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Cause in the Later Russell

Throughout his career, Russell sought to bring common sense, science, and perception into one consistent logical scheme.[1] His methodological project was to do this completely by means of logical constructions. If this could be achieved, he would be able, on the one hand, to show how the familiar objects, relations, and persons of common sense were logically constructible from some kind of purified data of perception. On the other hand, he would be able to analyze the concepts and entities of science so as to reveal them as logical constructions from the same purified data.[2] Although Russell did not succeed in his early attempts to "exhibit matter wholly in terms of sense-data. . .of a single person,"[3] he was able, in his later work, to construct a systematic picture of the world in which perception and physics each had a place and in which they were related to one another through events. It is this theoretical achievement of Russell that attracted the interest and effort of Grover Maxwell, and formed the foundation of a just appraisal of Russell's work and of a development and extension of the perspective of physical realism.

Physical realism, as understood by Maxwell, is a broader and less restricted empiricism than that of logical empiricism. This view accords reality to a world that is there and that can be understood in terms of an event ontology consistent with science. Physical realism incorporates a causal theory of perception to connect our experience with the real world, and employs a principle of acquaintance by which this experience is linked by logical constructions to the entities of science.[4] This essay addresses two questions: What is the concept of cause that plays a vital role in this picture of the world as the later Russell frames it? And, are there aspects of the concept of cause that may prove troubling to Russell's position or, possibly, to that of the physical realism which Maxwell builds on the later Russell?

Science: Particulars, Events, Causes

We may take *The Analysis of Matter* to represent Russell's mature approach to the problem of constructing a philosophical framework for science. In this

work Russell asks what the logical structure of physics, considered as a deductive system, is (i.e., the problem of the logical analysis of physics). He inquires what facts and entities we know that are relevant to physics, and may serve as its empirical foundation (i.e., the epistemological problem). Finally, Russell asks what the ultimate existents are in terms of which physics is true, what their structure is, and what their relations are to space-time, causality, and qualitative series (i.e., the ontological problem).[5]

In the order of exposition of *The Analysis of Matter* the logical analysis of the formal system of physics comes first before the discussion of the epistemological or ontological problems. The logical systematization is to a large extent prior to, and, initially, independent of, the formulation of the empirical basis of science and the choice of the epistemological and ontological units of analysis. Accordingly the ground-level unit of analysis for the logical system is called by Russell a "particular"; such a unit is said to be irreducible in the relative sense that for a given area at a given point in inquiry no further analysis is called for. Russell also tells us that such hypothesized particulars cannot be asserted to exist without qualification.[6] But, since physics is an empirical science, there must be a bridge between the point-instants and particles that are the result of the logical construction and the realm of experience. Such a bridge, however, is not between material units of analysis and subjective or mental data, since Russell's neutral monism requires that both the bridge and the entities bridged be neutral as to mind and matter.[7] The bridge between theoretical construction and experience turns out to be composed of events. Russell says, "I shall therefore assume henceforth that the physical world is to be constructed out of 'events,' by which I mean practically, as already explained, entities or structures occupying a region of space-time which is small in all four dimensions."[8]

The work of the construction of point-instants and of electrons that is carried out in the text shows that the requirements of the constructions of physics can be met by the use of events. As far as physics is concerned, the correlations of electrons, of quanta of energy, and so forth, can be stated in the form of differential equations, as is appropriate for causal laws.[9] But in the world of common sense in which objects, and relations between objects, and laws expressing generalizations concerning objects and relations are concerned, causal concepts not statable as differential equations are of great importance. It is in the commonsense world of objects that perception occurs. "Objects" are inferred as the common causal ancestors of groups of events "grouped about a center." A continuity of events in a single perspective, separated out from contemporaneous events, forms the causal line of a persistent object. A continuity of percepts from the different perspective of the observer constitutes another causal line, that of the persistent observer. In supporting such causal inferences Russell employs the principles of same cause-same effect, and different effects-different causes.[10]

But even with such causal inferences, certain problems appear in linking the

causal lines and causal centeredness used to frame objects and relations with the elegant apparatus of point-instants and electrons used in the constructions of space-time and particles required by physics. In relativity, space and time and its points and instants have become the four-dimensional manifold of space-time.

In this world causality is defined "in its broadest sense as embracing all laws which connect events at different times, or, to adapt our phraseology to modern needs, events the intervals between which are time-like."[11] But, as this would lead to the "inextricable intertwining" of geometry and causation, Russell proceeds to "distinguish time-like and space-like intervals by saying that the former occur when there is some direct causal relation, while the latter occur where both events are related to a common ancestor or a common descendant."[12]

Space and time, on the one hand, and cause, on the other, are thus reciprocally defined; if events are simultaneous but separated in space, there is no causal connection between them, but when they are successive there may be a causal connection between them. Causal lines occur where events occur one after another in time, and are similar to one another; these are called semi-independent causal lines. Copunctual events are defined as simultaneous events not separated by a space interval such as occur in a percipient when different causal lines converge and make a total effect that is causally related both to each separable causal line and to the convergence itself. "It is these two opposite laws, of approximately separable causal lines on the one hand, and interactions of co-punctual events on the other, which make the warp and woof of the world, both physical and mental."[13]

It seems that as long as the discussion is on the level of space-time no means of differentiating causal from noncausal groups of events is available, but that when space and time are considered, the ordering of simultaneity and succession and the use of similarity can provide such a causal order. Does this mean that the "warp and woof" of the world belong to the world of space and time, the commonsense world? Or can causal ordering be read back into the world of space-time, the world of physics?

Since the constructions of space-time, point-instants, and particles (electrons) are said to be artificial and to be defined logically in terms of events and their compresence, we can assume that the fundamental units of analysis are events. Events include both inferred and perceived events, but the latter are epistemologically prior. Such perceived events are not to be conceived in terms of a mind or self or subject, since Russell holds a neutral-monist position. The importance of perceived events in the analysis follows from the fact that it is from them that all events are inferred, from the fact that the objects and relations of common sense are constructed from them, and from the fact that, ultimately, the point-instants and electrons of physics are constructed from them also. These perceived events require the status of "reals" if the analysis is to escape the perils of phenomenalism and solipsism. Russell views such perceived events as real, ordered by the ab-

stract laws of physics, as qualitatively part of an observer's experience, and as events in the brain of the percipient.[14] Without the brain-electron-percept-event linkage Russell's constructions threaten to fall apart into what he calls "the concrete but disjointed knowledge of percepts" and "the abstract but systematic knowledge of the physical world."[15]

However, this linkage is a difficult one to maintain. Russell argues that an electron can be shown to be a construction from events. As a preliminary to this argument he states that we know in an intimate fashion our own percepts, thoughts, and feelings, and that, given the causal theory of perception, we can conclude that "percepts are in our heads, for they come at the end of a causal chain of physical events leading, spatially, from the object to the brain of the percipient."[16] Given the theory of space and time structures that he has developed, "a percept is an event or a group of events, each of which belongs to one or more of the groups constituting the electrons in the brain."[17] Leaving aside the discussion of the causal theory of perception for the present, we can conclude that the brain-electron-percept-event linkage is central to the argument of *The Analysis of Matter* and depends on the concept of cause.

> A percept, at any rate when it is visual, will be a steady event, or system of steady events, following upon a transaction. Percepts are the only part of the physical world that we know otherwise than abstractly. As regards the world in general, both physical and mental, everything that we know of its intrinsic character is derived from the mental side, and almost everything that we know of its causal laws is derived from the physical side. But from the standpoint of philosophy the distinction between physical and mental is superficial and unreal.[18]

The Analysis of Matter contains the picture of the scientific realism that Maxwell and others have admired. What Russell has done is to combine a logical and mathematically constructed theory to fit the current needs of physics (and to a lesser degree those of the other sciences) with an event ontology and an empiricism as free as possible from the limitations of the subjective. The picture of the world that emerges is saturated with causality: causality that allows the construction of continuities and transactions, the separation of spacelike and timelike intervals, and especially the causal theory of perception on the basis of which events perceived are there—in the brain of the perceiver. There is a circularity involved here, for how can we know that the causal line is from the star to the brain event, which is the visual percept referred to the star, except on the basis of earlier percepts? But the circularity by which science explains how and what we perceive on the basis of what has been perceived is perhaps neither vicious nor avoidable. We will return to a discussion of this aspect of Russell's treatment of causality later.

Russell admits that the causal theory of perception has been assumed, and that

he can find no way of resolving Hume's doubts concerning causality. Without an analysis that justifies inductive generalizations there can be no conclusive escape from solipsism or phenomenalism, both of which are unacceptable. Russell says, "Since, however, all science rests upon induction and causality, it seems justifiable, at least pragmatically, to assume that, when properly employed, they can give at least a probability. . . . I have made this assumption baldly, without attempting to justify it."[19] Russell acknowledges that these problems have been left unresolved in *The Analysis of Matter*, and, as we shall see, he returns to them in *Human Knowledge*.

As far as the treatment of events, point-instants, and electrons is concerned, *Human Knowledge* is not substantially different in terms of the constructions involved. There is a difference in the relation between events and qualities of the "complete complex of compresence," the bundle of qualities that constitute the event as experienced. The ontological effect of the shift is that "mental events" are said to have qualities directly given in experience, whereas the qualities of "physical events" are unknown, except in terms of their space-time structure. It thus seems that while the space-time structure and the causal laws of the earlier work are constructed from events, both perceived and inferred, the physical events of *Human Knowledge* are constructed from the space and time structure, and hence depend on causal laws that order this structure.

Russell here states explicitly a reciprocity between the space-time of physics and the causal laws of physics. Physical space-time is inferred from perceptual space and time. Events are located in space-time by means of the correlation of physical space-time and perceptual space and time, and by means of causal laws of physics that assign them an order. On the other hand, causal laws when expressed as differential equations assume an order in terms of space-time. The assigning of coordinates is itself dependent on the use of causal laws; that is, "the relation of causal laws to space-time order is a reciprocal one."[20]

Here again is a circularity involved in the definition of cause, space and time, and space-time. Essentially, the difference between this position and that of *The Analysis of Matter* is that the anomalous status of events is more marked in relation to compresent qualities, and that the circularity of the relations between events and space and time is more obvious. In the case of *Human Knowledge* each complex of compresent qualities is said to be unique by virtue of the improbability of the recurrence of such complexes. The qualities that together constitute the complex of compresence are each held to occur in scattered times and places, hence no assumption of events or qualities as universals is necessary in Russell's view.[21] In the light of the current discussion of event ontologists as to the identity of events[22] seen as particulars, as instantiation of qualities, or as space-time units, it appears that Russell held events to be all three: particulars insofar as the event is the terminus of the analysis in any given case; qualities (though not as the instantiation of universal qualities); and minimal spans of space and time, according

to the definition provided in *The Analysis of Matter* as the basis for the construction of point-instants.

My argument is that in one sense Russell's later work on space, time, matter, and causality is a resounding success. It is this work that has attracted current philosophers of science to Russell's philosophy, and it is this work that Russell himself felt to have been his most important contribution to philosophy. It consists in giving events a time span and a spatial location in some sense in our experience, and in showing how the space-time points can be logically and mathematically constructed from events.

The question of the real location of events is then resolved by placing perceived events in the physical brain, for which scientific evidence of causal connections can be offered, and by using such events as the basis for the rest of both the scientific and commonsense "objects" and "relations" inferred from them on the basis of causal lines and structures arranged about centers. This is not to say that no questions concerning events and time-series are left unresolved. The status of events that are percepts is left unclear. The connection of causal relations to space and time relations is also left ambiguous; sometimes causes are seen to be inferred from invariable sequences, in other passages space and time relations are discriminated in terms of causal laws.

Science: Induction and Causal Postulates

As we have noticed, Russell acknowledges the problem of providing a basis for inductive reasoning in *The Analysis of Matter*, judging it to be intimately connected with the topic of causality, and part of the problem bequeathed by Hume that he does not directly tackle. This is the new and major topic of *Human Knowledge*, called in this book "non-demonstrative inference." Russell considers the various views of probability that might provide a basis for inferences from specific observations to generalizations, reviewing such proposals as Mill's "uniformity of nature," and Keynes's "limited varieties." He finds that none of these is sufficient to fill the gaps between the given complexes of compresent qualities, the commonsense ordering of events, and the structures of physical theories required to complete his survey of human knowledge. At the end of the book he puts forth a set of five postulates that he believes sufficient for this purpose, and it is no surprise that causality figures intimately in all five of them. They include concepts that had been used in his earlier work without their being treated explicitly as postulates.

In discussing causality with respect to the need for postulates justifying induction, Russell considers the commonsense concept of cause and effect, and accepts a modified version of this concept for his principles. He explicitly rejects the idea that causality is invariable sequence, at least insofar as common sense understands it. Belief in an external cause of perception is embedded in animal behavior and in the very idea of perception, as it is implied in common language.[23]

Russell identifies three kinds of laws in science – laws of differential equations, which express the correlation of changes; laws of quasi-permanence, and laws of statistical regularity; only the second is problematic. Laws of quasi-permanence bring us to the enunciation of a causal principle to the effect that "given an event at a certain time, then at any slightly earlier or slightly later time there is, at some neighboring place, a closely similar event."[24] The postulate of quasi-permanence allows us our commonsense belief in things, and in the identity of a thing through changes. But this also involves "causal lines," a term defined as "a temporal series of events so related that, given some of them, something can be inferred about the others whatever may be happening elsewhere." Such "more or less self-determined causal processes" involve, as he says, constancy of quality, of structure, or gradual change in either.[25] Russell does not regard laws of statistical regularity as a postulate and dismisses it with the remark that it is useful in some areas of physics but need not be treated as a postulate. Russell discusses the "structural postulate" that has to do with the grounding of our belief in a common world that we share as perceivers; it refers to similarity or identity of structure that is shared by different perspectives "ranged about a center." His examples have to do with the different sounds that are similar in structure that different auditors hear when they are all listening to a broadcast. There, as in his early work, he refers to the imputation of a common causal ancestor for these differently positioned, but closely similar, observed structures. The common structures may be, he says, event-structures or material-structures, for example, a piece of music or a house; but, of course, since, as soon as we move away from common sense, all structures turn out to be event-structures, this is not an important distinction.[26] Russell also refers to "interaction" where causal lines intersect, and he employs a structural postulate to show that probable inferences can be made about what will ensue following such interactions, depending on the complexity of the causal lines involved and the accessibility of past observations that may allow us to make predictions.

The only other postulate discussed is that of "analogy," and this is specifically introduced to solve the problem of the necessity of supposing that others' perceptions are as valid a basis of evidence as one's own. If, using the causal postulates already accessible to you, you consider the probability that when you hear another person report an experience in words that, if you uttered them, would mean that you had had such and such an experience, and you are having the experience the other's words report, it is likely that you and the other observer are observing the same thing. The argument is based on employing analogy in supporting a similarity of another person's experience with one's own.[27]

The postulates meet the conditions of being true, of being believed in, of leading to no conclusion that experience confutes, and of being logically necessary if any occurrence or set of occurrences is ever to afford evidence in favor of any other occurrence. There may be some epistemological problems with these

criteria, but for Russell this is the solution for the support of nondemonstrative inference. This use of the concept of causality involved in them is striking and raises some questions about what that concept becomes in his later philosophy. The causal concepts, which were to have been replaceable within a fully developed physics by differential equations, but which seem indigenous to every other domain of knowledge, thus come back as solutions to the problem of induction, itself a postulate of physics. The three problems *The Analysis of Matter* leaves unsolved are (1) a kind of circularity in the use of causal concepts in the constructions in which cause itself is defined, (2) the need for some basis for the validation of inferences going beyond observations (the problem of induction), and (3) the viability of epistemological assumptions involved in the position of scientific realism in the later work of Russell. The first two problems find a joint answer in *Human Knowledge* that at least appears to legitimize the circularity by giving it a name and an explicit recognition as postulated. The third concern, which is epistemological, will be addressed in our next section, in the course of which the full picture of this shift in his concept of cause will be seen and its problems exposed.

Experience: Percepts and Causes

In order for Russell's scientific realism to be viable it must include an empiricist principle that enables the basic propositions, from which the event descriptions, point-instants, and so forth are constructed, to have a basis in experience. This basis is provided by the principle of acquaintance: "every proposition which we can understand must be composed wholly of constituents with which we are acquainted."[28] Maxwell adds to the principle of the doctrine of ramification and says that with the aid of Ramsey sentences, all the rest of the position is constructible. Hence, this Maxwell principle of acquaintance, and whatever causal assumptions may go along with it, demands our attention.

We must remind ourselves that in *Our Knowledge of the External World* sense-data and universal entities are held to be given in the direct two-term relation of acquaintance between subject and object. During this period, Russell holds a dualism of subject and object, mind and matter, particular and universal. But in 1921 in *The Analysis of Mind* he abandons the direct two-term relation of acquaintance, admits that all perceptual experience involves "encrustations of habit, memory, and expectation," and adopts neutral monism, which precludes the dualism of subject and object, mind and matter, and particular and universal.[29] In this book, the principle of acquaintance is seriously eroded. Russell maintains that he adopted neutral monism in 1920 and did not change his views after, which implies that *The Analysis of Mind* and *The Analysis of Matter* represent the same position. Since the former is a more detailed treatment of perception, memory, and belief, it is more appropriate as the basis for the consideration of cause in the context of epistemology.

Russell begins his discussion of cause in *The Analysis of Mind* with a criticism of the traditional notion, and he concludes that "cause in the only sense in which it can be practically applied, means 'nearly invariable antecedent.' "[30] He then goes on to apply the concept of invariable sequence in an examination of the so-called causal laws of physics and psychology. Physics is said to be concerned with changes in physical objects or pieces of matter; psychology with changes in what are called the appearances of the object at different places.[31] Perceptions are analyzed as the successive appearances of an object in one place. Physics, then, is distinguished from psychology in being interested in systems of particulars, that is, in objects or pieces of matter, or the correlations of changes in different places. Psychology is concerned with actual particulars, rather than systems of particulars, that is, with correlations of successive particulars at one place.

If we replace the term "cause" with "correlation," then causal relations of pieces of matter become correlations of changes of systems of particulars, and the causal relations of perception become the correlations of changes of particulars from one time to another. Moreover, the causal theory of perception, which says that one piece of matter is the cause of the perception of the piece of matter, becomes the doctrine that certain sequences of changes in the "appearance of an object" from different places are correlated with certain sequences of changes in "the appearance of the object" from one place at different times. The phrase "appearance of an object" is put in quotation marks because it refers to the particular, or, in earlier terms, the sense-datum, from which the "object" is constructed.

Russell describes the correlation of changes in appearances from one perspective by means of the analogue of a photographic plate.

> A photographic plate exposed on a clear night reproduces the appearance of the portion of the sky concerned, with more or fewer stars according to the power of the telescope that is being used. Each separate star which is photographed produces its separate effect on the plate, just as it would upon ourselves if we were looking at the sky. . . . All that we need say is that *something* happens which is specially connected with the star in question. . . since that star produces its own special effect upon the plate.[32]

Russell uses phrases that suggest the traditional conception of cause as something operative or productive of effects. He refers to the "active" place where the star is, and the "passive" place where the perception of the star is. It is true that the reference is qualified by saying that these terms are "only names," and that he does not intend to introduce any notion of activity.[33] However, it may be asked why Russell uses such terms and refers, as he does, to the "production" of effects, and of a process "radiating outward" from a star.

Further examples of the same embarrassment occur in the description of perceptions: "The appearances of objects" are distinguished in that "they *give rise to* mnemic phenomena," and they are themselves "*affected by* mnemic phe-

nomena."[34] In distinguishing between those mental occurrences that have an external stimulus, and those that are "centrally excited," Russell holds that the former may be regarded as an appearance of an object external to the brain; however, if the mental occurrence has not sufficient connection with objects external to the brain to be regarded as an appearance of such an object, "then its physical causation (if any) will have to be sought in the brain."[35] Thus Russell shifts from treating causal laws as statements about sequences of events, to treating them as statements about "action," "production," and "effects."

There is a similar shift involved in the formulation of his causal theory of perception. This theory is assumed in *The Analysis of Mind*, as it is in *The Analysis of Matter*. In the distinction between the "sensational core" of perception and the associations that memory and habit add to this, Russell says:

> For our purposes, it is not important to determine what exactly is the sensational core in any case; it is only important to notice that there certainly is a sensational core, since habit, expectation and interpretation are diversely aroused on diverse occasions, and the diversity is clearly due to differences in what is presented to the senses. . . . Thus, although it may be difficult to determine what exactly is sensation in any given experience, it is clear that there is sensation, unless, like Leibniz, we deny all action of the outer world upon us.[36]

Similarly, in the attempt to distinguish between images and sensations, Russell says that the only valid means is by their causes and effects. "Sensations come through sense-organs, while images do not. . . . We could distinguish images from sensations as having mnemic causes, though they may also have physical causes."[37]

Is Russell guilty of shifting from one meaning of causation to another? Or can all that is said of causation be interpreted by taking cause to be a regular sequence of events? It might be claimed that when Russell speaks of causes "producing" effects, he is using these terms only for convenience, and intends that "cause" should be defined as "invariable sequence." But even if this claim is allowed, a further difficulty arises.

Consider Russell's description of the star: its production of light, the transmission of light, and the resultant occurrence of a perception of light mean, he says, that the system of particulars called the appearance of the star is connected with other particulars called the "intervening medium," and with still other particulars called the "sensations of the star." Further, he distinguishes what may be called the regular appearances of the star, which are associated with the star itself, from the irregular appearances due to the intervening medium. The former are defined as "consisting of all those appearances which it presents *in vacuo*, together with those which, according to the laws of perspective, it would present elsewhere if its appearances elsewhere were regular."[38] In order for any particular to be

counted as the "irregular appearance of a certain object" all that is necessary is "that it should be derivable from the regular appearances by the laws which express the distorting influence of the medium. When it is so derivable, 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."[39]

The causal explanation for activity of the star can therefore be interpreted as the correlations between the sets of changes in star appearances, in the emission of light, and in the subsequent sensations of the star; and the different roles of the medium, the original source of the light, and the events in the nervous system are compatible with this interpretation. However, when one thinks of the star, the medium, and the nervous system as systems of particulars, and of these particulars as perceptions, the explanation becomes complicated. For the physical objects in question, which are discussed by physics, physiology, and psychology, are really "systems of appearances," and, in fact, the explanations of those sciences are constructed from percepts that are themselves the particulars of which the whole world is constructed. With respect to causation this means that we begin with sequences of percepts, that these percepts are formed into systems, some of them called physical objects and some correlated in what are called causal laws. Therefore, the physical object, the star itself, the light, the intervening medium, the eye, and the nervous system are all sequences of percepts. How is it possible, then, without circularity, to talk of sequences of changes in which physical objects, intervening media, organic stimulations, and reactions in the nervous systems are all sequential events? Only the final stage, the percept itself, is experienced, and the so-called earlier events of the sequence are not themselves observed nor can they be observed. These other events are inferred as causes *from* the sequences of percepts. How can they at the same time be the ground *from which* the causal connections are inferred?

The epistemological problem of causation, then, in this period of *The Analysis of Mind* and *The Analysis of Matter*, may be stated in this way: if the sequences of events which are empirically observed and on the basis of which the terms "cause" and "effect" are used, are percepts, then to support the inference to the causal theory of perception it would be necessary to have observed repeated sequences of events in which, for instance, the emission of light from objects was followed by the occurrence of visual experience. It would never be possible, however, to observe whether sequences of objects or physical conditions followed percepts, since by definition only percepts are observable. It would then be possible to observe only percepts followed by percepts; the effect but not the causes would be observed. In this case, by Russell's own criteria, the concept of cause would not be applicable. The problem is one of circularity, and it appears to be involved in all of Russell's discussions of the causes of perception. If we now recall that the "events" of *The Analysis of Matter* are percepts and events inferred

from percepts, it is clear that the epistemological circle of *The Analysis of Mind* also infects *The Analysis of Matter*, calling in question the sequences of events in continuities of causal lines, and the similarities of events ranged about a center that is causally ancestral to those events. Only a limited number of those events are percepts, and the causal lines involved in the causal theory of perception are assumed before the lines of causality themselves can be traced.

In a passage in *Human Knowledge* Russell seems to admit the problematic status of causal inferences:

> Everything that we believe ourselves to know about the physical world depends entirely upon the assumption that there are causal laws. Sensations, and what we optimistically call "perceptions," are events in us. We do not actually see physical objects, any more than we hear electromagnetic waves when we listen to the wireless. What we directly experience might be all that exists, if we did not have reason to believe that our sensations have external causes. It is important, therefore, to inquire into our belief in causation. Is it a mere superstition, or has it a solid foundation?[40]

Here Russell seems to recognize the very problem we have been considering in relation to his earlier treatment of cause. He seems also to assume that it is necessary to have a concept of cause that is more than the observation of regular sequences in order that a solipsistic kind of phenomenalism be avoided.

It would not be relevant to inquire whether it is possible to believe that certain regular sequences of events are observed and do give a basis for probable inference. It is evident, and Russell has already pointed out, that such sequences *are* observed, and that it *is* possible, with a minimum of faith in the future being like the past, to make probable predictions on that basis. To believe in an external cause for one's experience requires a greater commitment than the adoption of the view of causal laws as observed sequences of changes, and in this passage Russell seems to recognize that this is the case.

This emphasis on the necessity of certain assumptions about the nature of the world being made in order that any empirical knowledge be possible is the chief theme of *Human Knowledge*, as we have seen in our discussion of the postulate of nondemonstrative inference. It may be maintained that the difficulties that have emerged with respect to the circularity of the causal theory of perception could be overcome with the aid of the postulates that may provide the assumptions necessary as a foundation for the inferences to the unobserved causes of perception. In one passage, Russell, in discussing the postulate of structure with respect to causal laws, constructs a situation in which one sees a number of books of the same printing, all bearing the author's name; one is told a certain man is the author; one is introduced to him; and he says he is the author. When it occurs to you that the author may be the cause of the facts you have before you, Russell writes, this will cease to be astonishing if there is a law: "Any complex event tends

to be followed by other complex events identical, or approximately identical, with it in structure, and distributing themselves from next to next throughout a certain region of space-time."[41]

However when one attempts to apply this modest description of the causal law of nature to the example given by Russell, a difficulty arises. If the description of a causal law as involving the distribution of identical events in space-time is applied to the example of the alleged author and the copies of his book, one wonders why this book's immediate predecessor in the presses would not be linked as a cause of the second book, rather than the remote and unlike fountain pen with its human manipulator? Or why would the home activities of the typesetters not be as relevant as the activities of the author? In the case of the causal chain allegedly selected on the basis of the persistence or continuity of qualities or structures, the example of broadcasting is given. Why would other atmospheric waves not be linked with sound waves rather than the activities in the studio? It seems that the description of causal chains and laws given in *Human Knowledge* would be consistent with considering night the cause of day. But it is difficult to believe that this would satisfy the epistemological or metaphysical needs of Russell's theory. It seems, then, that in *Human Knowledge*, Russell has been led to give a much more important role to this principle in his philosophy and that the principle itself involves a good deal more than the bare assertion of the occurrence of sequences of events.

The same considerations apply to the circularity of perception. If we return to the star, the light, the eye, the perceived star, we find that tracing this complicated causal chain would involve more than identical events next to next through space-time, or the persistence or gradual change of qualities and structures. It is only when we are already in command of the scientific explanations that we can read persistence of structure or identity of events into this situation. Moreover, only the "sensational core" of the perceptual experience is connected with what is perceived, and the disentangling of the effects of habit, memory, and anticipations from this core requires the use of causal inferences concerning perception, memory, and imagination. The given experience in Russell's analysis with its commonsense objects and relations demands an analysis, but that analysis is itself the outcome of a set of inferences that derive their authority from the given perceived events, which are what is being investigated.

Conclusion

Thus far we have seen that the development of the later concept of cause, in its ontological role in the construction of orders of events, and in its epistemological role in the causal theory of perception, demands more of a basis than Russell provides in the percepts-events of his mature work. On the one hand, the units of analysis that link percepts with the construction of point-instants and particles constructed from them (i.e., events) are defined only in terms of minimum

volumes of space and time. On the other hand, the given experiential qualitative complexes of compresence, when stripped of the accretions of memory, habits, and linguistic expression, are ordered only as relations of experienced space and time. It seems that substantive causal assumptions are needed before the event-structures and qualitative complexes can be brought together in any systematic way, and certainly in any way that meets the needs of common sense.

From my perspective, it seems to be the case that the circle within which events and the perception of events are thus constricted could be broken, if the given structure of experience were allowed to include causal connection from which further causal inferences could be derived. If, as Russell said, our human perceptions, habits, actions, and speech are naturally saturated with causality, it may be that this is a good reason to recognize experience as itself ordered causally as well as spatially and temporally. Such enriched perceived structures could support, on the one hand, a causal theory of perception in which the eye-light connection is given rather than inferred. On the other hand, causal givenness might allow the discrimination of causal lines and structures from contiguously and contemporaneously given causally irrelevant happenings. Whether such a view of experience would be compatible with an event ontology is another question.

If we look back at the complicated role played by the concept of cause in the later philosophy of Russell we find a major philosophical advance, and some major philosophical difficulties. The advance comes by way of the explicitness with which Russell spells out the role of causal lines and causal centeredness with respect to the construction of the concepts of physics in terms of events, intervals, point-instants, and electrons. In this sense the construction of *The Analysis of Matter*, supplemented by *Human Knowledge*, fulfills the promise of the plan of constructing the concepts of space, time, matter, and cause by logical techniques, and justifies both Russell's own judgment and the high opinion of contemporary philosophers of science such as Grover Maxwell. It seems also to be part of that advance that Russell, stretching the scope of empiricism and probing its limits, uncovered in *Human Knowledge* the limits of this empiricism and put forth a set of postulates involving causality as necessary if common sense and scientific knowledge are to be possible. In this sense it would be true to say of Russell's later work that if it was a "retreat from Pythagoras," it could also be considered "an advance from Hume." On the other hand, certain major problems emerge in the study of Russell's later work, and most of them turn up in the discussion of cause.

In 1912 Russell had called for a purified concept of cause with no implication of compulsion, operation, necessary connection, or universality. In this view causes are to be inferred only when the connection is observed, and without excluding the possibility of action at a distance and without requiring that there be a resemblance of cause and effect.[42] As we have seen in his later philosophy, Russell needs and employs an "operational" concept of cause, inferred where it cannot

be observed on the basis of the principle of same cause-same effect, and different effect-different cause, and hence, based both on similarity and contiguity in space and time. Therefore, in having been forced to give a stronger metaphysical meaning to cause, he found it even more difficult to provide an empirical warrant for it. Especially is that true in the light of Russell's more and more limited claims for some direct, incorrigible, or unmediated empirical base, such as his principle of acquaintance had once provided. If Maxwell is to follow Russell's lead with respect to acquaintance, he may give an analysis of acquaintance similar to that of the 1914 quotation of that principle. (And Russell had excellent reasons for abandoning the view of direct, immediate, indubitable two-term acquaintance with the accompanying realist view of propositional constituents.) Or, more likely, Maxwell may follow Russell into a modified "acquaintance principle" as is suggested by the adoption of the causal theory of perception, and, in that case, he faces difficulties with the necessity for extensive psychological and linguistic analysis required to uncover what Russell calls the "sensational core" that warrants the "basic perceptual proposition," the perceptive premise of his empiricism. It goes beyond the scope of the present discussion to analyze the problems of this kind of analysis, which, for Russell, would require a careful consideration of *An Inquiry into Meaning and Truth*,[43] and, for Maxwell, an extensive study of his work on perception, and the way this would tie in with his version of the logical construction that parallels Russell's. But whatever the outcome of a revised "principle of acquaintance," and whether either of the two Russellian alternatives or some other be adopted, we cannot view the circularity of the causal theory of perception as entirely innocent, although admitted. In conjunction with the circularity involved in the reciprocal definitions of causal laws and space-time locations in which events themselves are caught, we find real conceptual difficulties for a physical realism on a basis of an empiricism founded on the causal theory of perception.

Notes

1. For a full discussion of this theme see my *Bertrand Russell's Theory of Knowledge* (London: Allen & Unwin, 1969).

2. Bertrand Russell, *My Philosophical Development* (New York: Simon and Schuster, 1959), pp. 205–7.

3. Bertrand Russell, "The Relation of Sense-Data to Physics" (1914) in *Mysticism and Logic* (London: Allen & Unwin, 1917), p. 157.

4. Grover Maxwell, "Structural Realism and the Meaning of Theoretical Terms," *Analyses of Theories and Methods of Physics and Psychology*, Minnesota Studies in the Philosophy of Science, vol. IV, ed. S. Winokur and M. Radner (Minneapolis: University of Minnesota Press, 1970); Grover Maxwell, "Theories, Perception and Structural Realism," *Pittsburgh Studies in the Philosophy of Science*, vol. IV, ed. R. Colodny (Pittsburgh: University of Pittsburgh Press, 1971); Grover Maxwell, "Russell on Perception: A Study in Philosophic Method," in David Pears (ed.), *Bertrand Russell: A Collection of Critical Essays* (New York: Doubleday [Anchor], 1972); Grover Maxwell, "Corroboration without Demarcation," in *The Philosophy of Karl Popper*, vol. I, Library of Living Philosophers, ed. Paul Arthur Schilpp (LaSalle, IL: Open Court, 1974), pp. 292–321; Grover Max-

well, "The Later Bertrand Russell: Philosophical Revolutionary," in *Bertrand Russell's Philosophy*, ed. George Nakhnikian (London: Duckworth, 1974), pp. 169–82.

5. Bertrand Russell, *The Analysis of Matter* (New York: Harcourt, Brace, 1927), pp. 1–10.

6. Ibid., pp. 8–9.

7. Some writers have argued that there is a difference between the "phenomenalism" of *The Analysis of Mind* of 1921 and the realism of *The Analysis of Matter* of 1927. It is for this reason, perhaps, that the "later Russell" has been dated from the latter book. However, both books state the causal theory of perception, and Russell himself refers to his having adopted the position of neutral monism in 1920 and retaining it ever since. See *My Philosophical Development*, p. 13. Also see Elizabeth R. Eames, "The Consistency of Russell's Realism," *Philosophy and Phenomenological Research*, 27 (June 1967), pp. 502–11. Russell, commenting on this article, wrote: "I have read your article with much pleasure and profit. I am glad that you find my philosophy less incoherent than most people do. I think also that your interpretation of my philosophy is more correct than most people's" (Russell to Eames, Sept. 30, 1967).

8. Russell, *Analysis of Matter*, p. 286.

9. Ibid., pp. 245–46.

10. Ibid., p. 282. Defending the view that "all our percepts are composed of imperceptible parts," Russell cites two premises: that "exact similarity is transitive," and that "indistinguishability is not transitive." In addition, he writes, there is another source, "derived from causal arguments"; we argue, he writes: "Different effects, different causes."

11. Ibid., p. 313.

12. Ibid., pp. 313–14.

13. Ibid., p. 315.

14. Ibid., pp. 382ff.

15. Ibid., p. 275.

16. Ibid., p. 320.

17. Ibid.

18. Ibid., p. 402.

19. Ibid., pp. 398–99.

20. Bertrand Russell, *Human Knowledge: Its Scope and Limits* (New York: Simon and Schuster, 1948), p. 326.

21. Ibid., pp. 294ff.

22. Reference to current discussions of issues concerning the definition of "event," "event-individuation," and "event-identity" is beyond the scope of this essay. Let the following references to different positions on the issue suffice: Roderick M. Chisholm, "Events and Propositions," *Noûs* (Fall 1970), pp. 15–24; Donald Davidson, "The Individuation of Events," in *Essays in Honor of Carl G. Hempel*, ed. Nicholas Rescher (Dordrecht: Reidel, 1970); Jaegwon Kim, "Causation, Nomic Subsumption, and the Concept of Event," *Journal of Philosophy*, 70 (1972), pp. 217–36.

23. Russell, *Human Knowledge*; for the difficulties of invariable sequence as a causal concept, see p. 315; for the role of cause in animal behavior, perception, and language, see p. 456.

24. Ibid., p. 458.

25. Ibid., p. 459.

26. Ibid., p. 464.

27. Ibid., pp. 493–94.

28. Russell, *Mysticism and Logic*, p. 219. Quoted by Maxwell in "Structural Realism and the Meaning of Theoretical Terms" (Note 4, this chapter).

29. Bertrand Russell, *The Analysis of Mind* (London: Allen and Unwin, 1921), Lecture I.

30. Ibid., p. 99.

31. Ibid., p. 99.

32. Ibid., pp. 99–100.

33. Ibid., p. 130, note 2.

34. Ibid., p. 131 (italics mine).

35. Ibid., p. 136.

36. Ibid., pp. 140–41.

37. Ibid., pp. 149–51.

38. Ibid., p. 136.
39. Ibid., p. 136.
40. Russell, *Human Knowledge*, p. 311.
41. Ibid., p. 467.
42. Bertrand Russell, "On the Notion of Cause," *Proceedings of the Aristotelian Society*, 13 (1912–13); reprinted in *Mysticism and Logic and Other Essays*.
43. Bertrand Russell, *An Inquiry into Meaning and Truth* (London: Allen & Unwin, 1940).