of such projectable regularities, judgements of probability are inapplicable. And all such causal regularities, we have argued, presuppose the physical world, since causal laws relate physical events. Robinson seems to think that he can refer to the 'order' of experience in a way that does not presuppose an explanation for experience. But what does 'order' mean in this context, if it doesn't refer to a projectable order? A bare description of the sequence of events constituting our experience to date would indeed not formally entail the existence of a physical world. But neither could we rest content with such a description - not because such events would be 'improbable' a priori, but because on the basis of such a description we could make no judgements concerning the future course of our experience.

Robinson's argument that an ordered sequence is a priori improbable is flawed. He writes that 'What we are interested in is the probability of a series which is so structured that a conscious subject is able to discern manageable recurrent regularities. There are obviously many more series of logically possible experiences that do not fit this requirement than ones that do.'³⁰ From this premise he fallaciously derives the conclusion that 'As there are many more series which do not fit this requirement than ones that do, a priori it is improbable that one fitting the requirement would occur by chance.'³¹ The fallacy is a common one. It consists in supposing that from the purely formal calculus of chances it is possible to derive a substantive conclusion concerning which statements it is reasonable to expect to be true. As A. J. Ayer wrote, 'Since the calculus of chances is a branch of pure mathematics, it does not in itself yield any conclusion about the likelihood of actual events...The application of the calculus to games of chance depends on the empirical assumption that the objects which are used in them behave in a way that accords with the mathematical distribution of chances...This is a point that is too often overlooked. In particular, it is often assumed, quite unwarrantably, that if things were left to themselves, they would be equally indulgent to all the logical possibilities.'³² The point is that, a priori, there is no reason to regard a highly ordered sequence as any less probable than an

29 Ibid.

30 Ibid, p. 217.

31 Ibid.

32 A. J. Ayer, *The Central Questions of Philosophy*, p. 165.

unordered one. Rather, judgements of probability already presuppose projectable regularities in events. Our justification for positing the existence of an external, mind-independent physical reality is not that a given sequence of sense-data, or percepts, is a priori improbable, but rather that the regularity exhibited by this sequence cannot even be described (at least not in a manner that is projectable) without presupposing the existence of physical objects that are not themselves reducible to sense-experiences. Without the physical-object language, no projectable regularities in our experience could be identified and scientific enquiry would be impossible.

What I am contending is that the percept is an effect of the physical object perceived, but it is not just an effect; it is also a sign. It is a sign in the sense that it is an element in a pattern whose characterisation presupposes the terminology of physical objects. This account has the virtue that it captures the twofold nature of perception. On the one hand, I agree with Russell that the percept is an effect of the object perceived - a link in a long causal chain which is such that the percept is not likely to resemble the object which is its approximate cause except in regard to certain highly abstract, mathematical features. On the other hand, the percept is a sign of the physical object which is its remote cause. That is, it is an element in a pattern of sense-experience which can only be described by positing the existence of physical objects. Human beings must view experience in such a way as to discern projectable patterns in experience. In other words, we interpret our sense-experience, and in fact necessarily interpret it in terms of physical objects. The reason for this is that the only way we can identify projectable patterns in sensory experience is by recourse to description in physical-object terms. And I have argued that the physical-object language presupposes the existence of objects or events that are not themselves constitutive of sensory experience. Thus experience discloses or reveals physical objects, and is not merely the effect of physical objects.

I think that it is this fact that enables us to overcome what might otherwise seem an insuperable obstacle to the plausibility of any form of realism. The epistemic relation between percepts and physical objects is not one in which we infer the supposed cause (the physical object) from the effect (the percept) without ever having had any experience of the cause. We have argued above that Hume was surely right in arguing that such an inference could never be warranted. But in fact our inference is not of this kind; our positing a world of physical objects is not of the nature of a scientific hypothesis or theory (it is not as though the 'theory' that there exists a physical world has any serious rival as a means for accounting for our sense-experience). Rather, the existence of a physical world is presupposed by any and all hypotheses and theories concerning the course of our experience - such theories and hypotheses themselves being corroborated by their predictive success. Percepts are not just effects of external physical things, they are signs of these things. It is necessary for us to interpret experience so as to employ it as a guide to the future. In order to accomplish this task we must

identify the projectable pattern in our experience. The identification of this pattern presupposes the positing of physical objects, that is, it reveals the existence of an independent physical world. Thus the existence of the physical world is in this sense a priori. It is not the outcome of any process of empirical enquiry but rather a presupposition of it.

V. RUSSELL'S POSTULATES

I have discussed this point about the a priori nature of our belief in the physical world at some length in order to make more comprehensible the form that Russell's postulates take. For these postulates effectively describe how the world must be if it is to be possible for us to describe it in terms of physical objects. Now Russell certainly does not discuss the matter in the way I have done above. He does not refer to Hume, or say that percepts are signs, or anything of that nature. Nevertheless, I think that understanding this point about the physical world being a priori enables us to understand why Russell formulates his postulates in the way that he does.

Assuming, then, that the existence of the physical world is presupposed by science and not the outcome of it, what does it mean to say that there is a physical world? For Russell, the world consists not of permanent physical 'things' but rather 'events'. However, it is still the case that the physical-object language is applicable to experience and that this is only possible if events form groups which have certain characteristics such as make it possible to talk in terms of persistent things. For Russell, the existence of things will amount to there being certain identifiable strings of events that have certain properties. The existence of such strings of events is embodied in the first two of Russell's postulates.

The first postulate, which Russell calls 'the postulate of quasi-permanence', is formulated by Russell as follows: 'Given any event A, it happens very frequently that, at any neighbouring time, there is at some neighbouring place an event very similar to A.'³³ Thus, 'there is not [Russell writes] very much similarity between a three-months' embryo and an adult human being, but they are connected by gradual transitions from next to next, and are therefore accepted as stages in the development of one "thing"'.³⁴

This postulate, Russell explains, is not, however, sufficient to arrive at the concept of matter as used in physics. For example, we can pass continuously from one drop of water in the ocean to another, but two separate parts of the sea are not necessarily materially the same. However, when such situations arise, we believe that there is

³³ *Human Knowledge*, p. 506.

³⁴ *Ibid*, p. 507.

some one other part of the ocean which is materially the same as a part of the ocean a moment before. This requires that the postulate of quasi-permanence be complemented by Russell's second postulate, 'the postulate of separable causal lines'. This is stated as follows: 'It is frequently possible to form a series of events such that, from one or two members of the series, something can be inferred as to all the other members.'³⁵ As well as allowing us, in conjunction with the postulate of quasi-permanence, to assume that the world consists of continuous material things, the postulate of separable causal lines also allows us to suppose that separate causes frequently have separate effects, and thus that whenever we have two separate percepts they frequently have distinct causes. This, therefore, supplies a justification for the more rough-and-ready principle of 'different effects, different causes' which Russell had appealed to previously.

A series of events connected with each other in a manner suggested by the postulate we are discussing is called by Russell a 'causal line'. By way of explanation, Russell adds the following:

Between any two events belonging to one causal line, I should say, there is a relation which may be called one of cause-and-effect. But if we call it so, we must add that the cause does not completely determine the effect, even in the most favourable cases. There is always some influence, which is also causal, though in a slightly different sense, of the environment on the causal line. A photon in interstellar space is slightly deflected by gravitation from its rectilinear path, and in general the disturbing effect of the environment is much greater than in this case. What our postulate asserts may be re-stated as follows: A given event is very frequently one of a series of events (which may last a fraction of a second or a million years) which has throughout an approximate law of persistence or change. The photon preserves direction and velocity of motion, the billiard ball preserves shape and colour, a foetus develops into an animal of the appropriate species, and so on.³⁶

Russell believes that these first two postulates must be complemented by a third which allows us to deny 'action at a distance' and assert that 'when there is a causal connection between two events that are not contiguous, there must be intermediate links in the causal chain such that each is contiguous to the next, or (alternatively) such that there is a process which is continuous in the mathematical sense'.³⁷ This postulate, which Russell terms 'the postulate of spatio-temporal continuity' allows us 'to believe that physical objects exist when unperceived'.³⁸ It also allows us to infer the existence of light-waves and sound-waves in places where there are no percipients, even though such processes can never be observed and therefore could never be validly inferred using 'induction'.

35 Ibid, p. 508.

36 Ibid, p. 509.

37 Ibid.

38 Ibid, p. 510.

These three postulates, then, set out the properties of events whereby they form a physical world. However, they are still not sufficient. So far, we have said nothing about the connection of physical objects with percepts. We need some postulate to the effect that percepts are frequently the signs of physical objects and furthermore that something can be inferred from the percept concerning the physical object. Since Russell is concerned with setting out the properties of events in general which science presupposes he does not refer specifically to 'percepts'. Rather, he refers to those events which can be considered appearances or effects of physical objects. The postulate - Russell's fourth - is called simply 'the structural postulate', and it runs as follows: 'When a number of structurally similar complex events are ranged about a centre in regions not widely separated, it is usually the case that all belong to causal lines having their origin in an event of the same structure at the centre.' Concerning the phrase 'grouped around a centre', Russell says that this 'is intentionally vague, but in certain cases it is capable of a precise meaning.' He continues:

Suppose a given object to be simultaneously seen by a number of people and photographed by a number of cameras. The visual percepts and the photographs can be arranged by the laws of perspective, and by the same laws the position of the object seen and photographed can be determined. In this instance the sense in which the percepts and photographs are 'grouped about a centre' is precisely definable. When a number of people hear the same sound, there is an equally precise definition if there is an accurate method of determining when they hear it, for it is found that the times when they hear it differ from a given time by amounts proportional to their distance from a certain point; in that case, the point at the given time is the space-time centre or origin of the sound. But I wish to employ the phrase also in cases (such as smells) where no such precision is possible.³⁹

With the structural postulate, alongside our previous three, we now have a set of postulates which seem sufficient to generate science. However, Russell thinks that one more postulate is necessary. This is 'the postulate of analogy', and runs as follows: 'Given two classes of events A and B, and given that, whenever both A and B can be observed, there is reason to believe that A causes B, then if, in a given case, A is observed, but there is no way of observing whether B occurs or not, it is probable that B occurs; and similarly if B is observed, but the presence or absence of A cannot be observed.'⁴⁰ In *My Philosophical Development*, Russell writes that the most important function of this postulate 'is to justify the belief in other minds'.⁴¹ Thus whenever my body is damaged in some way I find that this damage causes me to experience pain and this in turn causes me to exhibit certain behavioural dispositions (such as a disposition to go to a doctor, etc.). If someone else's

³⁹ Ibid, pp. 510-1.

⁴⁰ Ibid, pp. 511-2.

⁴¹ *My Philosophical Development*, p. 151.

body is thus damaged and they exhibit the appropriate behavioural signs of pain, it is not physically possible for me to verify that they are in pain. However, the postulate of analogy allows me to make this inference.

Furthermore, Russell strengthens this account by referring to other uses of the postulate where we would certainly regard the inference as more or less certain. Thus Russell writes 'Suppose, for example that a barking dog is running after a rabbit, and for a moment is hidden by a bush. The bush accounts for your not seeing the dog, and allows you to infer that the bark, which you still hear, is still associated with what you saw a moment ago. When the dog emerges from the bush, you think your belief is confirmed.'⁴² One might think that the postulate of spatio-temporal continuity would suffice in this case, but this would come into operation only after the dog had emerged from behind the bush. Once this had occurred spatio-temporal continuity allows us to infer that the dog continued to exist when unobserved, provided there was a physical reason which prevented us from observing the dog when it was not observed. However, even if we did not subsequently witness the dog emerging from behind the bush (suppose our gaze was distracted by something else), the fact that we heard the dog barking would still give us an assurance that the dog continued to exist. Similarly, I have found that the visual appearance of a table is associated with a tactual quality of hardness when I touch the table. When I merely see the table without touching it I am no longer able to verify that the table is still hard in the physical sense of having properties which yield, in the appropriate circumstances, certain kinds of tactual sensations. The postulate of analogy, however, enables me to infer this physical property.

Now Russell's postulate of analogy seems to me to introduce an ingenious twist to the so-called problem of other minds. Traditionally, this problem has been dealt with separately by epistemologists as just a further problem where the sceptical challenge requires to be met. Thus Ayer, in his book *The Problem of Knowledge*, deals with the problems of perception, our knowledge of the past and our knowledge of other minds in separate chapters. Each problem is considered in a manner that makes little references to the others. Russell, on the other hand, thinks that if we properly analyse the inferences that we use in science, we shall find that they include a postulate which has the additional effect of justifying our claims to knowledge of other minds. Thus, the problem of other minds is not treated by Russell as a separate problem to that of our inference to physical objects; rather, both are subsumed under the more general problem of non-demonstrative inference. If Russell is right about this, then the existence of other minds becomes a scientific proposition. This does not mean that it becomes an 'hypothesis', any more than the postulates themselves are hypotheses. Rather, it becomes part of the scientific picture of reality on the basis of which we can formulate hypotheses concerning the states of other people's minds. On this account, science and knowledge are indeed coextensive. There is no such thing as non-scientific knowledge. Russell's account of other minds as something we can know from the general

42 *Human Knowledge*, p. 512.

principles of non-deductive inference that justify science in general is, it seems to me, an original way of viewing the problem of other minds. I'm inclined to think that it is true, though I don't think this is something we can say for certain until we have a clearer idea of the content of the postulates required by science.

Traditionally, the response to the argument from analogy to other minds is to suggest that the analogy is too weak to support the certainty with which we hold our belief in other minds. Suppose, for example, that we lived in a society where a certain part of our bodies could never be exposed to the view of others. If I had a birthmark on that part of my body, then I would scarcely be warranted in inferring that others had a similar birthmark in the same part of their bodies. It is true that we possess a broader body of theory which in fact states that individuals are unlikely to have birthmarks in the same places. But if we were not possessed of such background knowledge, would we therefore be warranted in inferring the existence of the birthmarks of others on the evidence available? Even if the data supplied some reason for believing this hypothesis, it would surely be insufficient to justify certainty, such as we possess when it comes to our belief in the existence of other minds.

Nevertheless, I think it is possible to furnish a thought-experiment which shows that whatever our ground for believing in other minds, it has to be of a nature as would justify various other common sense beliefs. We can, in fact, vary our properties to a certain extent. For example, we can alter our geographic location. We find that our location has no bearing on whether or not we enjoy conscious states. We can therefore infer that geography is irrelevant to consciousness and conclude that people in other parts of the world have conscious states. It may be replied that we cannot vary the place where we were born. This is true, but it seems a general scientific principle that the only thing relevant to causation is the present state of the universe. Origins are not directly relevant. Nevertheless, even taking into account only characteristics which are present states, it might be said that I have only a limited capacity to vary them. For example, I cannot vary my eye colour. Why should I not suppose that my having this particular eye colour is what makes me conscious so that only human beings with the same eye colour as myself have minds? But now, consider the following. Suppose that, at some point in the future, it became possible to surgically alter eye colour, so that people routinely changed their eye colour for purely cosmetic reasons. I might consider various things when deciding whether to do this myself. I might balance the expense of the operation against my desire to have blue eyes. But the one thing that I would not be anxious about is the possibility that in changing my eye colour I should become an automaton. This would not even enter my head as a possibility. Now, let us suppose that I am right to discount this as a possibility. I believe that I am indeed right, though I am not sure what principle is involved in this case. Nevertheless, if I am warranted in being certain that changing my eye colour would not result in my becoming an automaton I ought to conclude that eye colour is irrelevant to consciousness, and that therefore those with a different eye

colour to my own must have minds. So even though I am limited in the extent to which I can vary my characteristics, there must be at least one principle which enables me to be quite certain that others have minds. And this principle is a general principle of non-demonstrative inference in the sense that it also warrants other inferences that have nothing to do with the minds of others. It allows me to be quite certain that my varying my characteristics to the extent that I am able will not turn me into a 'philosophical zombie'. If I am right in this, then it follows that Russell is quite right to emphasise the connection of the problem of other minds with our non-demonstrative knowledge in general.

VI. THE STATUS OF THE POSTULATES

Earlier, we saw that Russell specified four conditions for inferential knowledge. Knowledge involving inference always invokes some general proposition, such as that A is always or usually accompanied by B. Now the fourth condition for such an inference to yield knowledge was that the relation of A to B must be of such a character that those relations which have this character are normally such that A is a sign for B. The question that was left unanswered by this account was what this general character of relation is. Russell's postulates answer this question. If the character of the regularity comes under one of these postulates then the regularity is of a character which in most instances can be relied on. Provided the world has the general characteristics embodied in these postulates, our tendency to make inferences in accordance with these postulates yields genuine knowledge, even though we can supply no further justification for the postulates themselves.

The above five postulates are claimed by Russell to be sufficient to ground scientific inferences. Russell does not, however, wish to maintain that they are all necessary, or that they have been stated in their 'logically simplest form'.⁴³ This, then, is a project which can be further pursued and concerning which fruitful results can be achieved. However, owing to a total lack of interest or comprehension concerning the project on which Russell was engaged, no such subsequent enquiry has ever occurred.

A good example of this lack of comprehension is provided by Grover Maxwell, who is himself a sympathetic commentator on Russell. In his essay 'The Later Bertrand Russell: Philosophical Revolutionary', he has the following to say about Russell's postulates:

[Russell] takes the untested, untestable, and, in this sense, non-empirical (though nevertheless

⁴³ Ibid, p. 513.

contingent) assumptions upon which our significant knowledge of the world and ourselves rest to be his notorious six 'Postulates of Scientific Inference'. But, in spite of my boundless admiration for Russell's later work, I do not think that he ever used these postulates significantly or ever showed how they could do much for anyone, be he scientist, philosopher, or man-in-the-street.⁴⁴

There are several points to be made here. Firstly, I'm not sure why Maxwell describes Russell's postulates as 'notorious'. It can't really be said that anyone has paid any close attention to them at all (prior to this study), or done more than dismiss them without making a serious attempt to understand their purpose. Secondly, there are five postulates, not six, a mistake Maxwell would not have made had the Postulates indeed been 'notorious'.

But in any case Grover Maxwell completely misunderstands the purpose of Russell's Postulates. He seems to take them as constituting a set of practical 'maxims' to be consciously applied to concrete situations in order to yield new knowledge, and rejects them on the ground that they are not fitted to serve this function. But this is not what they are at all. Rather, they are what has to be presumed to be true of the world if the inferences we in fact make are to be justified. The link here is with Russell's reliabilism. We found that a piece of (inferentially established) belief counts as knowledge if the inference on which it is based is such that all inferences of this general type are in fact justified, that is, if certain sorts of events really are signs of certain other sorts of events. For our knowledge to be genuine, the inferences we are disposed to make must track the way events succeed each other in reality. In order for this to be the case, the world must have certain characteristics. These characteristics, being presupposed by our non-deductive inferences, cannot be justified empirically; and the principles themselves are not analytic. The postulates are designed to capture these aspects of reality; they are framed so that they are jointly sufficient to ground the inferences we all in fact make. To criticise such principles on the ground that they are no use to the 'man-in-the-street' is besides the point. One might as well criticise physics on the ground that the knowledge of the fundamental particles of which matter is composed is of no use to ordinary people in their everyday dealings with the material objects they handle. Ordinary people can be quite ignorant of the composition of matter, but it doesn't follow that matter is not in fact composed of certain types of physical particles, or that such knowledge doesn't constitute a genuine discovery about the world. Similarly, it is not to be supposed that we would be any more familiar with the principles that ground our inferences than with the types of physical particles that constitute matter - both are equally remote to the 'man-in-the-street'. Russell's Postulates are only revealed at the end result of a great deal of highly technical and analytical enquiry. But they nevertheless represent a very significant and important discovery. They are meant to replace such vague notions as the 'uniformity of nature' and such invalid notions as induction by simple enumeration, with something that is both valid and more concrete.

⁴⁴ Grover Maxwell, 'The Later Bertrand Russell: Philosophical Revolutionary', in *Bertrand Russell's Philosophy*, ed. George Nakhnikian, p. 180.

A different kind of criticism would be that, if the postulates are meant to replace such vague notions as the uniformity of nature, then they fail in their object, since they are at least equally vague. Thus the postulate of separable causal lines says that it is frequently possible to form series of events such that from one or two members of the series something can be inferred about the whole series. Now this 'something', it might be said, is too vague to be any better than the principle of induction. Russell, as we have seen, criticised induction on the ground that, if taken literally, it would justify all sorts of inferences that we are not in fact inclined to make. Does not the same criticism apply to Russell's own postulates?

To some extent, this criticism is justified. Russell could answer that in practice we know how to apply these principles, that is, we know instinctively which uniformities are projectable. But the same could be said of the principle of the uniformity of nature which Russell criticised. Nevertheless, I think that Russell's Postulates are better than the uniformity principle; they seem to give a clearer idea of the principles required by science, even if they are not wholly clear.

Furthermore, it is possible that total clarity may not be obtainable. The postulates are suggested by what Russell calls 'animal inference', our innate and instinctive predisposition to take certain events as a sign for certain other events. It may be that the inferences we naturally make are so complex and subtle that we can never arrive at complete clarity concerning the principles that underlie them. Nevertheless, Russell's postulates clearly give a much better notion of what we must assume about the world for science to be possible. I think, therefore, that they represent a definite advance in epistemology.

It is, therefore, a pity that no one has really evinced any interest in them or sought to refine them further. It is admitted that science rests on certain principles which are 'synthetic', in Kant's sense. It is also recognised that such principles as 'induction by simple enumeration' and 'the uniformity of nature' have only a limited utility, and cannot represent the most accurate form of the principles we need in order to establish scientific knowledge. There is therefore a need to reveal the principles that underlie science in as exact a form as we can manage, bearing in mind that complete clarity is an ideal which may not be wholly realisable. Furthermore, the principles selected must embody what we take to be true statements about the world, which means that they must embody a metaphysic which we find scientifically and philosophically acceptable. Russell's Postulates were an attempt to get to grips with precisely this problem.

Once the Postulates are admitted then we have a physical world with sufficient causal connectedness to warrant further inferences on the basis of our perceptual experience - and science is launched. The Postulates

are not meant to be 'applied' in the sense in which Mill's canons of induction were meant by Mill to be applicable, in order to yield specific scientific conclusions. Rather, their purpose is to embody the necessary a priori knowledge without which we could never interpret our experience as experience of a physical world amenable to empirical investigation. For my part, I am inclined to agree that something like Russell's postulates are indeed a precondition for scientific enquiry, and that Russell has made a genuinely important discovery. Russell himself thought so, and was disappointed by the muted reception of *Human Knowledge*. In part the lack of interest was due to the fact that when this book was published, the philosophical world had ceased to pay any attention to Russell at all, beholden as it was to the philosophy of Wittgenstein and its various linguistic offshoots. But I think that another part of the reason may have been that philosophers were not clear what purpose Russell's Postulates were supposed to serve. I hope in the above account I have illuminated this purpose and made the Postulates more intelligible as a result.

VII. THE SIGNIFICANCE OF *HUMAN KNOWLEDGE*: THE RENEWAL OF EMPIRICISM

Human Knowledge has the subtitle 'Its Scope and Limits'. In other words, Russell is engaged in a critical enterprise in the tradition of Locke, Hume and Kant: he is attempting to define what we can know and also what we cannot know. In stark contrast to the scientific positivists and their philosophical descendants amongst analytical philosophers in the twentieth century, Russell does not have a boundless faith in our ability to 'grasp this sorry scheme of things entire'. Instead, he supposes that we live in a universe which transcends our ability to completely grasp it. This is evident in the limitations he places on knowledge. We can only know the abstract structure of things, not their intrinsic nature; our knowledge of causal laws gives us no rational insight into any supposed objective 'connection' between events which could somehow ground our inferences. Finally, our knowledge of the world is rooted in general principles which are given to us by nature and must be accepted if knowledge is to be possible at all. We can have a (limited) knowledge of the universe because we are the way we are and because nature is the way it is.

But in what sense can we be said to 'know' these general principles on which science is based? This is an issue which Russell addresses in the last few paragraphs of *Human Knowledge*. The upshot of his discussion is that his postulates are preconditions for rational enquiry itself. I think that this is the only answer that ultimately can be given. I also think that it is perfectly sufficient. If they are preconditions for rational enquiry then reason cannot undermine them. Hence, scepticism is avoided. Russell's philosophy, then, places him beyond classical empiricism and links him with a tradition of epistemological naturalism. It places him not only with Hume (in his more naturalistic moods), but also with such thinkers as Thomas Reid, Sir William Hamilton, and even, in

some respects, Kant. This is not always recognised because Russell frequently professed his adherence to 'empiricism'; and commentators have taken him at his word and assumed that he accepted the epistemological premises of philosophers such as Locke, without examining what Russell takes as constituting his empiricism. In *Human Knowledge*, whilst he declares his allegiance to an empiricist tradition, he transforms it in the direction of epistemological naturalism. Indeed, in the final lines of the volume empiricism is characterised in a thoroughly naturalistic way as the thesis that, due to our being creatures within the universe, all human knowledge is 'uncertain, inexact, and partial.'⁴⁵

Many commentators on Russell have been hostile or dismissive of empiricism, seeing it as bound up with a theory of perception which they think leads inevitably to solipsism. It is then claimed that Russell himself takes the standpoint of 'epistemological' or 'methodological' solipsism, that is, it is supposed that he thinks that our direct or certain knowledge is confined to the contents of our minds. But, as we have seen, far from being a methodological solipsist, Russell is consistently dismissive of such a position. He assumes that our knowledge is rooted in the fact that we are beings who are already oriented to a world that pre-exists us. Thus he writes:

Evolution and adaptation to environment cause expectations to be more often right than wrong, although the expectations go beyond anything logically demonstrable. Nature, we may say, has certain habits. The habits of animals must have a certain adaptation to the habits of nature if the animals are to survive.⁴⁶

This, it should be noted, is an explanation for our habits, not a justification. After the above quoted passage, Russell immediately writes that:

This would be a poor argument if employed against Cartesian scepticism. But I do not think it is possible to get anywhere if we start from scepticism. We must start from a broad acceptance of whatever seems to be knowledge and is not rejected for some specific reason.⁴⁷

Russell regarded *Human Knowledge* as his magnum opus, as the culmination of his work in theoretical philosophy. I hope I have said enough to show that *Human Knowledge* is indeed a very important work which has been quite unjustly neglected. Indeed I am inclined to say that it is the single greatest work of epistemology of the twentieth century, and, for this reason alone, might be thought to have some claim to be regarded as the single greatest philosophical work of the twentieth century. It has a scope and originality which

⁴⁵ *Human Knowledge*, p. 527.

⁴⁶ *My Philosophical Development*, p. 148.

⁴⁷ *Ibid.*

is not matched by any comparable work of which I am aware. Whereas other works become more a matter of historical interest with the passing decades, *Human Knowledge* is seen to become more important. Perhaps this is precisely because Russell was to some extent an philosophical 'outsider' at the time he wrote it, so that his work was not so dependent on passing philosophical fashions.

John Passmore once characterised Russell's philosophical development as 'the passage from Descartes to Hume epitomized'.⁴⁸ I think there is a considerable degree of truth to this description, but I want to add that the Hume to which Russell eventually subscribed was Hume the naturalist, not Hume the classical empiricist. H. O. Mounce has recently argued that Hume in some ways went beyond classical empiricism and partially realised a more naturalistic standpoint in conflict with his empiricist premises.⁴⁹ Russell did not start his philosophical career as an empiricist and thus his final view is less burdened by empiricist assumptions, and his naturalism is consequently more fully developed. Russell began as an idealist, but most of all as someone who believed that the nature of reality could be elucidated by pure reason alone. This is really a pre-critical form of rationalism which is reminiscent of Leibniz. By the end of his career he had come to a view much closer to Hume, but also a view which placed him with the Scottish naturalists such as Thomas Reid. This may seem a highly paradoxical thing to say on the ground that the Scottish naturalists are often seen as championing 'common sense', whereas Russell was always an ardent opponent of common sense. However, the paradox is resolved when one realises that 'common sense' means something quite different in the two cases. For Russell, Hume and the Scottish naturalists, the common sense that can be defended does not comprise the naïve beliefs of the uneducated. On the contrary, it consists in scientifically educated common sense - common sense corrected by empirical investigation. The common sense that Russell opposed and which was championed by his opponents was a view that held that science had nothing to teach us about the world and that our ordinary ways of speaking require no revision in the light of scientific discovery. Russell was surely right to reject this view as arising from wilful ignorance of science. We have seen in an earlier chapter the very great significance that such a theory as relativity has for our conception of the world. It is hopelessly naïve to think that one can have an accurate view of the world whilst ignoring the findings of the most advanced sciences.

Russell himself, in the later part of his career, began to realise his affinity with Hume and his writings on Hume become more approving. He still thinks of Hume as to some degree an extreme sceptic, and fails to notice the naturalistic side of Hume's thinking, but he credits Hume with the discovery that pure empiricism is untenable and that if science is to count as genuine knowledge then there must be general principles which are a priori.

⁴⁸ *A Hundred Years of Philosophy*, p. 239

⁴⁹ See H. O. Mounce, *Hume's Naturalism*.

In fact, I think that Russell should in some respects be regarded as the natural successor to Hume. Whilst identifying with the empiricist tradition, we have seen that Russell transcends it and arrives at epistemological naturalism. Furthermore, there isn't really any tension in Russell, as there is in Hume, between naturalism and empiricism because, as I have argued above, Russell's 'empiricism' did not involve his accepting the view that all knowledge derives from experience. Such a doctrine, indeed, would scarcely have commended itself to a mathematician. Thus, in his mature philosophy, Russell argues that our scientific knowledge rests on principles that are given to us by nature, not by either 'reason' or 'experience'. At the same time, and in contrast to earlier forms of naturalism, Russell substitutes strings of 'events' for substances with varying qualities, and his realism is thus more metaphysically sophisticated. He seeks to capture the properties that strings of events must have if science is to be possible, and offers a far more nuanced analysis than has been furnished by those analytical philosophers who continue to frame the problem of non-deductive inference in terms of 'induction' or the 'uniformity of nature'. This is what allows him to anticipate Goodman's criticism of induction by nearly twenty years. Hence, Russell is really the next great step from Hume via Scottish naturalism. For Russell, Hume had to be reconciled with science and Russell saw that the way to do this was through naturalism in epistemology. His reliabilist approach to knowledge presents human knowledge as something that involves our being in the world, related to it. Only because we are creatures within the world which have an instinctive tendency to respond in suitable ways to external stimuli is knowledge possible. It is not necessary for us to be able to justify our claim to knowledge in order to have it, provided that the inferences we habitually make in fact track the way reality operates.

All this, I believe, serves to support my claim that Human Knowledge is one of the most important philosophical works of the twentieth century. Such a claim is sure to strike the average reader as extraordinary. After all, I imagine that most professional philosophers haven't bothered reading the work at all. Part of the problem was that it was published at the wrong time. In 1948, ordinary language philosophy was at its height, and although logical positivism was not popular, it had left a legacy in its wake of a reluctance to tackle philosophical problems on anything other than a very narrow, piecemeal basis. There was also another matter which would have alienated philosophers in 1948. Russell opens the volume by announcing that he seeks to reclaim an old philosophical tradition by writing for a wide educated audience:

The following pages [he writes] are addressed, not only or primarily to professional philosophers, but to that much larger public which is interested in philosophical questions without being willing or able to devote more than a limited amount of time to considering them. Descartes, Leibniz, Locke, Berkeley, and Hume wrote for a public of this sort, and I think it is unfortunate that during the last hundred and

sixty years or so philosophy has come to be regarded as almost as technical as mathematics.⁵⁰

In the atmosphere of the time this would have been taken by some philosophers as tantamount to saying that they could ignore this book, dismissing it as a merely 'popular' exposition. Of course, this would be a grave error. *Human Knowledge*, whilst written for an educated public, would certainly be extremely difficult for any but the most dedicated general reader.

There is another feature which would have put academic philosophers off reading the work and which might also have re-enforced their impression of this being a 'popular' work, namely that the first section of the work expounds the general state of science of the time. In beginning the volume in this fashion, Russell is pursuing a long-standing ambition. In his *Autobiography*, Russell says that when he was an idealist he dreamed of writing two great works, a theoretical work which would start off with the concrete and become increasingly abstract, and a work on ethics which would start off abstract and become increasingly concrete. There would then be a third work which would be an Hegelian synthesis uniting the concrete and the abstract. He then remarks that he has in fact written the first two of these projected works.⁵¹ The work on ethics is a good description of *Human Society in Ethics and Politics*. And the work in theoretical philosophy is obviously *Human Knowledge*. This underlies the fact that Russell regarded this volume as his crowning achievement in theoretical philosophy. The work thus begins with a description of the actual state of science of his time, and proceeds in the following sections towards more and more abstract matters until it ends by uncovering the postulates of non-demonstrative inference which underlie all of science. The uncovering of these principles is held to be the hardest task of all, and the most abstract. But because the discussion of science comes first, this may give a false impression of this work to the unwary. For Russell is seeking to make a significant and original contribution to philosophy, not merely to expound or popularise either science or his own earlier philosophy.

Human Knowledge therefore, whilst retaining some fidelity to the empiricist tradition, goes beyond the empiricism of philosophers like Hume to embrace an epistemological naturalism, and in doing so effectively redefines and renews empiricism as a tradition. Some of Russell's insights were independently discovered by philosophers such as Quine and Goodman in the years after the publication of *Human Knowledge*, but the volume still, I think, contains substantial material which could be invaluable in present day discussions of epistemological issues. In any case, whether or not the reader agrees with the need for something like Russell's postulates of non-demonstrative inference, I hope the above exposition and defence has made the purpose of these postulates intelligible.

50 *Human Knowledge*, p. 5.

51 *Autobiography*, p. 727.

Conclusion: the 'Mental' and the 'Physical'

In this conclusion, I shall just make a few remarks designed to bring the various topics we have been discussing together and to underline the importance of Russell's mature metaphysic for which I have been arguing all along.

There are two facets to mind: consciousness, and intentionality. Russell supplied a solution to the first of these problems. In essence, his solution consisted in taking a mysterious dualism – that of conscious states on the one hand and non-living matter on the other – and showing how it is merely a local manifestation of a wholly unmysterious and ordinary dualism – that of abstract structure and concrete character. In the first half of this thesis, accordingly, I have sought to understand the nature of Russell's solution to the problem of consciousness and to show how misunderstandings concerning the course of Russell's development have acted as an obstacle to the assimilation of this Russellian solution. As a result of the failure to comprehend the nature of Russell's metaphysic, speculation in the field of the mind-body problem has tended to run into reductionist or eliminativist channels, which, however, represent a theoretical dead end. Only the Russellian approach, in my opinion, holds any possibility whatsoever of genuine philosophical progress. For conscious states undoubtedly exist. And equally indubitably, the qualities that figure in our sensory experience are not in any obvious sense reducible to a purely physicalistic description of the patterns of electrochemical stimulation in the brain.

Russell's neutral monist metaphysic rests upon a certain philosophy of science. It relies crucially on the thesis that there are grave limitations to the knowledge of the external world supplied by physics. In order to vindicate Russell's approach, as well as to delineate the general character of physical reality, we considered what knowledge physics supplies us with concerning the external world. We began by defending the thesis that the knowledge supplied by physics is structural, or largely structural. We then considered what physical science itself might have to say regarding the nature of the reality it describes.

Having accomplished this task we next considered the whole issue of intentionality, and how a Russellian might approach this phenomenon. The analysis of intentionality I have advanced, whilst congruent with a monist theory, is not a reductionist account. Although any specimen instance of an intentional state can be rephrased in terms of a set of conditionals, the 'inputs' to these conditions will themselves include further

intentional states, subject to a similar analysis, and so on *ad infinitum*. There is therefore, no question of reductionism.

And reductionism is surely scarcely a tenable position. If intentional states were somehow reducible to non-intentional states, then all that is happening when I am engaging in a philosophical argument with someone else can be adequately described by saying that I am uttering certain vocalisations which are causing certain neurons to fire in someone else's brain, and these firings in turn are grounding certain verbal dispositions in the person whose brain it is. However, these verbal dispositions must be understood as simply dispositions to emit certain sounds, which in turn might cause me to acquire certain dispositions to emit certain sounds, and so on. 'Meaning' does not enter into the picture, since this physical description is held to be complete, on a physicalist view.

But as a matter of fact this is quite untenable. As your eye passes over these words, they are not merely causing certain bodily dispositions or neural firings – they have meaning. The way to account for this phenomenon is not to attempt to reduce intentional to non-intentional states, but to reduce the mysterious dualism of intentional and non-intentional states to an ordinary and unmysterious dualism. In this case, a dualism of descriptions of physical state which do not involve conditional statements, and descriptions in terms of function which do. What we have done in the second half of this thesis, then, is to extend the Russellian approach to consciousness to the realm of intentionality – we have taken a mysterious dualism and rendered it unremarkable by revealing it as a local instance of a wholly unmysterious dualism.

At the same time, though this approach is not reductionist, it *is* monist. Our percepts are constituents of the brain. Our intentional states can only exist insofar as they are realised by brain states. It is, however, because the monism is not reductionist that it is a 'neutral' monism. Mind is not reducible to matter any more than matter is reducible to mind.

The terms 'mental' and 'physical' can be given a meaning in epistemology. One might define a 'mental' event as one which is *capable* of being known without inference; a 'physical' event is then one which is capable of being known inferentially. It will be seen that this does not exclude the mental being a subset of the physical. My own experience can be known non-inferentially by me, but can only be known inferentially to others. Hence, in relation to others, it can be regarded as 'physical'. Likewise, although items in my own experience are capable of being known non-inferentially by me, they can also be inferred; for example, I might infer that I must have had at some time in the past a certain experience which I do not in fact presently recall. Hence, even my own past experience can to this extent be 'physical'.

In the final chapter, indeed, we sought to show how neutral monism can vindicate and support our claims to scientific knowledge – to knowledge of physical events – and how the admission of ‘percepts’ in no way acts as a barrier to our grasp of the world. We saw how Russell's attempt to show how knowledge was possible led him to transform empiricism into naturalism and, in doing so, to supply a definitive answer to the scepticism of Hume. One of the aims of this thesis is to show how Russell's *mature* theory was more naturalistic and less traditionally 'empiricist' than is customarily supposed, despite his own stated allegiance to the empiricist tradition.

But the distinction between the mental and the physical which I have outlined above is one in epistemology – it is simply based on what *we* know and is, moreover, a distinction which is relative to a given knower. It is not a distinction belonging to *metaphysics*. In fact, I should say that although we can draw a distinction between the ‘mental’ and the ‘physical’ at the level of knowledge, we cannot meaningfully refer to the mental or the physical in metaphysical terms. The distinction between the mental and the physical is quite superficial, and not metaphysically fundamental, for two reasons. Firstly, the distinction is reducible to more fundamental distinctions – such as between structure and quality, or between occurrent properties and conditionals. In each case the ‘mental’ side of the dichotomy has an analogue in the external ‘physical’ world outside of our bodies – but in neither case does this in the least imply panpsychism, and indeed, *pace* Chalmers, there is no reason whatsoever to think panpsychism true. Secondly, these distinctions are theoretical; that is, these dualisms cannot be separated in a concrete situation. Qualities and relations must belong to some abstract structure; conditionals presuppose the existence of occurrent properties. Thus, there is no ‘physical *world*’ in contrast to a supposed ‘mental world’.

The key to solving the mind-body problem, then, does not lie in reducing either side of this dichotomy to the other but in realising that the whole distinction between the mental and the physical is superficial, illusory and unreal. It is for this reason that recent attempts to solve the mind-body problem have so evidently failed. In contrast to Russell's sophisticated, non-reductive theory, these ‘physicalist’ theories have generally taken the form of supposing that the ‘mental’ is eliminable or reducible to the physical, a task which, I have argued above, is quite hopeless. Likewise, the thesis of ‘materialism’ is equally absurd. Properly speaking, materialism is the doctrine that only the corporeal exists. But although functional states are *realised* by physical states, it makes no sense to say that they are *identical* with them. To put the matter in Aristotelian terms, form is not reducible to matter.

As with Aristotle, then, there is *one* world; the mental and the physical, though they can be theoretically

distinguished, are not separable in concrete actuality, or applicable to separate realms of being. Hence, though the distinction between the mental and the physical can be granted some epistemological significance, these terms cannot properly be thought of as possessing any fundamental *metaphysical* significance.

This really is the conclusion of this entire thesis; and this, I believe, constitutes the correct solution to the mind-body problem.

Appendix: Causality and the Quantum

In this appendix, I shall briefly discuss the phenomenon of ‘quantum entanglement’. The origin of this notion goes back to a 1935 paper jointly written by Einstein, Podolsky and Rosen, and which has come to be known as the EPR paper after the initials of its authors. This paper attempted to demonstrate that the state vector was an incomplete representation of physical reality, given certain plausible assumptions concerning the inadmissibility of superluminal signaling. The paper comprised two arguments. The first argument concerned the measurement of an observable on one of a pair of particles that were so related that the values of the observable for each of the particles had to sum to some definite value. The argument here was that, if the value of the observable on one particle is measured, the outcome of a measurement on the same observable for the other particle can be predicted with a probability of 1 (unity). Consequently, the value of the observable for this second particle, even prior to measurement, must be determinate, contrary to orthodox quantum mechanics. The possibility that a measurement of one particle somehow changes the state of the other can be ruled out if the particles are so separated that the measurements on the two particles are separated by a space-like interval. For then, a causal influence of one particle on another would be contrary to Einstein’s own (by that time well-established) theory of relativity.

The second argument within the paper, which seeks to extend the argument of the first, was not quite as straightforward as the first. Let us take two particles and consider two incompatible observables (say, position and momentum). And let us suppose that, as before, the two particles are so related that the values that each has for a given observable bear a certain determinate relation to each other, so that if the value of the observable of one is known, then the outcome of measuring the same observable on the other particle can be predicted with certainty. Suppose that we measure (say) the position of particle 1, thus determining the position of particle 2. The position of particle 2, then, must have been definite independently of the measurement of the position of particle 1. Now, we could just as well have measured the incompatible observable of particle 1, say momentum, which would have determined the momentum of particle 2. By parity of reasoning with the case of position, the momentum of particle 2 must be definite independently of the measurement of the momentum of particle 1. But if particle 2 has both a position and momentum quite independently of measurement, then this violates orthodox quantum theory. For according to the orthodox interpretation of Heisenberg’s Uncertainty Principle a particle is never in an actual physical state in which it has *both* a determinate position and a

determinate momentum. Whenever a particle is in an eigenstate of position, it is not in an eigenstate of momentum, and vice versa.

The soundness of this argument (which has been ascribed specifically to Podolsky¹) has been called into question by Tim Maudlin in his book *Quantum Non-Localilty and Relativity*. He argues that, from the fact that had I measured the momentum of particle 1 instead of its position the momentum of particle 2 would have been determinate, it does not follow that particle 2 has a determinate momentum given that I did *not* in fact measure the momentum of particle 1.² Although this is certainly the case, I am not sure that it affects Podolsky's argument. For the point is surely that my *decision* as to whether to measure the position or the momentum of particle 1 can have no effect on the state of distant particle 2. If either measurement results in my being able to predict with certainty the value of the same observable for the other particle, then, given the absence of superluminal influences, the values of both observables must already be determinate prior to any decision as to which observable to measure. Thus Podolsky's argument seems to me to be just an extension of the first argument.

Replying to the EPR paper, Bohr conceded that there could be no superluminal causality and that the measurement of particle 1 cannot affect the state of particle 2: 'there is in a case like that just considered no question of a mechanical disturbance of the system under investigation during the last critical stage of the measuring process'.³ Nevertheless, Bohr said that the measurement of particle 1 plays a conceptual (as opposed to a causal) role in the description of particle 2. Essentially, his argument relies on an appeal to his notion of complementarity. When the position of particle 1 is measured, and the position of particle 2 determined, it no longer makes sense to talk of the momentum of particle 2 (or particle 1). The properties of particle 2 have no reality prior to determining the type of observable that is going to be measured. In the case at issue, the measurement of a given observable determines what can meaningfully be said concerning the properties of *both* particles, even if, in this particular case, the actual physical measurement is performed on just one.

Bohr's reply to the EPR paper was accepted by the majority of physicists at the time, though it is difficult to see why. Take, for instance, the first argument of the EPR paper. In the thought experiment described by this paper the position of particle 2 will be predictable with certainty once that of particle 1 is measured. Even if we accept complementarity, particle 2 must have had a determinate position independently of the measurement of

1 See A. Fine, *The Shaky Game*, chapter 3.

2 Maudlin, *Quantum Non-Localilty and Relativity*, p. 141.

3 N. Bohr, 'Can Quantum Mechanical Description of Reality Be Considered Complete?', *Physical Review*, 48, p. 699, quoted in Maudlin, *op. cit.*, p. 142.

the position of particle 1, if we reject superluminal influences. If we accept complementarity, then we must say that neither particle has a position until a position measurement is performed on particle 1. But, if wave-function collapse is physically real (and not just epistemic), then this *does* imply an ‘instantaneous’ change in the physical state of particle 2, so that the latter has a definite position once that of particle 1 is measured. Hence, Bohr’s argument seems to totally miss the point. As Maudlin says, taking as his example observations on incompatible components of photon polarisation, ‘the question is not what role *experimental arrangements* on the left [-hand particle] have in defining quantities on the right but rather how one is to understand the *change in state* on the right which follows the *outcome* on the left. If no physical change has occurred, then the photon on the right which has a definite, well-defined polarization after the left-hand measurement, must also have had one before. So the original quantum state was incomplete.’⁴ However, the authority of Bohr, combined with the obscurity of his paper, proved persuasive at the time. Maudlin observes that ‘for at least thirty years the physics community preferred to rest content with the unintelligible pronouncements of Bohr rather than facing the consequences of Einstein’s critique.’⁵

The whole matter was taken out of the realm of philosophical speculation and into the realm of testable science by John Bell in 1964, who demonstrated that the denial of a causal connection between a pair of separated particles in EPR-type thought experiments would yield outcomes for the correlation of the measurement of observables on each of the particles which would differ slightly from the expected values if orthodox quantum theory were correct. The experiments are somewhat tricky to perform, but were successfully carried out by Alain Aspect. The results proved to vindicate quantum mechanical predictions completely. It is important to note, however, that this does not resolve the paradox presented in the EPR paper. What it in fact implies is that, under some circumstances, orthodox quantum theory does indeed imply the existence of causal connections between events separated by space-like intervals. This phenomenon is called ‘quantum entanglement’. No transfer of matter or energy is involved, nothing travels ‘faster than light’, and the process cannot be used to send signals, so overall there is no violation of relativity. And yet it is a kind of causal connection.

It is important to be clear about the nature of this causal connection. There is, to begin with, no question of ‘faster than light’ causation. It is sometimes said that the measurement of one particle involves an ‘instantaneous’ change in another distant particle. If by ‘instantaneous’ one means ‘at the same instant’, then the truth is that no two events in separate regions of space-time are ever at the same instant. In fact, it is difficult to describe the connection between the two particles in terms of cause and effect at all. The outcome of neither measurement can be identified as the ‘cause’ of the outcome of the other. Remember that in the Aspect experiment there was a space-like separation between the measurements on the separate particles. Thus,

⁴ Maudlin, *op. cit.*, pp. 143-4.

⁵ *Ibid*, p. 144.

in some frames of reference, the measurement of particle 1 would precede that on particle 2, but in others 2 would precede 1. Nothing objective corresponds to these observations. Thus, neither measurement can be identified as the ‘cause’ with the other relegated to the ‘effect’. Likewise, it is at least misleading to speak of ‘action at a distance’. For this seems to imply an agent and something acted upon. But again, no such distinction can be made in the Aspect experiment.

There would seem to be just two options for describing this state of affairs. On the one hand, one can say that in those reference frames where the measurement on particle 1 occurs before the measurement on particle 2 the measurement on particle 1 is the cause of the outcome of the measurement of particle 2. In frames of reference where the measurement of particle 2 occurs first, the measurement on particle 2 will be the cause and that on particle 1 the effect. If this is accepted then it means that what counts as a cause and what an effect is relativised to reference frames and does not represent any objective physical fact. Furthermore, it seems inapplicable in a reference frame where the two measurements happen simultaneously.

For this reason I prefer the following description. In the kind of causality involved here, there is no causal priority, and thus it is simply incorrect to talk of ‘causes’ and ‘effects’. Rather, what we ought to say is that there is a projectible *lawlike correlation* between the outcome of measurements of the same observable on the two particles. We might say that the two particles whose properties are thus correlated are a ‘causal pair’. But we need a new language of causality – one not implying causal priority – to describe this situation.

The outcome of Aspect’s experiment is frequently misrepresented. It is all too often described as somehow vindicating indeterminacy or overthrowing realism. But in fact it concerns merely the question of whether causation is local. What it in fact shows is that quantum mechanics requires some form of non-local causation. This is simply the outcome of quantum mechanics itself, as vindicated by Aspect’s experiments. It has nothing to do with hidden variables, and certainly has no bearing on Bohm’s theories. As Maudlin says:

...ironically Bohm’s theory, which does away with instantaneous wave collapse as a superluminal *physical* process, has been severely criticized for postulating superluminal influences. This is the price of clarity. By being explicit about what exists and how things interact Bohm presents a definite object of analysis. One can calculate how changes on one side of the apparatus lead to effects on the other. Most other ‘interpretations’ of quantum mechanics glory in vagueness. The exact status of the wave-function and the nature of wave collapse are not made clear. The wave-function is at once both physically real (to explain interference effects) and merely epistemic (to avoid wave collapse as a real physical process and other embarrassments...). When questions of ontology become acute the wave-function can be robbed

of all physical significance, becoming a mere ‘calculational device’.⁶

Indeed, my own suggested Ensemble Interpretation is actually very close to Bohm. It differs from Bohm primarily in that it sticks to the facts and refrains from explanation. My concern is not to explain anything but rather to describe what we already know in an intelligible and logical fashion.

The real implication of quantum mechanics is not where it has been traditionally asserted. It does not imply a fundamental metaphysical distinction between the ‘classical’ macroworld and the quantum microworld; it does not imply that observer and observed form some sort of unity in a manner which destroys science’s claim to objectivity, and it certainly does not imply the existence of many worlds or ‘many minds’ as has sometimes been claimed. The change in our common sense picture of reality that quantum mechanics necessitates concerns *causality*. Firstly, there is a degree of indeterminacy with respect to the behaviour of individual particles. Whether this indeterminacy is ultimate, only time will tell. Secondly, and connected with the above, the causal laws which govern nature at its most fundamental level concern *ensembles*. Finally, it frequently happens that there are lawlike correlations between particles which do not admit any causal ‘priority’. In fact, the main import of quantum mechanics is *holism*. The behaviour of a particle is a function of its total environment, in accordance with the associated wave-function.

As I have researched this whole topic, two things stand out. The history of quantum physics is frequently presented as issuing in an argument between Einstein and Bohr, in which the former, despite his radical innovations in physics, was too conservative to accept the new physics of the quantum, and in which he was bested in argument by Bohr. The first thing that strikes me is that this picture is wholly mistaken. Einstein was largely right in his disputes with Bohr. He simply insisted on a degree of clarity which Bohr disdained. The second observation I shall make before leaving this topic is that the theory of Bohm has been quite unwarrantably dismissed. The Copenhagen interpretation is really a return to the Protagorean formula that man is the measure of all things, whilst the relative-state interpretation goes beyond any conceivable empirical warrant. Both rely on highly tendentious metaphysical posits which can derive no support from empirical science itself. Bohm’s theory at least has the merit of presupposing nothing more than the sort of scientific realism that is taken for granted elsewhere within science. (Although I have my doubts about it, on the ground that it *might* not be susceptible to empirical corroboration.)

In conclusion: the Bohr-Heisenberg philosophy is an evident fraud; the concept of ‘complementarity’ is scarcely intelligible. The whole notion of the collapse of the state vector is an old wives’ tale. No quantum

6 Ibid, p. 146.

object is ever *observed* in a superposition of states. Empirically, the state vector describes the statistical frequency distribution of the outcome of observations over a range of possible values. The state vector is thus a description of aggregates of similarly prepared objects ('ensembles') and not of individual objects. The notion of superposition is highly metaphysical. In an attempt to avoid the subjectivism inherent in the Copenhagen Interpretation, the relative-state, or Many Worlds, interpretation has sought to interpret this superposition as a conjunction. The result has been some rather elaborate metaphysical commitments. This is not surprising since the whole notion of superposition is metaphysical. There is no difficulty that a purely statistical interpretation of the state vector confronts that does not also confront the relative-state interpretation, whilst this latter clearly involves vast metaphysical commitments which a statistical-realist interpretation avoids. There is thus no justification for the notion of branching universes or 'Many Worlds'. What is interesting is that the orthodox interpretation of quantum mechanics is often touted as ultra-empirical, when it in fact highly metaphysical. A description tailored strictly to the facts – which is what I have sought to substitute for this muddle – is statistical. The observed facts are that *ensembles* of quanta approximate the behaviour of waves, but that individual quanta behave as particles; furthermore, that the laws governing ensembles of quanta cannot be deduced from the properties of individual quanta. Nor can the behaviour of any individual quantum be deduced from the laws governing the ensemble to which it belongs. This is odd, but it is at least intelligible.

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