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EVENTS

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Abstract

That the theory of events has not recently contributed significantly to the problem of supervenience is due mainly to the literature being devoid of a genuine theory of events. Kim's theory is not accompanied by a method for its application independent of the expressions used to refer to events, and Davidson establishes events as spatio-temporal particulars without a theory about their nature.

The analysis of events is approached here in the context of the elucidation of supervenience. Conditions of adequacy reflecting prior metaphysical assumptions and the intended scope of the analysis are initially laid down, and after consideration of the work of Kim and Davidson, some suggestions of Cresswell are taken up, and while criticized, provide nevertheless the basic impetus for the analysis presented. This theory constructionally defines events as functions from possible worlds to regions of space-time, in which the event is manifested in the various worlds. Incorporated in this account is a theory of how events may coincide in value at certain worlds, and how a 'partitioning process' accompanies individual events, by virtue of which the manifestation is considered as an element or elements in a particular place in the causal history of the world in question. Different sorts of partitioning processes, and complex causal histories serve to allow the possibility of emergentism, notwithstanding the same-place-same-thing principle being taken as a condition of adequacy. An analysis of statements ascribing properties to events completes the account, which is then tested against the established adequacy conditions. It is shown to satisfy these, along with ascribing the appropriate truth-value to the various examples of purported event-identity considered in the paper.

I

In order for us to make sense of a significant portion of ordinary discourse, it would seem sufficient for us to adopt an ontology of events. It is not at all clear from that discourse, however, just what sort of entity it is that needs to be recognised, and this is all the more true if we add to the explanandum modal statements about the properties events might have had, or the ones that they could not but have.

The aim of this paper is to provide an ontological analysis of events that is sufficient for the interpretation of event-discourse, including the sorts of modal statements mentioned above. To be more precise, conditions of adequacy for the analysis may be formulated, against which it may be tested. These conditions fall into two groups; the first reflect some prior, more basic metaphysical ideas with which the analysis must be in accord, and the second determine the scope the analysis is expected to have.

In the first group there are four; taking " Px " to mean " x is a spatio-temporal particular ", " Qxyz " to mean " x took place in place y at time z ", and " Rxy " to mean " x caused y ": with 'u', 'v', 'w' and 'x' ranging over particulars, 'p' over places and 't' over times, the conditions may be expressed as follows:

(C1) $(u)(Pu \leftrightarrow (\exists p)(\exists t)(Qupt))$

(C2) $(u)(v)(Ruv \rightarrow (Pu \ \& \ Pv))$

(C3) $(u)(v)(p)(t)((Pu \ \& \ Pv) \rightarrow (u = v \leftrightarrow (Qupt \leftrightarrow Qvpt)))$

(C4) $(u)(v)(u = v \leftrightarrow (w)(x)((Ruw \leftrightarrow Rvw) \ \& \ (Rxu \leftrightarrow Rxv)))$

A few points may be mentioned. The forward implications of the principle bi-conditionals of (C3) and (C4) are clearly instances of the fundamental principle of extensionality that for " a = b " to be true, a and b must have exactly the same properties; (C3) contains a good portion of Kim's criterion for event-identity, and (C4) is identical to Davidson's, the latter taking events, as does Kim, as spatio-temporal particulars.[1] The adoption of both these conditions requires that some discussion and judgement is presented on the various points at issue between the two authors, and this is provided below in II. From that discussion there will arise certain paradigmatic particular cases of sentences asserting identity between events, for which the analysis must, in accordance with the above conditions, assign a particular truth-value.

(C2) is acceptable to both Kim and Davidson, and does not seem to offend intuition. Largely for these reasons, the inclusion of (C2) will not be defended here, but it may be pointed out that it does not carry with it any implication that a spatio-temporal particular is, by virtue of being spatio-temporal, a material entity. In considering the location of particulars in space-time, it is unnecessary and probably undesirable to be over demanding about the precise boundaries of particulars, and if exactness is abandoned in this sphere there is nothing to

stop us calling an idea in someone's mind a spatio-temporal particular. The location of the idea is just the same as the person's, or perhaps in his head. Clearly there is no need to adopt here a stand on the mind-brain identity thesis.

The second group of conditions may be presented by citing certain statement-forms; for each particular instance of these the analysis is required to provide an account of the determination of truth-value. The forms are:

(F1) Event e has property P;

(F2) Event e has property P, but it could have been not-P;

(F3) Event e could not but have been P;

(F4) Event e = event f.

Particular examples of these will be considered as required in the body of the paper.

One basic assumption may be stated explicitly. It is derived from some (unpublished) remarks of Kaplan, and amounts to treating space-time as a necessary existent, and furthermore treating some of its geometrical properties as its necessary properties. This is interpreted as implying that any possible world that is considered is taken to have the same space-time as the real world, and the same basic geometrical structure. Clearly, the idea is a development of the Kantian attitude towards space and time.

A word of justification is in order here for the method of analysis to be employed in the paper. Conditions of adequacy have been laid down that will constitute the principle test of the analysis that is to follow. This analysis will consist of 'constructional definitions' of events, and certain other entities needed for the treatment of event-discourse, and then interpretations will be provided, in the light of these definitions, of the statement-forms (F1) - (F4). This theory may then be tested against (C1) - (C3), and any particular consequences that have been shown to follow from them.

It may be objected that the definition of events to be proposed later is contrary to all our ordinary conceptions of just what events are; and this fact alone may be considered sufficient to discard the theory altogether. My defence of the method will be limited to a more or less innocent use of the argument from authority. It may be argued that innocence in the use of such arguments is inversely related to the status of the authority cited, and so here the use is far from innocent! Be that as it may, the objection being considered would be profitably referred to the first chapter of Nelson Goodman's 'The Structure of Appearance',[2] in which he devotes considerable space to the rigorous formulation of extensional necessary and sufficient conditions which constructional definitions need to satisfy in order for them to be considered accurate.

He considers this problem in relation to Whitehead's proposal to identify points with certain classes of volumes. It misses the point to criticize Whitehead because we are not talking about certain classes of volumes when we speak of points. What needs to be done is to reinterpret the sentences to be explained in the light of the definitions laid down. Before Goodman reaches the more technical discussion of conditions on constructional definitions, he states the requirement as amounting, roughly, to " Every sentence we care about that can be translated into the system shall have the same truth-value as its translation. " The problem with this, of course, is the determination of which sentences will be deemed to be of concern, as he has shown there exist sentences which must be excluded in order to avoid paradox, and the more formal presentation of the condition he suggests should be stated:

> ' The necessary and sufficient condition for the accuracy of constructional definition seems to be that the definiens be extensionally isomorphic to the definiendum. More generally, the set of all the definientia of a system must be extensionally isomorphic to the set of all the definienda. '[3]

A constructional definition is not, then, attempting to formalize our usual conceptions. A theory successfully constructed on such definitions is of intrinsic value in that it demonstrates an alternative way the true statements in some particular area may be analysed, with the additional advantage of perspicuity in logical structure.

The second authority I shall mention is Frege. In the preface to 'The Foundations of ~~Mathematics~~ Arithmetic', the following passage occurs very near to the end:

> ' To those who feel inclined to criticize my definitions as unnatural, I would suggest that the point here is not whether they are natural but whether they go to the root of the matter and are logically beyond criticism. '[4]

The definitions to be suggested below are almost certainly unnatural in some sense or other. But if they go to the root of the matter and are logically beyond criticism - or, in Tarski's terms, satisfy the condition of material adequacy and are formally correct - they will have served their purpose.

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There is a more basic, strategic, philosophical inquiry motivating the analysis of events, and it is hoped the latter will provide some illumination of the former. A precise characterisation of the issue is not easy to provide, and ingredients of the problem are present in various ideas and disputes in the history of philosophy. Some of these may be cited. Firstly, there is the idea, stemming from Hegel, that quantitative changes within a certain thing result, at certain nodal points, in qualitative changes in the thing. A common example of this transformation of quantity into quality, which with its reverse, is sometimes called the second law of dialectics, is the form of the progression of H_2O through changes in temperature, which is taken as the quantitative change. The changes in form at $0^{\circ}C.$ and $100^{\circ}C.$, from solid to liquid, and liquid to gas, are

taken as the qualitative transformations. A more exciting example is provided by Napoleon, no less, who speaks of fights between the French cavalry, who were bad riders but disciplined, and the Mamelukes, who were the best horsemen of their time but lacked discipline:

> ' Two Mamelukes were undoubtedly more than a match for three Frenchmen; 100 Mamelukes were equal to 100 Frenchmen; 300 Frenchmen could generally beat 300 Mamelukes, and 1,000 Frenchmen invariably defeated 1,500 Mamelukes. '[5]

Secondly, modern physics has taken such an extraordinary course of development that certain scientists have been encouraged to philosophize about the discoveries of science in ways that have offended some 'professional' philosophers. In particular the dispute between Susan Stebbing and Eddington will be recalled.[6] Eddington, in talking of his two tables and so on, undoubtedly was misleading, and Stebbing was correct to point out the criteria we commonly associate with properties like continuity and solidity when we say of something that they have these properties. However, there does seem to be some space between criteria for application and meaning, and it can barely be denied that modern physics raises a problem for our everyday conception of the world, and while Eddington failed to describe this problem soberly or accurately, it does not seem to be easily solved by an appeal to our ordinary usage of words.

Closely related to this are certain problems involved in the relation between the battle of Waterloo, and that certain movement of elementary physical particles at the time and place of the battle. This problem, which is mentioned by Cresswell, will be treated extensively below.[7] One central element to the problem is that of the possibility of reducing the battle to the particles, as a specific example of the reduction of branches of science to more basic, or fundamental branches. The issues will in fact be approached from the idea contrary to reductionism, known commonly as emergentism, or emergent evolutionism, or supervenience. The basic idea is that developing physical systems sometimes reach points of a certain complexity at which they acquire properties of an essentially new and different kind. Thus complex matter at a point of development becomes life, and life at a certain higher level attains consciousness. At the nodal points, the new properties emerge, or supervene, on the system.[8]

It should be stressed that no attempt is being made to show the essential equivalence of the ideas cited from dialectics, Eddington, and emergentism; they do seem, however, to be closely related. The intention here is not to provide an emergentist theory of events, but rather one that is neutral as regards this question. The analysis should provide room for emergentism, then, and equally room for its denial. This purpose is served

by giving a framework in which a notion basic to all the positions discussed can be expressed; the notion is that of 'levels of integration', as they are sometimes called, expressing the idea that reality can be studied at different levels, expressed in the hierarchy of sciences, from physics through chemistry and biology to psychology and sociology. The disputes mentioned above, roughly, are about the relations between these different levels, and such disputes in themselves are outside the scope of the analysis of events, though it may be hoped, as has been said, that the analysis will throw some light on those disputes.

II

Neither Kim nor Davidson is much concerned with (F2) or (F3), and it is from the requirements of these forms that the analysis presented here will spring. Consideration of them may be delayed, however, and (F4) may initially be considered without any reference to modalities. In a recent paper on events,[9] Kim seems to take as a major purpose of his account a defence of a version of the regularity theory of causation. While the motivation for the analysis should not be forgotten, the theory should, from our point of view, be tested as a theory of events, with conditions of adequacy already laid down, rather than from the point of view of how well it fits a certain account of causation.

According to Kim, events have a common structure, and constitute the exemplification by a concrete object (or objects) of a property or relation at a time. Events may be represented by expressions of the form

$$[(x_1, \ldots, x_n), \rho^{n+1}, t]$$

where $(x_1, \ldots, x_n)$ is an ordered n-tuple of concrete objects, the constitutive objects of the event; ρ^{n+1} is the n-adic property exemplified by the ordered set of objects - the constitutive property of the event; and t is the time of the event. A certain amount of complexity is required for the precise formulation of identity conditions, but basically the idea is clear: events are identical if constitutive objects, properties and times are identical. His picture of events is clarified when he says:

' Every event has a unique constitutive property, namely the property an exemplification of which by an object at a time is that event ... these constitutive properties of events are generic events. It follows that each event falls under exactly one generic event. ' [10]

The constant conjunction element in a causal relation between two particular events is then analysed in terms of the constant conjunction of the generic events that the particular events exemplify.

It is important, Kim says

' to notice the distinction drawn by our analysis between properties constitutive of events, and properties exemplified by them. An example should make this clear: the property of dying is a constitutive property of the event [(Socrates, t), dying], i.e., Socrates' dying at t, but not a property exemplified by it; the property of occurring in a prison is a property this event exemplifies, but is not constitutive of it. ' [11]

Properties an event exemplifies are easy enough - they are properties true of the event. The constitutive property holds between the constitutive objects, and furthermore only 'pure universals', he says, are allowed to play the role of constitutive property. However, not only does Kim leave the notion of 'pure universal' unexamined, he does not provide us with any method of determining just what the constitutive objects of an event are.

We need to remember here Davidson's good advice that a clear distinction must be made between events and the terms we use to describe them.[12] Kim sells us the idea of constitutive properties the more easily by talking about Socrates' death and pointing to the property ' dying '. But all are agreed that events are spatio-temporal particulars, and from this it follows that just what constitutive property an event has is independent of how we refer to the event, and so it is inadequate to treat solely of events that under most normal circumstances are referred to by a single description that itself lends credence to the idea there is some unique constitutive property of the event to which it refers. Yet Kim always speaks of individual events with expressions that display the event's structure, as conceived by Kim; the event wears its structure, as it were, on the face of the expression that Kim uses to refer to it. But no method is provided, of course, for deciding just <u>which</u> expression displays the event's actual structure.

It is possible that one confusion present here is between the necessary properties of an event, and the constitutive property of an event. At the level of a simple example, it may seem that there is a direct relation between the constitutive property and a certain necessary one. Thus it seems reasonable to think that, corresponding to the constitutive property of Socrates' death, namely 'dying', there is the necessary property of the event, ' is a dying '. If we imagine a far more complex event, though, it is unlikely that it would be correct to say that for this event to occur in any possible world, it must display exactly this highly-complex relation; might there not be, possibly, just a little variation at the 48th place of the predicate? There will, clearly, be some relation the other way round, from necessary properties to the constitutive one, but it is not clear that it can be described generally in any particularly simple way.

By way of more direct criticism, there is at hand a powerful counterexample to Kim's theory, which shows that it contradicts (C3) and (C4). Rosenberg has pointed out that [(Oedipus, Oedipus' mother) married, t,] and [(Oedipus, Oedipus' mother) marrying incestuously, t] are identical, having the same locations, constitutive objects, causes and effects.[13] And yet, on Kim's account, they are distinct, displaying as they do different constitutive properties. And so, distinct particulars share the same location, causes and effects, according to the analysis, which therefore immediately becomes inadequate for our purposes, and needs to be modified. Rosenberg himself proposes amendments so that events

turn out identical if their constitutive objects are, if their times are, and if their respective objects all share the same constitutive properties, of which there can be more than one. Now he notes that it is clear that whether or not events are identical is not something that can be read off from their descriptions, as indeed has been implied here, following from Davidson's good advice. Rosenberg says descriptions may cite different constitutive properties, but it seems that descriptions alternatively might not cite any such properties at all. Socrates' death might be perfectly well picked out by the description ' the event you described to me last week '. This aside, Rosenberg argues that when it comes down to actually determining event-identity, we have to resort to Davidson's criterion: events are identical if and only if their causes and effects are identical. It seems then we are still left with no method for determining the structure of any given event, for we might know its causes and effects without knowing just what constant conjunction or conjunctions of properties this particular case instantiates.[14] It cannot be denied that the suitability of Kim's account of event-structure for the explication of the constant conjunction element in causation is definitely something in its favour, but without a guide to the determination of structure in the particular case it remains inadequate.

Perhaps it may be argued that it is obvious in any, or at least, most, particular cases, just what the constitutive objects are; where it is obvious a method for determining structure might be described as follows: take all possible combinations of the constitutive objects, and list for each combination the pure universal or universals they exemplify. My objection to this raises again the philosophical problem motivating this inquiry, for I think it is not possible to take the first step - to determine objectively and unambiguously, the unique constitutive objects of an event, conceived as a spatio-temporal particular. Is it neutrons and electrons on that day in 1815, or men that are constituents? To take another example, consider the event ' the first performance of Lulu in Chicago '. Are the constituent objects of this all the people involved in the production, the theatre where it was staged, and so on, or alternatively, the work of art, and the theatre where it is performed?

As will become clearer later, it is in the context where a method exists for determining the ordered series of objects constitutive of an event that Kim's analysis can be introduced, after some modifications. Nevertheless, his basic claim that all events can be reduced according to his schema will still be questioned, some events being treated as basic particulars, not open to reductive analysis of this sort. Kim mentions the

problem of the relation of whole to parts and says that he expects the problem depends for its solution on a satisfactory general account of properties. I suspect rather that the problem is best approached not so much from the point of view of properties, as from the relations between the objects which hold properties. The problem of whole and parts is closely related with the strategic problem under consideration here; the battle of Waterloo has properties of a sort not seemingly explainable in terms of its parts, conceived as elementary physical particles; perhaps, then, new properties have emerged at the level of the whole. Now properties that elementary particles have and properties that battles have, and what generally having properties boils down to, is not the most pressing aspect of the problem here; rather our first problem is with the relation of the object, the battle, to the objects, the constitutive particles.

These issues will be expanded when an analysis of events is presented below, but there is a difficulty to be considered that Kim mentions, for any analysis of causation which involves constant conjunction and that does not treat events as he does with unique constitutive properties. It has been said that the conditions of adequacy in operation here are independent of the motivation behind Kim's account, but nevertheless causation is one of the most important problems that

a theory of events should be able to play a part in, and an argument of the sort Kim presents should at least be mentioned, particularly as I assume constant conjunction is likely to play a central role in any adequate theory of causation.

Kim considers a theory which does not analyse the structure of events, and treats, in his terms, only of properties exemplified by events;[15] a problem arises if the following, seemingly inoccuous proposal is made as regards the satisfaction of the constant conjunction requirement in a regularity theory of causation: two events, e and e' satisfy the requirement if there are generic events F and G such that e is an F-event, e' is a G-event, and F-events are constantly conjoined with G-events.

Kim interprets a picture of this sort as allowing considerable freedom in the choice of generic events to which the events may be said to belong, and shows that if any grouping of events is allowed as a generic event - or if any property exemplifiable by events is taken as one - then the requirement so interpreted becomes quite useless. He dows this by showing that every event satisfies the requirement with respect to any event that satisfies the requirement with respect to at least one event. Taking the schema above, let e" be any arbitrary event and R be any relation such that R(e",e). We explain 'H' to be true of any event g just in case

$(\exists f)(R(g,f) \& F(f))$. Then clearly e" belongs to the generic event H, and H-events are constantly conjoined with G-events, from which it follows that e" and e' satisfy the requirement of constant conjunction.

It seems to me to be clear from this that any satisfactory account of causation must demarcate among properties those that might be able to fill the role of being a ' genuine ' constant conjunct for a theory of causation, and this is no minor problem. It is, after all, a disguised version of Goodman's new problem of induction. It is not a problem, though, for which there is no analagous difficulty for Kim, for it will be recalled that Kim said nothing much about ' pure universals ', and without demarcating these off, it is possible to construct some very objectionable events, according to his schema. It is certainly the case that H is not a pure universal, if the expression is to be given any reasonable meaning, for a large number of possible interpretations for R. While, then, Kim's point is taken that there are pitfalls for crude or oversimplified approaches to the constant conjunction requirement, this does not seem to compel us to adopt his approach, or any one like it.

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The motivation for Davidson's interest in events is different from Kim's - though causation does play a central role for him as well - and there is not in Davidson's work an analysis of events that genuinely rivals Kim's. His concern is to establish events ontologically, in order to provide an account of some ordinary discourse. He does, however, offer a criterion for event-individuation different from Kim's, and also disputes with him over the truth-value of certain particular cases of supposed event-identity.

It would be too strong to claim that it is a necessary condition of our understanding a certain part of ordinary discourse that we adopt an ontology of events. Other methods are available, which are probably equally as adequate. Davidson may argue however, that he offers an account that comes near to being sufficient for the solution of the problems associated with that discourse. He asks us[16] to note that, in virtue of its logical form, " Sebastian strolled through the streets of Bologna at 2 a.m. " entails " Sebastian strolled through the streets of Bologna ", but our usual way of formalizing these sentences does not display this relation at all. A language in standard formalization would take the first sentence to contain an irreducible three-place predicate, and the second an unrelated two-place predicate.

Davidson's solution consists in providing verbs of action or change with an extra, ' event ' - place, thereby assuming them to take an event-object. Thus " Sebastian strolled " is construed as " There is an x such that x is a stroll and Sebastian took x " or, as Davidson prefers, " There is an x such that Sebastian strolled X ". Taking another example from a different paper, we have the problem that " Brutus stabbed Caesar in the back in the forum with a knife " entails " Brutus stabbed Caesar in the back in the forum ", which in turn entails " Brutus stabbed Caesar in the back ", itself entailing " Brutus stabbed Caesar ". Davidson writes

' ... our theory of language has gone badly astray if we must treat each adverbial modification as introducing a new place into a predicate...once we have events to talk about, we can say as much or as little as we please about them. Thus the troublesome sentence becomes:: " There exists an event that is a stabbing of Caesar by Brutus event, it is an into the back of Caesar event, it took place in the forum, and Brutus did it with a knife. " The wanted entailments now go through as a matter of form. '17

Davidson says that this treats adverbial modification then, on a par logically with adjectival modification, adverbial clauses modifying the events certain verbs introduce. But there are other possible treatments of adverbs other than his and the one he attacks in the passage. Without going into details, it should be mentioned that the problem of adverbs is being approached from a different direction with some success. Into a basic calculus we may introduce a predicate modifier, construed as

a function that maps an extension of one predicate onto a new extension. 'Slowly', for example, is interpreted by a function which, when attached to the predicate 'x drives', yields a new predicate, 'x drives slowly', whose extension is the set of all slow drivers.[18] Clearly the account will need to be extended to cope with adverbs that do not modify a predicate by picking out a set contained within the original extension. Things that satisfy 'x drives slowly' are clearly among those things that satisfy 'x drives', but it will prove to be more tricky to characterize the value of the function associated with 'nearly', for example. However, Davidson faces analagous problems with adverbs of this soft with his approach, as indeed, it seems any theory of adverbs will.

Thus it should be stressed that ordinary discourse does not compel us to adopt an ontology of events along the lines Davidson suggests, as there are other alternatives no worse than Davidson's. Nevertheless there is strong intuitive support for the idea that there are events. Some of this support springs from the vital role events play in certain philosophical theories - of action, explanation, causality and the mind-brain relation.[19] To take just one example, both Kim and Davidson think that cause is a relation that holds between events. It has been

given here the status of a condition of adequacy that causes and effects be spatio-temporal particulars, and I think that it is a central feature of our understanding of causation that events may be causes and effects. Furthermore, the importance of causation in modern philosophy of language and epistemology adds further weight to the argument that we should recognize events as entities.

There are arguments to hand, though, that try to show the event theory of causation has important limitations. Certain examples do not at all well fit Davidson's picture of " x caused y " as an extensional context in which x and y are properly supplanted with expressions referring to events. Russell Trenholme[20] has noticed that while it is reasonable to agree that 'John's walking' and 'John's walking slowly' are associated with the same event, it might be true that " Stubbing his toe caused John to walk slowly ", but false that " Stubbing his toe caused John to walk ". Goldman raises an associated difficulty;[21] Davidson would presumably want to regard these simultaneous actions as identical: John's singing, John's singing loudly, and John's singing off key. Now, he argues, it could be the case that his being angry partially causes his singing loudly, but it does not cause his singing off key. So there is a difficulty here like Trenholme's, of the breakdown of the intersubstitution of identicals

salva veritate. But a different conclusion may be drawn, if we remember Davidson's criterion for event-identity - that they are identical if they have the same causes and effects. Standing by this, the arguments seem to support the conclusion that John's walking and John's walking slowly are distinct, as, by the same reasoning, are John's singing loudly and his singing off-key.

Davidson, of course, is aware of difficulties of this sort. He cites certain statements himself that go against the account he gives, a good example being " The slowness with which controls were applied caused the rapidity with which inflation developed. "[22] His tentative suggestion is that these statements are rudimentary explanations, and explanations typically relate statements. Therefore, 'caused' in cases such as this is better read 'causally explains'.

There is definitely, I think, something to this, but the temptation to resort to a paraphrasing in terms of the more vague 'causally explains' is to be avoided, as I think to do this, rather than to confront more directly these apposing arguments, is liable to lead to the abandoning of causation as an objective relation holding between events altogether. This danger is even clearer when it is realized the transition from a statement about a causal relation between two events to a statement of causal explanation is in many cases a completely effortless step, the former often being used precisely to give a causal explanation.

Naturally our purpose is served by rejecting the arguments of Trenholme andGoldman, as they undermine our conditions of adequacy; yet one would be hard pressed to deny their assertions that what the Davidsonian takes to be an intersubstitution of identicals leads to a breakdown of the salva veritate principle, in so far as we appeal for guidance concerning truth-values to our natural intuitions. Defending, as I wish to, the Davidsonian identity claims, it is necessary to deny the breakdown of the principle; and this involves the assertion that we have a better theory of the nature of causation than the one implicit in our intuitive denial of the statements " Stubbing his toe caused John to walk " and " John's being angry caused John's singing off key ". Although these statements might be misleading, and unable to play a clear explanatory role, these statements are nevertheless true. The apparent strength of the arguments presented by Trenholme and Goldman is based largely on our being infected with the confused and wrong idea that we can read off from a singular causal statement what constant conjunction of properties is being, in this particular instance, instantiated. We know that the truth of " the striking of the match caused the lighting of the match " does not imply that strikings and lightings are constantly conjoined, any more than " John's last action caused what made Susie jump " implies last

actions of John are always followed by jumps of Susie. No more is required of the expressions used to pick out the cause and effect than that they do so adequately pick them out. Causation is a relation holding between events independently of the choice of referring expressions in asserting the relation to hold in any particular case. Consequently the truth of such a singular causal statement must be saved through the transformations according to the principles of extensionality.

It may well seem that in providing the adverbial modification to the effect in " John's stubbing his toe caused John to walk slowly " we are indicating the causally relevant feature of the effect. Once the objectivity of the causal relation, and with it the extensionality of the context 'x caused y', have been grasped, there is nothing to stop language users introducing conventions about the use of adverbs in the context of singular causal statements. Something of this sort, in fact, no doubt exists, though not as anything explicitly formulated. If it is said " John's being angry caused John's singing loudly ", there is at least the suggestion that the loudness of his singing is causally related to his anger. Certainly there are other factors aiding us to pick up this suggestion - most importantly, the expectation from past experience of the constant conjunction of anger and loud singing, that it <u>is</u> the anger and

loudness causally related - but the unwritten convention is, I suspect, there as well. Its presence is not to be questioned, but equally it should be recognised for the sake of the theory of causation.

I take the requirements of an adequate theory of causation to be a very good reason for adopting an ontology of events. Further, as is clear from our conditions of adequacy, I think a good theory will incorporate Davidson's criterion for event-identity. The main shortcoming in his work, for our purposes, is the lack of a theory of events; they are treated as basic particulars, with no direct handling of the problem of their constitution. This aside, there are also some very questionable positions Davidson adopts when certain concrete examples of statements asserting event-identity are considered. Goldman has argued against certain Davidsonian identity claims, and his attacks will be criticized, but in controversy with Kim, it seems the evidence goes against Davidson.

The first of Goldman's arguments to be considered here is centred on statements essentially using the preposition 'by':

> ' We say ... that John turns on the light 'by' flipping the switch, or that he checkmates his opponent 'by' moving his queen to king-knight-seven. As used in these contexts, the term 'by' expresses a relationship that holds between acts, between John's act of flipping the switch and his act of turning on the light, and between John's act of moving his queen to king-knight-seven and his act of checkmating his opponent.

> The relationship in question might be expressed by saying that the one act is a 'way' or 'method' by which the other act is performed. Typically, when act A is the way by which act A' is performed, we can explain how act A' has been performed by citing act A.[23]

His point is, of course, that this relationship is asymmetric and irreflexive, and so any A and A' that satisfy it cannot be identical. The cases he quotes, however, are examples of cases where Davidson would ascribe identity:

I do not want to adopt any position on Davidson's thesis, almost universally accepted, that actions are a kind of event. It is not at all obvious, it seems, that this is true, and that they share the same criterion of identity. Supposing they are, though, I think Goldman's argument is less powerful than it at first appears to be. Notice first that the form of the statements we are considering does not suggest that 'by' is a relation holding between two acts; the sentence " John turns on the light by flipping the switch " would at this surface level be analysed more accurately as a relation between a statement and an act. More precisely, perhaps, the form is " He performed this act by performing that one ". It seems that the form of the second half of this statement is still unclear, but following Goldman's remarks at the end of the quote we may be entitled to consider instead " His performing this act is explained by his performing that one ". We are taking explanations, though, to relate

statements, not acts or events, so this last would be more properly rendered " " He performed this act " is explained by " He performed that act "." In this form, we are much more happy to accept that this act might be identical with that one. Explanation of something under one description can quite commonly be provided by presenting that same thing under a different description. And of course, we are to expect irreflexivity and asymmetry in explanation, this in no way entailing non-identity because of the intensionality of the context.

Goldman plays on the uncertain semantics of 'by', and if uncertainty is removed in the way it has been here his argument falls. —There does, however, seem to be non-equivalence between " John turned on the light by flipping the switch " and "" John turned on the light " is explained by " John flipped the switch " ". It may be argued that the space between these two arises because it amounts to an attempt to reduce an explanation of how something was done to an explained by relation holding between two sentences. It is not necessary to enter discussion on the variety of possible forms of explanation, provided we may adopt the quite reasonable idea that explanation contexts generally are non-extensional, as it seems there is general agreement that 'by' establishes an explanation context. It is not always of the same sort, but there does not seem to be a usage which is

not some kind of explanation context. Thus even if some of these contexts relate descriptions rather than sentences, I would argue that the choice of description to refer to the particular acts is an ingredient in the determination of the truth-value of the complete statement. This being the case, the force of the argument is lost.

Regardless of the question of whether or not 'by' contexts are themselves always, or ever, explanations, I think the surface form of the 'by' statement is good evidence for the first term in the relation being a sentence. If it is accepted that the first term is a sentence, the thesis that it is, nevertheless, an extensional context can be undermined from a different viewpoint. We may employ a device used in a Fregean argument often cited by Davidson[24] to show that the context fails to satisfy the principle of the intersubstitution of logically equivalent sentences salva veritate. If we replace " John turned on the light " with the logically equivalent sentence " $(\iota x)(x=2) = (\iota x)(x=2$ & John turned on the light)" we end up with an absurdity: " $(\iota x)(x=2) = (\iota x)(x=2$ & John turned on the light) by flipping the switch. "

Before leaving consideration of Goldman's position, mention should be made of a seemingly quite extraordinary argument he puts forward in defence of his 'fine-grained' approach to event-identity (or, more correctly, act-identity, which is his particular

concern). His approach may be criticised, he says, for generating a proliferation of entities; it may be said, even, that the furniture of the world would be increased to such an extent that an agent may be said to be performing at any given moment indefinitely many acts, and this is surely ontologically unacceptable. He goes on:

> ' This objection is misguided. A fine-grained method of act-individuation cannot justly be accused of 'increasing the furniture of the world,' for such an approach would not countenance any entities that would not be admitted by a rival method of act-individuation. What, after all, are the acts it would allow in its ontology? They are acts such as John's moving his hand, John's frightening away a fly, John's moving his queen to king-knight-seven, John's checkmating his opponent, etc. But surely these are all acts that would be countenanced by any theory whatever, including Davidson's thesis. The bone of contention, then, is not whether these acts exist, but whether they are identical with one another. ' 25

Let us initially put to one side the minor point that his way of speaking is, at the level of propaganda, anti-Davidsonian. Formulations like 'They are acts', 'the acts it would allow', and 'these are all acts' suggest diversity at the point of controversy where Davidson asserts identity. But this is not the main point; Goldman's whole position here seems a little silly; how many things there are is the same problem as how many <u>distinct</u> things there are, and while the fine-grained approach is not under criticism for recognising some spurious entities of a different kind, it still offends against metaphysical parsimoniousness within the field of acts and events, for countenancing so many <u>distinct</u> things.

There is one particular example that has become a focal point for the differences between Kim and Davidson; the example is this: is Brutus' stabbing of Caesar identical or distinct from Brutus' killing of Caesar? Davidson says they are identical; Kim denies this, but his reasons for this position seem rather weak:

> ' Notice ... that it is not at all absurd to say that Brutus' killing Caesar is not the same as Brutus' stabbing Caesar. Further, to explain Brutus' killing Caesar (why Brutus killed Caesar) is not the same as to explain Brutus' stabbing Caesar (why Brutus stabbed Caesar)![26]

The first contention here only has force so long as no precise interpretation is given to the expression 'same as'. The question is posed " The same what? " If the answer is " The same event ", no progress is made as this is what is in dispute; but no clue is given to what else it might be. And anyway, while it might not be absurd to say they are not the same, it might nevertheless be false to say it.

The second contention, that the killing and the stabbing have different explanations, is no doubt true, but there is confusion in the notion of 'the explanation of an event' if this fact is taken as showing that the killing is distinct from the stabbing. If the question, " Why did event e occur? " arises, without any particular description attached to the reference to e, it seems we are left at a loss for a reply until we discover under what circumstances it would be deemed that e had not occurred. When we

know this, I think an explanation may be given, for this will be satisfied if an explanation is given of why an event with a particular property or set of properties occurred. For example, suppose it is said, e would not have been said to have occurred if there had been no explosion of this magnitude, to explain why the particular event e occurred boils down to explaining why an event which was an explosion of this magnitude occurred. If we are faced with an explanation of why the avalanche occurred, we need to explain not only why an avalanche occurred, but also, why only one occurred, as Davidson has noticed. Thus the singularity is accounted for. However, I still think sense can be made of the assertion that these explanations fall short of explaining a particular event. We have not explained why this explosion, or this avalanche occurred, and not another one. To provide an explanation of one unique event, we would need an explanation of all the properties of some minimal set which together constitute a sufficient condition for that event; and in addition, an explanation would be required of why it was unique in some particular respect. Of course, in some theories of events, any explosion of this magnitude at place p and time t is identical with this one (assuming it to have occurred at t and p), but we are not compelled to

adopt such a theory, however attractive it appears.

This is in line with Davidson's outlook, explanations being conceived as relating statements, or properties, and events being explained under descriptions, not absolutely. Kim's argument about the stabbing and the killing does not lend weight to the thesis that they are distinct, then, as Davidson would reply that this is best understood as one event being explained differently under different descriptions. Is Davidson correct about the identity of the killing and stabbing then? I think there is good reason to doubt that he is.

We should look closely at the precise referents of the descriptions, 'Brutus' stabbing of Caesar' and 'Brutus' killing of Caesar'. The immediate difficulty is that there are no rules laid down for the precise determination of boundaries of events, and as has been mentioned above, this is not a particularly tragic feature of event expressions and discourse. We may observe that it is not necessarily the case that everything mentioned in the description is completely in the event; 'the explosion at x' is the same event as 'the explosion in the world at x' but does not contain the whole world. We do not need all of Brutus in his stabbing of Caesar, then, but just enough of him to make it <u>his</u> stabbing.[27]

Before continuing along the line of spatio-temporal location, it will prove useful to refine the example, and do away with some unfortunate historical details. This was no ordinary stabbing; in particular, Brutus was not alone. From this, I think we can show the stabbing and killing distinct, though not in the way originally desired. The first point in this demonstration is the contention that the killing of Caesar causes Caesar's death. This in itself needs justification, as at first sight it would seem that a killing includes the death of the victim. Davidson has successfully shown, however, that this is not always the case, arguing that the conclusion of the following story is true:

> ' Suppose I pour poison in the water tank of a space ship while it stands on earth. My purpose is to kill the space traveller, and I succeed: when he reaches Mars he takes a drink and dies. Two events are easy to distinguish: my pouring of the poison and the death of the traveller. One precedes the other, and causes it. But where does the event of my killing the traveller come in? The most usual answer is that my killing the traveller is identical with my pouring the poison. In that case, the killing is over when the pouring is. We are driven to the conclusion that I have killed the traveller long before he dies. '[28]

The conclusion is all the more easily taken when we distinguish once again the event from the description of the event. Perhaps we do not know it is a killing until the spaceman is dead, but this does not stop it being a killing if he does die from drinking the water.

The second point in the proof - that, historically, Brutus' stabbing Caesar was distinct from Brutus'

killing Caesar - is that Brutus' killing of Caesar caused Caesar's death. There is a problem about the relation between the killing of Caesar and Brutus' killing of Caesar, but however this is resolved I do not think we will want to countenance any killing that does not cause the death of the killed. Let it be stipulated, with some justification I hope, that Caesar's death was over-determined causally, but for anyone to be x in the formulation 'x's killing of Caesar' they have to have done sufficient to cause Caesar's death. It may be objected that this makes the dastardly man who holds Caesar's hands while the others stab him innocent. Or perhaps more worrying is the fact that it might be said he is not innocent as in the circumstances of people thrusting knives in the direction of Caesar, he did enough to cause Caesar's death. Such problems cannot be ignored, but surely it is possible ultimately to ask who was holding the knife; it is also possible that there is more than one who was, and finally, it is reasonable to say that only those in this category whose actions singly would have been sufficient to cause the death actually caused the death, others being ' accomplicies ' or whatever. It should be remembered that the concern here is completely exclusive of any morality; it may be as wicked, or even more wicked, to be an accomplice rather than the agent who is directly causally responsible.

The final point in the proof is that Brutus' stabbing Caesar did not cause Caesar's death. Brutus' stabbing was, as Davidson himself says,[29] literally, spatio-temporally, only part of the cause. The particular nature of the death Caesar suffered excludes its being the result of a single stabbing.

Now for this argument to be at all acceptable some more will need to be said about the relation between Brutus' killing Caesar and the killing of Caesar, for it may seem reasonable to say that, as with the stabbing and the cause of death, Brutus' killing Caesar was only a part of the general killing. It is just this breakdown of the killing into constituent killings that I think is incoherent. Whether or not a man's death is causally overdetermined, he still only suffers one death, and whether or not a lot of people killed him, he still only suffers one killing. The upshot of this is that either Brutus' killing is identified with the killing, or we stop talking about Brutus' killing altogether. In the discussion under point two in this proof a criterion was given for valid instances 'x's killing of y' for cases where many people were involved in y's killing. The present discussion is urging that there is not a distinct event associated with each of these valid instances. This is not to argue that in general " x caused y" implies that x

uniquely caused y; I do not want to consider this here. But in the particular case of killings and deaths, I think there is only one killing that causes a death.

To talk about Brutus' killing of Caesar is misleading then, as the event referred to includes Cassius and all the others. It is the same event, in fact, as Cassius' killing Caesar. Disagreements over this question, however, do not seem to be in the mainstream of the dispute over the identity thesis about the killing and the stabbing. All the important issues there seem to be saved, and made clearer if we consider, instead of the historical killing of Caesar, the fabulous one in which Brutus kills him on his own. In this case, and particularly in view of the foregoing discussion, is not Davidson's position clearly correct?

It is now possible to return to the discussion of the location of theevents under consideration. The remarks about the whereabouts of Brutus' stabbing of Caesar are as relevant to this example as they are to the historical one. What conditions might there be on the location of the killing of Caesar? I think it is quite reasonable to stipulate that a killing involves the whole of the killed organism, just as the death of an organism does. For something to be killed is for the whole thing to undergo a significant

change - for it to be diverted onto a more or less quick path to death. But is all Caesar's body in Brutus' stabbing of Caesar? Surely not; all that needs to be within this event is that part of his body into which the knife was plunged. Just as it seems that the arm holding the knife has to be attached to Brutus' body for it to be Brutus' stabbing, without all of Brutus' body being part of the stabbing, so Caesar's back only needs to be in fact Caesar's back for it to be a stabbing (into the back) of Caesar. I claim then, that the stabbing and killing are distinct.

Given the conditions of adequacy that have been laid down, this gory business unfortunately cannot be left here. Identity has been denied in accordance with (C3) - variation in location. Now unless we can find a difference in their places in the causal framework we are in danger of not meeting (C4) from the other side; that is, we might be unable to show two distinct things do not have the same causal role. In the light of the spatio-temporal divergence, though, a difference can probably be described; for example we might say that the stabbing caused a dislocation in the spine, but rather than say the killing caused this, say instead this was part of the killing. However, outside the immediate events

in Caesar's body, the killing and the stabbing do have extremely close causal consequences.

A second example that has caused much controversy is the relation between the death of Socrates and Xantippe's becoming a widow. Here, again, I think an identity claim can be shown to contravene the conditions of adequacy, contrary to Davidson. The location of Socrates' death does not seem to give rise to any particular difficulties - it occurs where he is. Xantippe's becoming a widow is harder, because the determination of its location requires us to decide how to cope with the fact that, as described, the event amounts to a change in an ('external') relation of hers, a change furthermore to which she seems at the time to contribute nothing at all. Her only significance seems to be her part in a marriage ceremony in the past. Nevertheless, in a way similar to that in which I might witness an event which I only discover later, and could only discover later, was a killing, I could observe Xantippe's becoming a widow, without knowing until later that it amounts to that. Say Socrates dies at t; then her becoming a widow might be identical with the event Xantippe's sleeping at t. If Xantippe is to be the subject of the event, which does not seem to me to be at all strange, then it occurs where she is, and while the change in relations she holds is in this case

a very nebulous one, (though dependent on a physical change in someone else), it is for all that no less a genuine change. An analogy may be considered; suppose I pick out from a collection of books a single one with the description 'the one I bought from Jones'; you cannot tell from the collection which one it is, but if there is in the collection only one I bought from Jones, there is nothing wrong with the description; Equally, if we take all the events constituting Xantippe's life, and call one of them her becoming a widow, you will be unable to tell precisely, perhaps, which one it is I am referring to; but this does not bring into question the validity of the description as a description for the event, which crudely is simply the t-time slice of Xantippe.

I will take the denial of the identity argument in the two cases I have considered here to be concrete conditions of adequacy for the analysis to be proposed, arising from (C1) - (C4). A third, and final example provides a case where the analysis is required to assert, rather than deny, an identity. It is an example that Davidson raises without himself casting a final judgment.[30] He asks us to imagine a metal ball that becomes warmer during a given minute m, and that during the same minute rotates through 35 degrees. Is the warming of the ball during m identical with the

rotation of the ball during m? If not we are in danger of having to abandon (C3). The example is raised to give expression to Davidson's doubt about whether or not identity of space and time is enough to ensure identity, but he does point to a way out of the paradox. It may be argued that the warming and the rotation of the ball are identical with the motions of the molecules constituting the ball during m, and thus are themselves identical. Within the context of the discussion so far, with no consideration of modal contexts, and concern exclusively with spatio-temporal particulars, I think this argument has sufficient force for the identity claim to hold. However, the analysis to be presented here is to be expected to throw further light on this example, particularly as it contains an element associated with the stategic problem of emergence and reductionism. To see the thing as a ball is different from seeing it as a collection of particles, and the relation between these viewpoints is, basically, an instance of the basic problem. For example, it might be claimed, in an attempt to make Eddington sound less sensationalist, that the property of solidity has supervened on this collection of molecules. There is fairly strong evidence for a very strong relation, in fact identity, to be said to hold between heat and the motion of molecules; the fact that the same may be said of rotation also

lends support to the reductionist argument of Davidson.[31] But the defence is only of this particular reduction, not the theory in general. About this, the theory of events should remain neutral.

III

It is not possible here to investigate all the possible modal implications of (C3) and (C4); There is however a tendency to treat them as though they imply that location, causes and effects are necessary properties of spatio-temporal particulars; that, for example, an event could not but have the causes and effects it has, or could not but have the location it has. Thus these properties are treated as though they are of the type that fits statement-form (F3). This amounts to the conditions being taken instead to be

(C3') $(u)(v)(p)(t)((Pu \,\&\, Pv) \rightarrow (u = v \leftrightarrow \Box(Qupt \,\&\, Qvpt)))$

(C4') $(u)(v)(u = v \leftrightarrow \Box(w)(x)((Ruw \leftrightarrow Rvw) \,\&\, (Rxu \leftrightarrow Rxv)))$

with '$\Box$' understood typically as 'in all possible worlds where the particulars are present'. It seems quite likely that this is what lies behind the modal assertion at the end of this passage from Davidson's 'Causal Relations':

' ... Mackie asks, " What is the exact force of the statement of some experts that this short-circuit caused this fire? " And he answers, " Clearly the experts are not saying that the short-circuit was a necessary condition for this house's catching fire at this time; they know perfectly well that a short-circuit somewhere else, or the overturning of a lighted oil stove...might, if it had occurred, have set the house on fire "...Suppose the experts know what they are said to; how does this bear on the question whether the short-circuit was a necessary condition of this particular fire? For a short-circuit elsewhere could not have caused this fire, nor could the overturning of a lighted oil stove. '

Why not? Presumably because for anything to be this fire, it has to have the same cause as this one. But this is surely far too strong. Why couldn't a short-circuit elsewhere have caused this fire? And indeed, it is only if his own criterion of event-identity is misread do we have to deny this possibility.

A further example may be considered. Take one particular event - the explosion in the chemistry laboratory at t. It was caused by Jones' mixing samples of a and b in the laboratory just before t. Among its effects were the destruction of the laboratory, the death of Jones, and Smith being made to jump. He was passing the laboratory at the time and as usual he was looking at it because he found it so aesthetically pleasing.

I think we may set, as conditions of adequacy on the theory of possibility to be present in the analysis of events below, the requirement that, with reference to this example, the following are

deemed to be true: " The explosion might not have caused Smith to jump "; " The explosion might have been a suicide, or Jones might have made a mistake "; " The explosion could have happened a few moments earlier "; " The explosion could have damaged the refectory " (assuming that it in fact did not).

I shall preface the presentation of the analysis of events with a consideration of the source from which one feature of it is derived, which is some side remarks in a book otherwise devoted to the formal analysis of English.

In his book ' Logics and Languages ' Cresswell indulges from time to time, as he says, in a little speculative metaphysics.[32] The purpose of this is to investigate the nature of the entities required for the semantical analysis of language, and as these remarks are supposed to be of only an illustrative nature I think it is reasonable to take some of them out of context, and while criticizing them, use them nevertheless as a basis for an analysis of the sort desired here, which is capable of playing more than a purely illustrative role.

The set of entities of particular concern here which he describes are called <u>basic individuals</u>. He begins with the set of all space-time points, and defines a possible world to be any subset of this set. The set of basic individuals, comprising physical

objects, events, states, processes, and so on, is defined as follows: a basic individual is a function from a world to a part of that world - clearly, therefore, this is a function from possible worlds to possible worlds, with the condition that the value for each world is a subset of that world. These values are space-time portions, and if we are considering some world where a particular basic individual does not exist, the value of the function comprising that individual will in that world be the null set. The value of a function in a world is called the manifestation of that individual in that world.[33]

Cresswell assumes that for each point of space-time there are only two possible states - either occupied by matter, or unoccupied by matter. Sometimes he writes as though a world is defined as a set of space-time points all occupied by matter; it would seem much more convenient, though, for him to identify a world by citing the set of points which comprises it, and then to say just which of these points are occupied.

The major reason for interest in Cresswell's proposals is that he claims they provide an indication of the way to solve the problem of saying what is right and what is wrong with the statement (1) The battle of Waterloo is nothing more than a certain movement of elementary physical particles.

(1), he says, is true in the sense that the value of the individual called the battle of Waterloo in the real world, and indeed in any world is a movement of elementary physical particles ...

' However, (1) taken in another way is false. This is because we can also understand the particular movement of elementary particles in a particular world as an event. If we can accept an absolute space-time framework then we can form the function whose value for any world is the set of space-time points which is the value in the actual world of the battle of Waterloo function. It is functions of this kind which mightbe said to represent absolutely physical individuals, and if (1) is meant to assert the identity of the battle of Waterloo and the absolutely physical individual which coincides with it in the real world then (1) is false, since although the battle of Waterloo has a manifestation (possible null) in each world it need not be the same manifestation in each; and this is why seeing it as a battle is different from seeing its manifestation as an absolutely physical event. '

I will try to show that there is a great deal of confusion in the way that Cresswell proposes individuals may be constructed, and his account seems to involve a series of counterintuitive positions, which will be investigated more fully later. However, I think this passage shows that within a framework of the sort he suggests it is possible to provide clarification of some important features of the precise way an emergentist metaphysics might be rigorously worked out. In particular, we may draw, on the basis of this passage, a vital distinction between two properties that might both go by the name 'physical'. The battle of Waterloo may, in one sense, be called physical, and essentially so, in so far as its

manifestation in any world is a physical thing; however, there are no particular physical entities - atoms or whatever - that are identical with the battle, that always constitute it wherever it is manifested. The constraints on what might constitute the manifestation of the battle in any world are not of this physical sort, but are, rather, concerned with features like the size of the battle, and its place in the historical causal framework.

These issues will be discussed more fully later, but we need to consider Cresswell's own comments on the ascription of properties to events, which do not themselves seem to get us very far towards an explication of the notion of emergence. The arguments he presents which are of most importance here are contained in the following, somewhat lengthy passage:

> ' Surely a function from worlds to worlds is a very rarefied and abstract object? Do not nominalists fight shy of admitting sets and functions into their ontology and only do so reluctantly when forced? Yet they certainly believe in blackboards. The view that a function from worlds to worlds is an abstract entity is a question-begging one if being an abstract entity rules out being also a physical object. For on the analysis I am proposing some functions from worlds to worlds are physical objects and so the right conclusion is that not all such functions are abstract entities. The objection must say more. The objection must hold that the nature of ordinary physical objects and events is well enough known to show that they behave in certain ways in which set-theoretical entities do not behave; and I would maintain that this cannot be shown.
>
> I recognize of course and have frequently been stressing that the analysis I am proposing is subject to philosophical scrutiny. But it must not be facile

scrutiny. As an example of facile scrutiny consider the following, equally question-begging, instance of the general argument outlined above: the objection is that physical objects cannot be sets, because we can perceive physical objects through the senses. But whoever saw a set coming down the road? The question here is begged because whatever the analysis of 'seeing' is in terms of the metaphysics I have been sketching, it will at least be a two-place property and there is no reason why the proposition "ω sees (a,b)" should not be true in a world w where a and b are sets...As far as the set coming down the road is concerned, one mightwell be prepared to say that one sees a set of three men coming down the road because one sees each of the men. I.e. for some sets, although the set is distinct from its members yet to see the set is just to see the members. But in any case the question is not whether anyone would be happy to say that a thing is a set or a function; the question is whether it is a set or a function. '

From the point of view of the method of constructional definition, and from the point of view of the analysis of events, the two passages that have been quoted from Cresswell, confused though they are, deserve close scrutiny. We may attempt a logical reconstruction of Cresswell's development of these proposals. We wish to take events, physical objects, and so on, to be spatio-temporal particulars, let us suppose even space-time slices; I think it likely that Cresswell thinks we take them to be this last, which in his analysis constitute the manifestations of individuals in worlds; for example, with reference to a particular blackboard, he describes its manifestation in the real world as 'that subset of space-time which makes up the blackboard throughout its history'. Now we face certain problems; we want to be able to talk about properties that an individual might have but does not have, and also about individuals which do not in fact exist. More

particularly it is necessary to construct a framework in which sense can be made of the question, " Would the blackboard have been better placed near the window? ". It is implausible, Cresswell argues, to identify the blackboard with its manifestation, because we cannot ask this question of a space-time slice.

One point may be raised here, to digress for a moment. It might not be reasonable to ask this of a space-time slice, but it might be reasonable to ask it of the contents of that slice. Of course, it will not be asked of the contents of the slice which covers the entire historical existence of the blackboard, but rather of the contents of the slice covering the blackboard during the course, perhaps, of the lesson in which information for students is written on it, and where it is located in a dark corner of the room. This is only a suggestion, and is in no way supposed to sort out the problems of talk about three-dimensional objects in our four-dimensional world. What is at stake, though, is the ascription of possible properties, and naturally enough there is an air of incoherence about attributing a possible property of alternative location to a space-time slice; not so much, though, to a material entity in a space-time slice. To pose the problem of possible properties as one arising from the identification of spatio-temporal

things like blackboards (that is, for Cresswell, the manifestations of blackboards) with space-time slices requires some justification for this assumed identity.

Now it may be argued that Cresswell, in talking of a space-time slice, is talking of the slice with matter in it, and so to make this distinction between a space-time slice and the matter in it is not germane to the analysis; further, it would be said, Cresswell is right to say the question about the preferred location of the blackboard cannot be asked of the space-time slice viewed in his way as already containing matter. In reply, the point to be made is this: Cresswell may be trying to sell the manifestations of individuals as being the same sort of thing as we ordinarily understand by individuals, and this is not the case. We take them as spatio-temporal entities, certainly, but with things like physical objects these are, in our conception, objects which can quite plausibly change location, unlike a space-time slice. In his account, no mention is made of this crucial difference. Furthermore, if Cresswell does consider manifestations to diverge from our ordinary notion of individuals, his account is deficient in that it offers no account of how things like blackboards, as conceived by us, and movable in space, fit in to the picture he presents.

To return to the mainstream of discussion, given all the problems to be met by the analysis of events, Cresswell proposes that events are identified with functions from possible worlds to possible worlds, as described above. There is no problem with this; it would be facile indeed to object that set-theoretic functions are not the sort of things that events are, as we understand them; as stated above, this sort of criticism misses the point of the method of constructional definition in philosophy. We may note, though, that little sense can be made of the question, " Would it have been better placed near the window? ", when it is asked of a function from possible worlds to possible worlds. Indeed, no more sense can be made of this than of the question's being asked of a slice of space-time. This observation should not come as any surprise, for it has been shown that constructional definitions are not intended to serve the purpose of replacing the definiendum by the definiens in all the relevant contexts, but of providing translations of those contexts in line with the definitions, and then comparing the truth-values in particular translations with the originals. Cresswell, however, seems to prefer the ascription to the function of all those properties that were formerly attributed to the black-board, and this would seem to lead us to absurdities.

To expand; there are certain metaphysical assumptions which are very broadly acceptable and which concern the sort of entity that might be said to have certain properties. To contradict such assumptions would demand at least an argument to defend such a procedure. Referring to the last quoted passage in the light of these assumptions, it is difficult to make sense of a statement like " The view that a function from worlds to worlds is an abstract entity is a question-begging one if being an abstract entity rules out being also a physical object. " One thing that cannot be doubted is that such functions are abstract entities; ambiguities in the word 'abstract', such as they are, will not be resolved with the result that such functions are not considered abstract. Now it would seem from the name, that physical objects are not abstract entities, as we conceive them, but Cresswell may constructionally define them as these functions. But what he cannot do is then say these functions hold properties like weight, temperature, volume, or, in the case of events, duration. To do so would be to contradict those assumptions of property-holding that have just been alluded to. How could a function get hot? It is not composed of molecules. Cresswell seems to be ignoring the second stage in the analysis; if we are going to provide a theory of events, we need, as an integral part of that endeavour, to provide a theory of property ascription for events as well.

It may be objected that this involves a misconstrual of Cresswell's intentions. But if this is the case, why, in the last paragraph of thelast quoted passage, is there an argument that seems to be trying to give some plausibility to the notion that we might on occasion be prepared to say that one sees a set coming down the road? And according to the remarks immediately preceding this argument, it seems this thinking, seeing thing seeing a set coming down the road is also a set! I protest, and yet in the context theargument seems to have the purpose of lending plausibility to the even more extraordinary idea that we sometimes - in fact, commonly - see functions from possible worlds to possible worlds coming down the road. It seems unsurprising to me that it clearly fails to lend any plausibility at all to such a proposition.

None of this, it should be stressed, is meant to bring into question the value of set-theoretical frameworks in the analysis of statements with forms (F1 - (F4). But it is precisely such an analysis, given the framework established, that is missing from Cresswell's account.

Bearing all this in mind, it will be useful to look more closely at just how far Cresswell has taken us in the solving of problems associated with (1). We start with the problem that while the Battle of Waterloo and a certain movement of

elementary physical particles share the same location in time and space, they seem to be different sorts of thing, and so a question mark is placed over the statement of identity between them. Cresswell attempts to solve this by his framework of individuals, as functions, and their manifestations. He distinguishes two different functions, one which has as its manifestation, where this is not the null set, the battle of Waterloo, and another which has as manifestation invariably across worlds the movement of elementary physical particles associated with the battle in the real world. However, at the spatio-temporal level, this association is taken always to be identity and no more is said about it. The value of the individual called the battle of Waterloo, he has written, in any world <u>is</u> a movement of particles.

There is, in fact, incoherence in the construction of the 'absolutely physical individual' function, which will be described later. Leaving this aside, it is clear already that Cresswell is not going to tackle one feature of the problem of emergentism, that being this identity of the battle of Waterloo and the movement of elementray physical particles, conceived as manifestations in space-time. The distinction he draws between the two remains entirely at the level of individuals conceived as functions, and this does seem to leave an important remainder of the problem unconsidered. Of course, we are working within

the framework of (C3), and so it is not the case that the identity of the (spatio-temporal) battle and (spatio-temporal) movement of particles can be questioned; however, I hope to show that even within this framework, it may be possible to incorporate an emergentist theory of levels, though such a theory would be much weaker than some which seem to imply a denial of (C3).

However, there is a way of presenting a Cresswellian picture that does incorporate an insight. To show this, first let us take necessary properties to be simply those which a thing must have if it is to be that thing; that is, in any world where that thing exists, it has these properties; contingent properties are those which are not necessary. A second distinction, to be drawn only roughly, is derived from Leibniz, and is between those properties intrinsic to a thing, and those that are external, or relational. For example, in Cresswell's picture, the structure of matter in a manifestation, the ascription of 'occupied' or 'unoccupied' to each point in the manifestation, would exhaust a description of the intrinsic properties of that manifestation.

What Cresswell's framework could be said to show is that the (spatio-temporal) battle and the (spatio-temporal) movement of elementary particles draw the line between necessary and contingent properties at different places. The interpretation of his account I have in mind is as follows: Let us say there is m-identity across worlds between manifestations if they are manifestations of the same individual function; and from our definition

of necessary properties, we will be able to read off the necessary properties of m-identical things by observing what properties each manifestation of the function in question has in every world.

Now Cresswell, under this interpretation, may be taken as identifying the necessary properties of a movement of particles with the intrinsic properties of that movement, as there is by definition identity between the manifestations of the absolutely physical individual. This is almost certainly too strong. But let us not debate this; suppose he is right: something along the same lines, though much weaker, probably is right. I assume that the battle of Waterloo has very different necessary properties; the battle could have been fought by a completely different set of men. It could have lasted a longer or shorter time, and covered more or less (geographical) space.

As for its necessary properties - that it was fought between England and France, that it was not just a skirmish, and so on - these are not related directly with any particular movement of elementary particles.

The relation 'having different necessary properties from ' is a relation that holds, then, between the spatio-temporal battle and the spatio-temporal movement of particles. A simple and straightforward assertion of identity between these things, like

Cresswell's, seems, then, to be failing to grasp the complexity of their spatio-temporal coincidence, given the modal features of the situation just referred to. While this presentation is of course not one that Cresswell himself adopts, any light it throws on the difficulties of a rigid reductionism, when modal properties are taken into account, has its source in the framework he constructs.

This survey of Cresswell's proposals may be ended with a look at some of the more dubious features of his apparatus, which will act as an introduction to the analysis to be presented here. There are four points I want to note.

Firstly, it seems strange to take possible worlds as subsets of the set of all space-time points. The very construction of this set seems obscure; apparently one subset of it is the real world, in which case it would be useful to know how to get all the other members of the set that are not in this subset, the real world. Are they possible points? And is it the case that one subset can have different arrangements of matter in it? The account is, in fact, seriously deficient in the provision of these basic set-theoretic details.

We are much better served by the assumption mentioned above drawn from Kaplan, that we take space-time, and certain of its basic geometric properties, to be features of all possible worlds. Thus what

goes on in different possible worlds is not seen as happening in a space-time different from that in the real world, and correctly so. If I say " Nixon might not have won the election " I have in mind a course of development thatthis world, taken crudely as a space-time receptacle, might have followed; I am not thinking of possible events taking place 'somewhere else'. Again, in most circumstances when a counterfactual situation is alluded to which is not overtly about possible courses of development of the real world, there is no need for this to be conceived as occurring in an alternative space-time. The assumption adopted here about space-time clearly does exclude the possibility of accommodating talk about different space-times, or alternative geometrical structures for this, or another, space-time, but this, I feel, is no great short-coming. A question mark hangs over discourse about such bizarre possibilities anyway, and even if it eventually attained credibility, the assumption could at that stage be dropped and the analysis modified accordingly.

Secondly, and arising from one feature of the previous point, Cresswell's matter that does the occupying of space-time is left in a haze of confusion. His account is basically materialist, and I am in sympathy with such an approach, but there does seem to be some naivety in his account. Matter appears to be a collection of homogenous point-occupying bits, indistinguishable one from another, but this seems

not only unacceptable, but as I hope to show, unnecessary as well.

Thirdly, reference was made earlier to an incoherence in the construction of the function he calls an absolutely physical individual. This, it will be recalled, had the same manifestation in each world, but on his account there are worlds which do not even contain the space-time slice constituting this manifestation, because of Cresswell's extremely broad definition of possible world, as any subset of the set of all space-time points.

Cresswell's purpose would, in fact, have been served by a function characterised with slightly more complexity. Clearly, we can conceive of the same matter in the same structure occupying different portions of space-time in different worlds. The absolutely physical individual function could then be constructed as having as manifestation, in any world where it existed, the same matter in the same structure, somewhere within the world, as the manifestation in the real world coinciding with the battle of Waterloo. With a construction such as this, intrinsic properties of the manifestation are left invariant, which is the essence of Cresswell's point.

Fourthly, as he has characterised them, there are a vast number of individuals. He asks us to " Note that our range of basic individuals is far wider than any ordinary notion of things ", and a little later on

asserts " We have said that physical things have the status of functions of a certain kind. There is now the quite different problem of marking off those which human beings can recognize as things. About this problem we refuse to pronounce... " We may reasonably object to this; while it is a different problem from the construction of individual functions, it is still the responsibility of metaphysics to go some way at least towards drawing a boundary between those functions that can reasonably be called individuals, and those that can't. Without this, the category of 'basic individual' is all the less interesting. For example, we can imagine a function which may be described as follows: in the real world, it has as manifestation a four-second slice of an atom in England in 1976, and a ten-second slice of a neutron in France in 1679; in all other worlds it has the null-set as manifestation. I think it a matter of ontological fact that this function is not an individual, regardless of human powers or capacities. A preliminary theory of individuals should, then, at the very least, assert that only a subset of this class of functions are individuals.

These observations are sufficient, I think, to show that any adequate theory of events is going to involve much more precision and working out than Cresswell provides. While the account to be presented here is considerably different from Cresswell's, his account

was nevertheless the basic impetus for it, providing the idea of identifying the individual with a set-theoretical function which has a set of possible worlds as its domain.

As has been made clear, a theory of events should not, I think, venture to give an answer to the problems of either reductionism or emergentism; rather it should remain neutral, leaving room for either. We need, though, to bear in mind the conditions (C1) - (C3), and any room for emergentism that we leave is not to allow the possibility of there being two distinct things at the same place in space-time. On the other hand, while I intend to provide a basically materialist account, it must not be so crude or naive as to imply a strong reductionism, or a refutation of emergentism.

The following is supposed to be no more than a first step towards a theory of events, and as such displays, in places, some crudity. To satisfy completely conditions (F1) - (F4) requires, I think, a theory of quite broad scope, particularly, as I hope to show, it is not possible to give a general account of the properties events hold, as they fall into kinds which have significantly different features. It is hoped that at least some headway is made in distinguishing these kinds, and the beginnings of an analysis of them presented.

The set-theoretical framework I am propsing is as follows: we take a non-empty set $\mathcal{W}$ of possible worlds, a non-empty set $\mathcal{A}$ of point-masses, and a non-empty set $\mathcal{E}$ of space-time points.

We assume $\mathcal{E}$ has a geometry, according to the assumption from Kaplan.

For each $w \in \mathcal{W}$ there is a function

$$f_w: \mathcal{A} \rightarrow \mathcal{E}$$

such that for all $a \in \mathcal{A}$, there is an $e \in \mathcal{E}$ such that

$$f_w(a) = e.$$

For any world $w \in \mathcal{W}$, f_w is called the distribution function for w.[34] We consider a class of functions G, from worlds to regions of space-time and the null set; thus for each $g \in G$,

$$g: \mathcal{W} \rightarrow (\mathcal{P}(\mathcal{E}) \cup \Lambda)$$

A subset of G, at present undefined, is called the set of events.[35] For each event g let there be a function from worlds to sets of point-masses hg such that

$$hg(w) = \{ a \in \mathcal{A} : f_w(a) \in g(w) \}$$

The value of hg for a world has a geometry, restricted from that on $\mathcal{E}$. Intuitively, the values of hg are sets of point-masses structured according to their place in space-time. For each g, w, hg(w) is called the physical manifestation of g in w.

For each hg(w), there is an infinite series of partitioning processes. At one extreme, the resultant partition does not divide the physical manifestation at all, viewing it in its entirety as a unity. At the other

extreme, the resultant partition is one that partitions the physical manifestation into its individual point-masses. All possibilities between these two extremes are included in the series of partitioning processes. For any partition, each part of the physical manifestation partitioned off from the rest of the manifestation is itself called an event, or sometimes, for clarity, a sub-event.

We shall take, as a primitive, undefined feature of each world w, that world's causal history, consisting of a series of causal chains, and such that for some partition or partitions of each hg(w), the events constituting hg(w) according to that partition or those partitions are each a stage in some causal chain in the causal history of that world.

Partitioning processes are themselves ordered according to a hierarchy of levels. Each event has associated with it a partitioning process of some given level.

This account embodies materialism in so far as it implies that for any world, if everything in the domain of the distribution function for that world is taken out - that is, if all the matter is removed - the result is an empty world. Events are construed as a subset of functions from worlds to regions of space-time. For any particular world w, we may determine for any given event e the physical manifestation of e in w by means of the distribution function, and the

function he. The physical manifestation of an event in a world is the structured set of point-masses within the space-time region that constitutes the value of the event-function at that world.

The operation of partitioning processes are best explained with reference to some particular examples, though it may be conceived simply as a four-dimensional version of dividing a two-dimensional closed shape into various spatial regions. At one extreme, no partitioning lines are drawn through the area of the shape; at the other extreme, the basic constitutents of the shape, however they are conceived, are partitioned individually by the dividing lines. And so, for example, the battle of Waterloo may be seen, at one extreme, as a unity, as that one thing which is that (spatio-temporal) event; at the other extreme, alternatively, it may be viewed as all those point-masses constituting the physical manifestation.

As a first approximation, we may characterize one of the interesting partitions between these two extremes as one which views the physical manifestation as a series of elementary particles in motion through time. This is not quite accurate, though, for all we have within the boundaries of the event are time-slices of particles, not complete particles. Another interesting partition includes the treating of all the men - or more accurately, man-slices - within the boundaries of the event as partitioned-off sub-events, the battle here being

viewed as a gigantic, complex relation of violence and fighting between a series of men.[36]

Of course, there are an infinite number of possible partitions, and the great majority of them will not bear fruit, the criterion for which is the generation of sub-events which have a place - as a stage - in the causal history of the world.

Something needs to be said about physical objects. In a fashion akin to Cresswell, let us assume, firstly, that conceived as four-dimensional things - intuitively, objects through time - they are like the physical manifestations of event functions. In fact, an extension of the theory of events provided here would identify particular physical objects and people with functions like events. Now let us consider a four-dimensional person, Jones, and partition him accordingly so he is conceived as a series of time-slices. An important feature of our intuitions about people is expressed by the fact that we are uninclined to call the event Jones' waving goodbye at t, the event 't-slice of Jones waving goodbye'. Whether or not they are identical, it seems to me, depends on whether reductionism, in the form of reducing a person to the series of events constituting the time-slices of his life, is or is not true. If it is false, and something like our intuitions is right, perhaps we would say

that being able to wave goodbye was a property only held by people, and if it had not been a person, but a machine that looked like a man, we might have been more happy to say it was the time slice of the machine that was waving its arm, leaving out of the description the implied intention in the description 'waving goodbye'.

In the case of four-dimensional physical objects, then, we can see one way the picture presented here leaves room for emergentism, and this indicates how it might generally be adopted into the account of events. The clue is in our descriptions, an example of which we have just used. To call the event 'Jones' waving goodbye' involved us in looking beyond the boundaries of the event, and locating it in a framework of conscious animals going through changes and actions; the time-slice of Jones is taken as Jones at a time, and in such a way that it is not necessarily the case that he is reducible to all his time-slices. We could say, more closely to the language used in the presentation of the analysis here, that the description locates the event in a historical causal chain.

The emergentist may then construct a metaphysics like this: firstly, he identifies within the causal history of the world strands which are interlinked but nevertheless maintain some degree of autonomy from each other. These are viewed as in a hierarchy, from lower

to higher levels of complexity, determined with reference to the structure of matter. Secondly, he may conceive of there being a parallel hierarchy for partitions. Not all partitions will be found within this framework, but only a subset of them, namely those which give rise, in their application, to sub-events that play a part in the world's causal history. In a particular case, he may then argue as follows: we may consider the battle of Waterloo in at least three ways: as 'the battle', as a series of men fighting, and as a series of molecules in motion. For each of these views, there are events (functions) which all share the same value at the real world, but, having as they do different necessary properties, have divergent values at some other worlds. Each partitions its physical manifestation differently, but all do it successfully, in the sense that they all give rise to sub-events that have a place in the causal history of the world. The places each has, though, are in different causal chains, which, as stated above are interlinked but nevertheless are not all collapsible into one another.

This last point is the crux of the emergentist position. The reductionist is not likely to waste his time questioning whether or not we can distinguish a hierarchy of what are commonly called 'levels of integration' of matter; by this I mean we can simply accept that there are, for example, levels corresponding to inorganic matter, living things, and conscious things.

To recognize these divisions is not to adopt emergentism. The question of emergentism is most clearly formulated as one about the relation between those levels, whether or not each has a degree of autonomy over those lower than it in the hierarchy.

The picture of the world present here - neutral as regards reductionism - may be viewed thus: there is we suppose, some level at which everything in the world would be gone if we removed a series of objects conceived as four-dimensional spatio-temporal entities. There is, that is, a set of manifestations that exhaust the world, in this sense, say the set that would intuitively be called the set of all elementary particles throughout the time dimension of the world. Constructed out of this set, though not exhausting it, are two series of qualitatively different sorts of objects corresponding to physical objects of medium size, and animals, through time.[37] Animals themselves contain the qualitatively different subset-conscious animals. Manifestations of the first sort are characterised by very long time dimensions, and ones of objects and animals by relatively long time dimensions. Most events, as we understand them, cut across this characterisation of the world, having as a rule relatively short duration, and constituting often time-slices of these objects; one property, commonly, is true of the object during the time-slice. So, for example, Jones' waving goodbye is a time slice of Jones in which it

is true of him that he is waving goodbye, and it is the only time that it is true of him, in that temporal region. We could, to be sure, take a set of events the removal of which would leave nothing in the world, but some of these are liable to be of very odd construction, and difficult to describe. The picture of objects being the basic furniture of the world is a more stable and more easily described account.

Let us look more closely at the value of a typical event at some world, taking as given a prior classification of the world into a series of objects of various levels. What taking this amounts to is the assumption that the world has a natural partitioning attached to it; clearly our perceptual apparatus may be conceived as providing something like this. As has been described already, there are various ways this slice of space-time can be looked at - depending particularly on what level of objects are of interest. Some clarification is still needed, though, of the extreme partition that does not draw dividing lines in the area of the event; for example, what is it to conceive of the battle of Waterloo as a unity? It is important not to confuse this extreme partition with the partition corresponding to the highest level at which an event may be viewed. By way of comparison, let us first consider the event of Jones' waving goodbye. The highest level at which this can be viewed is [illegible] the highest level of objects that we have so far considered - namely, conscious

animals. It is, as a matter of fact, also this level which, in the case of this event, has associated with it the partition that does not intrude on the contents of the event. The most natural description to go with the event - 'Jones' waving goodbye' - reflects no break-down of the event into constituents. Similar remarks are not true of the Battle of Waterloo, and great care needs to be taken in the use of this description. It has been argued that the battle of Waterloo has different necessary properties from the event that shares the same value at the real world, but which partitions the physical manifestation into men. The battle might have been fought by a completely different set of men, but a series of men fighting could not be <u>this</u> series of men fighting if the former involved no men present in the latter. The battle of Waterloo is an event corresponding to the next higher level of objects, constructed out of the level of conscious animals. This, more abstract level of objects consists of things like nations, social groups, and so on. Thus it may be said that the battle of Waterloo was fought by England and France, that it was decisive, and so on, and these properties, at face value, make sense only for a level of objects higher than the level of individual men.

It might be thought there is a difficulty here. According to the account just given, this highest level of viewing the battle of Waterloo does not treat it as a

simple unity, but as something reducible to a relation of conflict between two nations. Thus the French and English armies, such as they are contained within the boundaries of the event, are conceived as spatio-temporal slices of two nations. And there is a partition that splits the event into these two sub-events. The point is well taken, but it would be wrong to think it is an objection to the theory presented here. To see the battle of Waterloo as a unity is not to see it as the battle of Waterloo; no significance is to be attached to the fact that this description does not imply any breakdown of the physical manifestation of the event. The extreme partition whereby there is in fact no breakdown into sub-events is not always identical by any means with the highest level from which the event can be viewed. In the case of Jones' waving goodbye, this happens to be the case, but not because of this description; the description simply illustrates the event's nature as an individed (unpartitioned) event of the level of conscious animals.

The properties that are true of the event unpartitioned are in fact the most basic properties, true of events of all levels: namely, properties of spatio-temporal location. It is worthwhile to stress, in conjunction with this point, that the paper is attempting to construct a theory of events, not a theory of event descriptions. Of course, our ultimate goal is

the complete explication of event-discourse but the contribution this paper is supposed to make to that endeavour is the provision of an ontological theory about events. How descriptions refer to events, and their analysis in terms of concepts like rigid and non-rigid designation and so on, are not problems this paper tries to tackle. I use the expression 'Jones' waving goodbye' and assume that it suggests there is no partition in the physical manifestation; but at the same time 'the battle of Waterloo' is a description corresponding to a level in which the manifestation is partitioned, although this is not apparent from the expression 'the battle of Waterloo'.

From here, I wish to proceed to the problem of the analysis of the ascription of properties to events. It would seem possible to hold the belief that the properties of events are reducible to just two categories - properties of spatio-temporal location, and causal properties. While I will not defend this position, for simplicity I will assume its truth, and so offer an analysis of properties only for these two kinds. Further, I hope that the foregoing discussion has shown how such an analysis of property ascription might be generated. Firstly, let us consider the ascription of properties of location; if P in (F1) - (F3) is taken as such a property, I think it is clear from the foregoing that these statement-forms may be analysed as follows: with r as the real world,

(F1*) e(r) is P;

(F2*) e(r) is P, but there are worlds w such that w $\neq$ r and e(w) is not-P;

(F3*) There is no world w such that e(w) is not-P.

With causal properties, the situation is naturally more complex. In order to remain neutral as regards emergentism, and leave room for an emergentist metaphysics, it will be necessary to subscript properties according to the level of integration of matter which is the lowest in the hierarchy at which they can, at face value, be meaningfully applied. This is the level at which the property would be said to emerge. Incidentally, we may say an event is of a level which is the highest one of which there are properties true of it. Equally, we cannot, as we did with locational properties, take as the holder of the property the value of the event at the world in question. This value is shared by many different events of differing levels. Rather we are considering, when ascribing causal properties, the physical manifestation of the event partitioned in the particular way that is associated with the event. Let '$\langle hg(w) \rangle$' be a singular term referring to such a partitioned physical manifestation in this case, that of event g in world w. If l is the level at which the property P 'emerges', or 'supervenes', the statement-forms under consideration are analysed as follows:

(P1**) $\langle he(r) \rangle$ is P_1;

(P2**) $\langle he(r) \rangle$ is P_1, but there are worlds w such that w $\neq$ r and $\langle he(w) \rangle$ is not-P_1.

(P3**) There is no world w such that $\langle he(w) \rangle$ is not-P_1.

The emergentist will deny the coherence of the claim " $h_g(w)$ is P ", if the partitioning giving rise to $h_g(w)$ is of a lower level than 1.

It is undeniable that the theory cannot get very far without more details being provided of the precise nature of the causal histories of the worlds. But it should should be mentioned that many of the problems about its structure are not the concern of the analysis of events, but depend on a decision about reductionism and emergentism, and this is highlighted by the position of the causal history in this account of events - as an undefined given, satisfying a minimal description. Some explanatory remarks of a metaphorical sort may, however, be of assistance in elucidating the position of causal histories in this theory.

Consider a world of Physical objects, being balls of certain masses and velocities moving in a Newtonian space. The movement and interaction of the balls throughout a time period is one strand, one chain, in the causal history of the world viewed as a collection of balls. Another strand throughout that period is the movement and interaction of elementary particles comprising those balls. An event may be considered that is a time-slice of the world; an event, furthermore, of the same level as the physical objects. We have called each partition in this event a stage in the causal history, and what this means should be a little clearer with

reference to this example. The time slice of a ball, with properties of mass, location and movement, may be seen as having causes and effects within the entire history of the world, conceived at this level. It is a meaningful whole in reference to the laws governing that causal history, in a way that some perverse partitioning, uniting as a single sub-event, odd ball-slices from various parts of the world, is not.

What needs to be done, finally, is for the t theory just presented to be tested against the conditions of adequacy laid down at the beginning of the paper, and to consider how the theory copes with the particular concrete examples of purported event identity that have so far been considered.

To begin, we may consider (C1) to (C4). (C1) is, clearly, satisfied; there is no spatio-temporal particular which does not take place at some particular time and place. (C2) is satisfied, also. While the precise nature of causal histories has not been dealt with to any great degree, it is strongly suggested that the causal relation holds between sub-events, which are both of course spatio-temporal entities.

(C3) is also satisfied. To take an example, the battle of Waterloo and the movement of particles have been distinguished as events, that is, at the level of functions, but their spatio-temporal values - and, a fortiori, their physical manifestations - are identical

at the real world. They have associated with them different partitioning processes, but they operate on the same thing. Whether or not the causal chain in which the battle is a stage is reducible to that in which the movement of particles is a stage is a question independent of the identity of physical manifestations.

It needs to be said though that the adoption of (C3) as a condition of adequacy does considerably reduce the scope for any emergentism, as in some strong forms it may well be argued that in no way are the battle of Waterloo and the movement of particles, even at the spatio-temporal level, identical. The correspondingly weaker form of (C3) that is associated with this sort of idea is the position that no distinct things of the same sort can have identical locations in space-time.[39] Little can be said about the prospects for such a theory, though it certainly cannot be ruled out that a coherent account of the relation between the battle and the movement of particles may emerge from it. So much seems to hang on the explicit formulation of the condition itself, for the definition of what different sorts of things are, and the criteria given for determining which sort of thing some particular belongs to may well contain the essence of the emergentism in the whole account.

(C4) is satisfied also, following naturally from the satisfaction of (C2) and (C3).

(F4) has not yet been considered directly, but

the theory clearly gives rise to the following interpretation:

(F4*) For all w, f(w) = e(w).

We may now turn to the particular cases of purported event identity that have been discussed. Firstly, there is the case of Brutus' stabbing Caesar and his killing him. Clearly, at the level of functions, there are two events to be distinguished here; even if their values coincide at the real world, there are clearly worlds where they diverge. Brutus' stabbing Caesar might have been a wounding, and not a killing, and his killing him might have been a clubbing, and not a stabbing. It is to be noticed that I am assuming certain conventions hold about the relation between the event and the expression referring to it. In particular, I am assuming in cases like this that for an event to be, for example, Brutus' stabbing of Caesar, it is necessary and sufficient that it be a stabbing of Caesar by Brutus, side-stepping any problems about uniqueness. The conditions for identity, then, can be read off from the descriptions.

For simplicity the historical killing of Caesar will not be considered, and rather we will assume the fictitious one in which Brutus was the sole stabber is the event we are concerned with. At the level pf physical manifestations, the killing and the stabbing have associated with them partitions of the same level. They are distinguishable in space-time exactly as they were in the previous discussion. The value of the killing of Caesar

contains Caesar's body completely, wheras Brutus' stabbing him does not. The two do not share an identical manifestation, then, in the real world, and have different, though very close, positions in a single thread in the world's causal history.

Two questions of possibility arise here; could the stabbing and killing have coincided, and does the act of killing ever coincide with the killing itself? I am inclined to think that it might sometimes be the case the act of killing and the killing coincide- witness the death of someone from the explosion of a small bomb planted in his pocket; the act of killing this person most likely involves all his body, which is an important consideration, as we have seen. I am much more doubtful that a stabbing is ever a killing. It would certainly have to be no ordinary stabbing, and even in extreme cases I doubt it would be claimed the entire body was contained within the boundaries of the stabbing.

Similar remarks apply to the example concerning the relation between Socrates' death and Xantippe's becoming a widow. Once again, at the level of functions, we have here two distinct events. Divergence is obvious in cases where they are not married. In the real world case, in which they are married, the remarks made earlier apply, mutatis mutandis, here also. In this case, the values of these two events do not even overlap. Once again, it should be mentioned that some of the force of this position derives from the way in which I am taking expressions to refer to events. Thus it is certainly

possible to object that it is wrong to assume we can read off the necessary and sufficient identity conditions from 'Xantippe's becoming a widow'. Now it may be the case that the population is won over to a Davidsonian position and regularly use this expression to refer to Socrates' death, but this is of no concern here. The expression is being used precisely to refer to that event whose identity conditions can be read off from the description.

The most interesting case not concerning modalities for this theory is, unsurprisingly, that in which the identity claim is upheld, namely the case of the ball being both heated and rotated during a given minute m. It would seem to be the case that we can yet again distinguish two events at the level of functions. Presumably, this ball could be heated at m without being rotated, and vica versa. We will need to recognize, though, the coincidence of the value of these functions at the real world, and while nothing has been said to rule it out, it might perhaps seem strange that they both partition the manifestation in the same way, but nevertheless are different events.

I do not think this problem can be solved without some decisions about the necessary properties of the ball, for consider the following argument; assume that it is necessary that the ball be composed of the molecules that actually do compose it, or very nearly so anyway - we may

allow something short of exact correspondance here. Now, clearly it is rash to say anything very definite about the necessary properties of events like a certain motion of molecules, but it seems at least a defensible hypothesis that for any motion of molecules to be identical to the one that shares the same value at the real world as the heating and rotation it too has to share the same value with a heating and a manifestation. In reductionist terms, any motion of molecules that was not both a heating and a rotation could not be this motion. If this is correct, I think it may be inferred that the heating, the rotation, and the motion of these molecules all share the same value in every world and are, in consequence, all identical. This is an instance of a particularly strong reductionism, and in this case, I am inclined to believe it, or something like it, is true. The weaker conclusion that arises if we drop the assumption that the ball is necessarily composed of the particular molecules it is actually composed of - namely, that in any world where it is composed of these molecules there is this heating at m if and only if there is this rotation - this conclusion, I think, is quite acceptable. It is to be noted that this heating was spoken of advisedly; in other words it might not have been to exactly the same temperature, as indeed the rotation might not have been of exactly 35 degrees. But to be identical with this heating, we cannot allow a variation from the actual final temperature of, say, thousands of degrees, any more than this rotation

may be considered identical with the ball rotating through 360 degrees a hundred times during m.

No large scale adoption of reductionism is involved in this case; certainly the position is compatible with there being some emergent properties at the level of medium-sized physical objects. But so long as a sharp distinction is drawn between heat and the sensation of heat, examples like the one considered seem very strong examples for a reductionist position. The difficulties of the position of the heating and the rotation in the world's causal history may be dissolved as before, and the emergentist is open to the line, if he wants to accept reductionism in this case, that at this point two causal chains in the world's causal history are running parallel.

Finally we need to consider the modal statements that were adopted with reference to a particular explosion, at the beginning of III. There are four statements, each of which is to be said to be true. p43

Initially, it is worthwhile to recall the significance of these examples. They were raised in opposition to the idea that the identity criteria proposed by Davidson, and that in (C3), may be interpreted in a particular modal way; in particular, I wish to deny that the causes and effects of an event are the necessary properties of that event, anymore than its precise location in space-time is.

Nothing very positive has been said about what means might be used for determining which properties are necessary and which contingent, but in the discussion about the different sorts of properties that might be necessary for the battle of Waterloo compared with a movement of particles, there is the implicit idea that what an event's necessary properties are will depend on what sort of event it is. Thus, I think a decision may be reached about the necessary properties of the battle of Waterloo, and that explosion, only when we have some idea about the sort of properties that are necessary for battles and explosions in general. Of course, there might be further necessary properties peculiar to each particular case, but the frame of reference is a framework of kinds.

The general theory of events, it follows, should not have anything particular to say about necessary properties, and as will be seen, the four sentences to be considered are easily incorporated into the picture that has been presented.

Firstly, " The explosion might not have caused Smith to jump " is clearly true on the above account. This explosion might well have taken place in a world in which Smith was nowhere near the explosion when it occurred, and so the explosions place in the causal history of that world would diverge from its place in the real world. Similar remarks are applicable to the

causes of the event too, which is the gist of the second statement: " The explosion might have been a suicide, or Jones might have made a mistake ". Taking explosions to have necessary properties to do with size and location, basically, clearly the precise details of events and actions leading up to the fatal mixings of the explosive substances are not directly significant for the problem of the identification of the explosion.

Again, the statement " The explosion could have happened a few moments earlier " is easily accommodated in the approach urged here, and so is " The explosion could have damaged the refectory " provided to do so it would not have had to be of a significantly different order.

In general, then we may say for each kind of event there will be a set of conditions, which each event in the kind will hold in a form modified to suit the particular requirements of the individual event. These conditions determine which physical manifestations in various worlds may be considered to be manifestations of the event. It is the presence of conditions of this sort that helps most to characterize the event subset of G.

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Despite the limitations of the analysis of events presented here, I would claim that it has succeded in the aims established at the beginning of this paper. It satisfies conditions (C1) - (C4), while having

the scope needed according to conditions (F1) - (F4). Further, all the particular instances of assertions of event-identity are given the appropriate truth-value by the theory; it also does not attempt to provide any a priori account of the necessary properties of events in general, which is here considered undesirable as is apparent from the remarks immediately above. Finally, it leaves room for the rejection or development of an emergentist metaphysics, and I would claim, sheds some light on just what is at stake in the emergentist dispute with reductionism. The analysis has, then, I hope, some value as a first step towards a theory of events.[40]

Footnotes

1. See Davidson (1), Kim (2). For references, please refer to the biblipgraphy.
2. See Goodman, pp.3-32.
3. Goodman, p.13.
4. See Frege, p.11.
5. Quoted by Engels, ch.8, p.146.
6. See Stebbing, particularly Part 2.
7. See Cresswell, P.95, and III below.
8. For a modern consideration of Emergence, see Meehl and Sellars.
9. Kim (2).
10. Ibid., p.226.
11. P.226.
12. Davidson (3), p.697.
13. See Rosenberg, p.330.
14. This is a point Davidson makes in attempt- to reconcile Hume and Mill, on the one hand, and Ducasse on the other. This depends, as he says, " on the distinction between know- ing there is a law 'covering' two events and knowing what the law is: in my view, Ducasse is right that singular causal state- ments entail no law; Hume is right that they entail there is a law. " (Davidson (3), p.702).
15. Kim (2), p.227.
16. Davidson (1), pp.218-9.
17. Davidson (2), pp.83-4.
18. The example is taken from Goldman (2), p.770.
19. Davidson (1), pp.217-8.
20. Trenholme, p.447.
21. Goldman (2), pp.766-767.
22. Davidson (3), p.702.
23. Goldman (1), p.5.
24. Davidson cites an equivalent deduction for a different purpose in Davidson (2), p.77.

25. Goldman (1), pp.8-9.

26. Kim (1), p.232 (footnote); quoted in Davidson (1), p.223.

27. There is a principle at work here, stemming from Aristotle, that boils down to trying to keep events in as confined a location as possible. This supports and strengthens the principle of same place-same thing - our condition of adequacy (C3) - for if Jones' location is 'in the room', and Smith's is too, they turn out identical according to (C3). The result is avoided if more precision is applied in the determination of location.

28. Davidson (1), p.229.

29. Davidson (3), p.699.

30. Davidson (1), pp.230-1.

31. While both the heating and the rotation may be reduced to the same motion of molecules, it may be argued that from this general absolute motion we can abstract the two components related to the distinct features - heating and rotating - of the 'higher' level.
I am inclined to doubt that the suggestion here would undermine the identity claim. Incidentally, a further argument against the alleged identity might be raised with reference to (C4); it might be said that the rotation and not the heating made x dizzy. The reply should, I think, be clear: there are not two events here but one, and it is its being a rotation, and not its being a heating, that is causally significant to x's becoming dizzy.

32. Cresswell, p.5.

33. Cresswell's entire discussion of basic individuals is on pp.94-8, and so for simplicity I have not provided footnotes for the particular features of his account, as I present and discuss them in this paper.

34. I am taking distribution functions, then, to be total functions. The metaphysics has its roots, then, in the philosophy of Empedocles, though there are no particular reasons of a metaphysical kind why a total and not partial function was employed. It would seem, in fact, that a partial function would be more defensible from the point of view of our intuitions. I do not want to discuss this though; the reason for a total function being employed is simply the fact that if the presentation of this theory in a formal language was attempted, the construction of the truth-definition will proceed all the more easily if a total function is employed.

35. Once again, I have in mind here a total, rather than a partial function, following Cresswell. As before, there are probably good intuitive reasons, from the point of view of metaphysics, for making the decision in favour of the partial function, but in terms of the development of the theory formally, the total-function version would be most naturally considered first.

36. The relation holding between the partitioned objects, or more generally, sub-events, is that derived from the geometry on ϵ.

37. We are leaving non-animal life out of account here, for simplicity.

38. Clearly it is the case that locational properties are sometimes causal ones. Any locational property true of e(w) is clearly true of any ⟨he(w)⟩ .

39. For further discussion, see Wiggins, especially fn.44, p.72.

40. I would like to thank Dr. W.Hart for his help in the production of this paper.

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