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Causation, Contexts,
and Event Individuation

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1. Introduction

The kind of events used in linguistic theories are rather coarse-grained. For the purpose of tense semantics, it is sufficient to identify events with intervals of time. Although this view will not be tenable for more subtle phenomena, people still agree that events can have several properties and be described in various ways. Parsons (1990), for instance, suggests a rule that "every stabbing is a killing". Or, we would like to be allowed to assume that if Sue repaired something in e, and this something was indeed her car, then Sue repaired her car in e. There is a philosophical tradition, however, that perceives events as very fine-grained objects. This tradition was originated by a suggestion by Davidson (1969) to individuate events: two events e and f are identical iff they have the same causes and effects. If this criterion is adopted, the linguist's simple objects are no longer sophisticated enough. Tension arises as soon as the linguist starts using event causation. Using a *CAUSE* relation between events is appealing in certain cases. Should the linguist, then, reshape his ontology to make sure that the *CAUSE* relation does the right things? This question has never been answered thoroughly.

The structure of this chapter is the following: I start by presenting two examples that demonstrate why causation seems to require fine-grained events. Next, I discuss Lewis's definition of *CAUSE* as a relation between events. I show that he misuses the fine-grainedness of events to hide shortcomings in his theory. A repair of Lewis is then developed, based on a suggestion by Dowty for a *CAUSE* relation between propositions. This new *CAUSE* is still a relation between events. The new theory does not make any claims about the nature of events in and of itself. I show that the philosophical notion of events leads to wrong predictions in certain, up to now unnoticed cases. I thus suggest using the Dowty-style *CAUSE* with linguistic events and reanalysing the prominent counterexamples as

counterfactual statements involving a focus. I show that this perspective leads to interesting predictions in a wide range of examples, including the problematic cases above.

2. Event Individuation by Causal Relations

Davidson (1969) suggests the following criterion to individuate events: two events are identical if and only if they have the same causes and effects. At least one direction of this equivalence is a necessity, once we assume that events stand in causal relations. Let me give two examples that illustrate why this assumption leads to events that differ only in very subtle ways.

(1)   a. Pat came home late last night because of a traffic jam. She started cooking spaghetti at 11 P.M. which caused the neighbour to call the police.

        b. The traffic jam caused Pat's cooking spaghetti.   (false)

        c. The traffic jam caused Pat's cooking spaghetti late.   (true)

        ∴ The event of Pat's cooking spaghetti is not the same event as the event of Pat's cooking spaghetti late.

(2)   a. Bob was tied to the railway line where the train would pass in a few minutes. However, the departure of the train from the preceding station was delayed. Therefore Bob was still alive when Pat accidentally came by and could rescue him. Just when she had pulled him off the railway, the train thundered past.

        b. The delayed departure caused Bob's rescue.   (true)

        c. The departure caused Bob's rescue.   (false)

        ∴ The train's departure is not the same event as the train's delayed departure.

Whereas the linguist would be happy to have only *one* event of cooking or only *one* event of departure, the philosopher will have to accept at least two. These events admittedly look very similar, and it was claimed (see, e.g., Lewis 1973) that the difference between such events was due to the choice of properties that are essential for the respective event. Thus, the event e_1 of the train's departure can occur at earlier times in other worlds. The event e_2 of the train's delayed departure, on the other hand, necessarily occurs too late. We will see where this leads us.

3. Lewis: A Formal Theory of Causation

David Lewis (1973) has set up a formal theory of event causation, building on Davidson's intuitive notion of event causation. Starting out from his theory of counterfactual implication, Lewis gives the following definition:

(D.I) The relation O is a unary relation on the domain of events. $O(e)$ is true in a world w iff e occurs in w.

An event c causes an event e, $c\ CAUSE\ e$, iff

a. $O(c) \,\square\!\!\rightarrow\, O(e)$ and

b. $\neg O(c) \,\square\!\!\rightarrow\, \neg O(e)$.

If the events e and c both occur in w, then condition (a) is trivially true and (b) roughly says: "If c had not occurred, e would not have either." This seems to be a correct way to formalise the kind of reasoning we actually do to establish c as a cause of e. However (D.I) turns out to have the tendency of mistaking necessary preconditions as causes. Let us look at an example:

(3) Imagine that Joe had a bad accident, e_1, in 1989. Luckily, Dr. Spock came by and give first aid (e_2). He managed to get Joe's heart beating again (e_3) and thus saved his live. One year later, Pat (who is a member of the mafia) shot at Joe (e_4). Joe died as a consequence of the shot (e_5).[1]
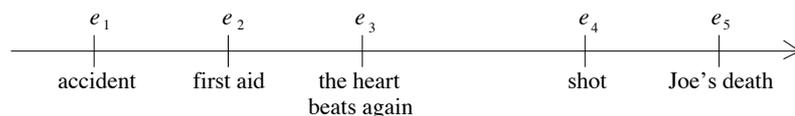
Intuitively one would like to find two causal relations in this diagram: $e_2\ CAUSE$ e_3 and $e_4\ CAUSE\ e_5$. Lewis's definition however, if innocently applied, makes the prediction that, for instance, $e_2\ CAUSE\ e_5$ because, if Dr. Spock had not saved Joe's life in 1989, the actual death would not have occurred in 1990.

Lewis tries to come up with a solution for this problem by discussing the circumstances in which an event e occurs in some possible world and those in which it doesn't. The notion of occurrence is a central ingredient of Lewis's theory and interacts with the notion of essential property: if an event e occurs in a world w, then it has to have all its essential properties in w. On the other hand, if something occurs in w that has all essential properties of e, then e does occur in w. (It is easy to check whether (D.I) relies on these assumptions.) However, a fine-grained distinction of events does not help to avoid $e_2\ CAUSE\ e_5$. Let me show why.

If we take Lewis's writings seriously, we must assume that his reaction to example (3) would be as follows: when uttering a sentence such as

(4) Dr. Spock's first aid caused Joe's death

we never know which one of a multitude of events of *Dr. Spock's first aid* we are referring to. Context will make clear how *stable* or *fragile* the event referred to must be.[2] If we argue, for example, that

(5) Dr. Spock's first aid caused Joe's heart to start beating again

is a true sentence, we assume that we talk about an event $e_2{}'$ of first aid and an event $e_3{}'$ of heartbeat with the following properties: $e_2{}'$ is comparatively stable—that is, we have to go to remote possible worlds in order for $e_2{}'$ not to occur.

Event e_3' on the other hand is comparatively fragile—that is, it ceases to occur easily enough as we move away from the actual world. Thus, in worlds where e_2' does not occur (= far away), e_3' does not either; therefore sentence (4) is true.

Can we make use of this kind of reasoning to prevent the causation relation between Dr. Spock's first aid and Joe's actual death? We want to argue that (4) is false. Thus, we have to show that there are worlds where Dr. Spock's first aid does not occur but Joe's death still does. We can either claim that the event e_2'' we refer to in (4) is so fragile that it easily ceases to occur. Especially, we have to find worlds where this actual first aid does not occur yet Dr. Spock does something to save Joe's life. In such worlds $\neg O(e_2'') \wedge O(e_5)$ holds true. Therefore e_2'' does not cause Joe's death. Alternatively, we can claim that the event e_5'' denoted by 'Joe's death' in (4) is very stable. It even occurs in worlds where Dr. Spock's help, e_2'', does not occur, and therefore there are again worlds where $\neg O(e_2'') \wedge O(e_5'')$ holds true. This kind of event of Joe's death can probably be described as *Joe's death no matter when*.

Lewis claims that our choice of events is contextually driven. Context tells us what is essential for the event in question: "Don't say: here we have the events—how fragile are they? . . . Our standards of fragility might be both vague and shifty. . . . [The] resolution of vagueness is influenced by context" (1986: 196ff.). However, there is no independent notion of context in the examples above. The term "context" is used to hide our pretheoretic intuitions. In short, "context" can tell us which standards of fragility to use iff this "context" knows whether we want to prove or reject a causation relation.

I conclude that the distinction of causes and necessary preconditions cannot be made by relying on the fact that each event-denoting expression can refer to many events of varying stability. It may be useful in other respects to have many events at hand, but it is not with respect to this problem.

I also refuse the following kind of answer: "Maybe Dr. Spock's first aid does cause Joe's death one year later, in an abstract sense". This kind of extension of a theory to the borderline cases may be an elegant simplification in some cases, but it is not here. It would, for example, not be able to explain why we have an intuitive notion of *occurrence of an event* and of *causation*. If we stick to the good intuitions about event occurrence, we get the bad causations and vice versa. In a good theory, however, the good intuitions about the objects and concepts involved should converge in the core cases, and the shaky intuitions should correlate to the borderline cases.

4. Dowty's Repair

The definition of causal dependence in (D.I) was made in such a way that one of the two defining clauses would always be trivially true or false. We now develop a modified version of (D.I) by getting both clauses to work.

What really happened in the above example was that necessary preconditions c of later events e had a strong tendency to be analysed as causes of e. We can fruitfully construct hard cases for Lewis by telling stories in which some neces-

sary precondition c of e took place but without literally causing e. The kind of examples that will contradict our intuitions most clearly is of the following shape. Assume that some event c takes place at some time and that it prevents another event e, which would otherwise have taken place, from happening. For instance, Carol might find and switch off a ticking bomb, which would have otherwise exploded and destroyed the White House. Assume, moreover, that this makes it possible for some other event of the same kind as e to occur later. In our example, the bomb might be reused years later to blow up the Kremlin. One would clearly hesitate to say that Carol's finding the bomb caused the Kremlin to explode. Yet, this is what our theory predicts. Sentence (4) is an example of this kind.

Why are we so sure that Pat's shooting at Joe was cause for him to die but not Dr. Spock's first aid? In some sense, we seem to think that Joe might have lived on for many years after the first aid he was given by Dr. Spock. Nothing at the time of Joe's accident in 1989 points in a direction that inevitably leads to Pat's shot one year later.[3] There are possible worlds close to the actual one where Dr. Spock's first aid occurs but *not* the alleged effect, Joe's death from a shot in 1990. Causes, however, should in the simplest case always lead to the effects, as long as no mystery occurs in between.

Can we flesh out condition (D.I.a) so as to capture this observation? Lewis himself made a similar suggestion in order to handle a different problematic case: some course of events may be transferred into other worlds where "it keeps its intrinsic features" and exhibits the same sort of behaviour, but matters differ in other respects (1986: 206f.). Lewis added that such an operation was not in the spirit of his whole enterprise. The problem is that standing in any other world, we will always find a world in which both c and e occur and which is very similar to the actual world—namely, the actual world itself. We can't say something like (6):

(6)   An event c causes an event e iff
     a. For all worlds where $\neg(O(c) \wedge O(e))$, there is a world w' that is closer to the actual world and where $(O(c) \wedge O(e))$ holds true.
     b. $\neg O(c) \; \Box \!\!\to O(e)$.

In Lewis's framework we always decide relative to a (counterfactual) proposition Φ how close a possible world w is to the actual one. (In fact, Lewis only *compares* possible worlds where Φ is true in their relative closeness to the actual world, where Φ is false.) So, there is nothing like a set of worlds being *close* to ours in any absolute term.

Dowty (1979) discusses Lewis's notion of causation and notes the theory's tendency to mix up necessary preconditions with causes. He develops a modification that mimics our desired definition (6). His definition does not provide an absolute criterion to distinguish causes from preconditions. The perspective is the following: Lewis's theory gives us an enormous number of causes for every event. We want to find the "strongest" causes—those that can be already omitted by making minimal changes in the actual world. To find the strongest

causes, we compare the possible causes pairwise. This is Dowty's definition, adapted for the event case:

(D.II) a. *e depends causally on c* iff $O(e)$, $O(c)$, and $\neg O(c) \,\square\!\!\rightarrow\! \neg O(e)$.

  b. *c* is a *causal factor* for *e* iff there is a series of events $c, c_1, \ldots, c_n, e$ ($n \geq 0$) such that each member of the series depends causally on the previous member.

  c. '*c CAUSE e*' is true iff *c* is a causal factor for *e* and, for all other *c'* such that *c'* is a causal factor for *e* and all $\neg(O(c) \wedge O(c'))$-worlds *w* in which $\neg O(c')$ is true, there is some $\neg O(c)$-world *w'* which is equally or more similar to the actual world w_0 than the other $\neg(O(c) \wedge O(c'))$-worlds. As a formula:

$$\forall w(w \vDash \neg O(c') \rightarrow \exists w'(w' \vDash O(c') \wedge \neg O(c) \wedge d(w_0, w') \leq d(w_0, w)))$$

  where *d* measures the distance of w_0 from counterfactual worlds induced by the counterfactual formula $\neg(O(c) \wedge O(c'))$.

Apart from adapting Dowty's definition for the event case, I have included some refinements while keeping the idea that we compare weightier causes and lighter causes. The differences are of a rather technical nature. The definitions will have to be refined even more if we want them to work in cases in which more than two potential causes for an event are to be compared. They should result in a partial order among a finite set of potential causes. I omit such details here.

Let us look at our examples again to see how (D.II) works. What about the first aid e_2 of Dr. Spock in 1989, in comparison to Pat's shooting e_4 in 1990? Now we are allowed to rely on an intuitive notion of occurrence: $\neg O(e_2)$ holds true in worlds where, basically, Dr. Spock does nothing for Joe. In these worlds Joe dies in 1989. In the same way, Pat's shooting does not occur if Pat does nothing, and Joe's death e_5 does not occur if Joe dies at another occasion, under different circumstances. Thus we find that both, e_2 and e_4 stand in the crucial counterfactual relation to Joe's death e_5. But what will worlds look like where either e_2, e_4, or both do not occur? Worlds where e_4 (= Pat's shooting) but not e_2 (= the first aid) occurs are rather outlandish. These are the worlds with Joe's spontaneous self-healing or other miracles. So we can ignore these as candidates for *most similar worlds*. If e_2 does not occur, e_4 does not happen either in the more similar worlds. A lot more things do not happen also—for example, everything Joe did between 1989 and 1990. Thus, we can claim that the worlds in which $\neg O(e_4)$ and $O(e_2)$ hold are closer to the actual world than those in which $\neg O(e_2) \wedge \neg O(e_4)$. The following holds true:

(7) $\forall w(w \vDash \neg O(e_2) \rightarrow \exists w'(w' \vDash O(e_2) \wedge \neg O(e_4) \wedge d(w_0, w') \leq d(w_0, w)))$.

On the other hand, the same does not hold true for e_2 as a cause for Joe's death. The following is *false*.

(8) $\forall w(w \vDash \neg O(e_4) \rightarrow \exists w'(w' \vDash O(e_4) \wedge \neg O(e_2) \wedge d(w_0, w') \leq d(w_0, w)))$.

The closest worlds are those in which e_4 does not occur but e_2 still does. Thus, in comparison to the more stable e_4 (Pat's shooting), e_2 (Dr. Spock's first aid) is ruled out as a possible cause. We can derive this without any additional assumptions about the essential properties of the event of Dr. Spock giving first aid to Joe.

5. A Problematic Case

Note that the Dowty-style analysis (D.II) does not solve the linguist's problem of having too many events. It avoids certain misuses of the lavish richness of the domain of events. However, examples like (1) and (2) above still motivate a rich event ontology. It is interesting that (D.II) in and of itself does not provide an independent identity criterion either. The framework will be flexible enough to host any kind of event. It is our raw intuition about sentences such as (1b) and (1c) and (2b) and (2c) that calls for a fine-grained individuation.

Let me reconsider (1) in the new framework. If we ask ourselves which of the two cooking events, the cooking of spaghetti, cs, or the late cooking of spaghetti, csl, is the one that causes the neighbour to call the police, (D.II) will give a clear answer: although both events qualify as potential causes, it is only the more fragile csl that actually stands in the *CAUSE* relation to the neighbour's call (d):

$$(csl \; CAUSE \; d) \wedge \neg (cs \; CAUSE \; d).$$

This does not run against our intuition. However, it leads to serious problems in the analysis of sentences of the following kind:

(9)   If Pat's cooking had occurred earlier, it would not have caused the neighbour to call the police.

The first sentence refers to an event of Pat's cooking spaghetti which can occur at earlier times in other possible worlds. It might, for instance, refer to cs. It may, however, not refer to csl because wherever csl occurs, it occurs late. The second sentence takes up the event with the anaphoric pronoun *it*. The sentence counterfactually states that *it* would not have stood in a certain causal relation. This presupposes that *it* actually *does* stand in that causal relation in the *actual* world. (Otherwise we would be allowed to say: ". . . it would not have caused the neighbour to call the police *either*", which is certainly odd in the above scenario.) However, the event that causes the call in the actual world is csl, the essentially late event of Pat's cooking spaghetti. But exactly this event was not a possible denotation for *it*. Therefore, we cannot represent a sentence like (8) in our theory of causation.

Definitions in the tradition of (D.I) and (D.II) have the effect that an event can hardly occur in other worlds without its causes and effects. An event that causes something else to happen will keep all the properties that are necessary for the causal relation in all worlds where it occurs. Therefore an event can only occur without causing if certain external parameters have changed that are also necessary for the causation to take place. The event csl of essentially cooking

spaghetti late can then only occur without causing the call if the neighbour is deaf, for example.

However, sentence (9) demonstrates that we quite naturally talk about events that occur *without* causing what they actually *do* cause in the real world. And we do not have in mind any external changes like a change in the neighbour's perceptive abilities. This observation can't be explained in the framework discussed so far.

6. Two Kinds of Causal Statements

The conclusion to draw from examples like (9) is one that is not breathtakingly new at all:

(10)   There are sentences of the form *the A caused the B,* where *the A* and *the B* refer to events *a* and *b*, which are *not* equivalent to *a CAUSE b*.

Let us call these sentences *pseudocausal sentences* in contrast to *true causal sentences*. The existence of pseudocausal sentences was already noted by Davidson (1969). A more recent discussion to the same end can be found in Bennett (1988). Dowty (1979) doesn't have to face these questions because he defines causation as a relation between propositions, not events. He can leave the linguistic notion of *event* untouched but has to pay the prize: events no longer cause.

Remember that our final definition of *CAUSE* in (D.II) was such that it could be used with both linguistic events and philosophical events. In the rest of the chapter I elaborate (10) in such a way that

> *CAUSE* is understood as a relation between linguistic (= coarse-grained) events.

All alleged counterexamples are understood as pseudocausal sentences—that is, not referring to a causal statement *a CAUSE b*. I interpret pseudocausal sentences as counterfactual statements that involve a focus. This motivates my distinction between true causal sentences and pseudocausal sentences on independent grounds and at the same time gives a comparatively precise answer to the question "what do pseudocausal sentences say?"

I claim that there is an essential difference between true causal statements and pseudocausal statements. Let me repeat two examples:

(11)   The delayed departure caused Bob's rescue.
(12)   Dr. Spock's first aid caused Joe's heart to start beating again.

Sentence (12) will qualify as a true causal statement. We refer to the event e_1 of Dr. Spock's first aid, and to the event e_2 of Joe's heart starting to beat, and the world is such that nonoccurrence of the first would have resulted in the nonoccurrence of the second. In (11), however, matters are different. We refer to the event *d* of the delayed departure and the event *r* of Bob's rescue. But if the departure had not occurred, the rescue would have taken place all the more. I as-

sume that (11) rather expresses that "if the departure had occurred *in a different manner* (e.g., at an earlier time), then the rescue would not have occurred". The difference between true causal statements and pseudocausal statements is this:

(13)   True causal statements talk about the nonoccurrence of certain events.
       Pseudocausal statements talk about the occurrence of events in a different manner.
       There is no event so fragile that it could not occur in a different manner.[4]

I assume that pseudocausal statements are formally distinguished from true causal statements in that the former are understood with a focus on the crucial property. I now demonstrate that recent theories about focus can be used to straightforwardly derive the meaning of pseudocausal statements. I do not go into a formal definition of the *focus semantic value of a sentence*. However, my informal discussion is based on the interpretation of focus developed by Rooth (1985, 1992), and my terminology is coherent with his theory. If we manage to elaborate (13) in a satisfying manner, then events will prove to be solid causes and effects without becoming useless for linguistic purposes.

7. Some True Causal Statements

We distinguish true causal statements from pseudocausal statements in that the former do not contain a focus and are interpreted along definition (D.II), whereas the latter are distinguished by having a focus feature on some property in the description of the events involved, and consequently are interpreted in a different manner. In this section, we interpret some sentences as true causal statements and see what the result is. I sometimes call them *causal statements* for short, to avoid the puzzling question of "whether a true causal statement is true".

Let us begin with

(14)   Pat's cooking spaghetti, cs, caused the neighbour's calling the police, d.

This sentence, if interpreted as a causal statement, is true iff the relation

$$(cs \; CAUSE \; d)$$

holds true because of definition (D.II). We have noted in section 5 that cs, the event of cooking spaghetti, will in any case be a potential cause for d, the call. However, in section 5 we have still maintained the picture that there was another potential cause, csl, the cooking-spaghetti-late event. We have given up this assumption in the meantime. We assume, in best linguistic tradition, that there is only one event of cooking, which is a cooking of spaghetti, which occurs late, which is performed by Pat, and so on. Therefore cs has no longer to compete with other potential causes, apart from very weak ones such as the invention of the telephone, Pat's birth, and so on. We thus find that ($cs \; CAUSE \; d$) holds true, because of definition (D.II). Sentence (14) is true in our world.

The sentence

(15)   Pat's cooking spaghetti late caused the neighbour's calling the police

is true for the same reasons because (15) expresses the same causal statement as (14). The expressions 'Pat's cooking spaghetti' and 'Pat's cooking spaghetti late' denote the same event.

Now consider the sentence

(16)   The (late) departure, e, caused the rescue, r.

If we interpret (16) as a causal statement, we predict that it will be true if and only if the relation

$$(e \; CAUSE \; r)$$

holds true, because of definition (D.II). However, we have noted already that the nonoccurrence of e means that the train does not leave the station at all. In worlds where the train does not leave the station, Bob will be rescued in any case: Pat will come by, will find him lying on the railway, and free him. Therefore, e does not even qualify as a potential cause for r. Sentence (16) will be predicted to be false. (This prediction is elegantly confirmed in section 8.)

The following sentence will also be false if interpreted as a causal statement:

(17)   The traffic jam, t, caused Pat's cooking spaghetti late, cs.

As in (14) and (15), there is only one event, cs, of Pat's cooking spaghetti. If the traffic jam had not occurred, then Pat would still have cooked spaghetti, just somewhat earlier. Therefore, the relation $(t \; CAUSE \; cs)$ does not hold. (Note that matters would be different had we assumed that Pat originally had intended to go to a restaurant and only cooked spaghetti because the restaurants had already closed when she came home.)

Sentence (12) is another example that becomes true if interpreted as a causal statement. I do not go through the computations.

We have seen whether some sentences are true or false if interpreted as a (true) causal statement. The results are acceptable for sentences (12), (14), and (15). However, for (16) and (17) we are left with a problem. After all, we had the feeling that they should be true in *some* sense, if they are uttered in the scenarios I gave in (1) and (2). In the next section I show that they are true if they are interpreted as pseudocausal statements (with a certain focus structure).

8. Pseudocausal Statements

Let me start from the by now well-known sentence (16) in order to give an outline of the interpretation of pseudocausal statements. I propose that we take (16) to mean something like this: "If the departure had not occurred in a *delayed* manner, then Bob would not have been rescued". To evaluate this sentence, we have to check in *nearby worlds*, where the departure was not delayed, and see whether the rescue takes place therein. However, when looking for these nearby worlds, we take into account that the departure must have a property contrasting with the delay. The departure should not be omitted altogether but should occur *early* or *in time*.

It has been shown that focusing an expression in a sentence always results in evoking a set of logically and contextually appropriate *alternatives* to the focused expression (see, among others, Krifka 1991 and Rooth 1992). Focus associates with operators that compute the value of the sentence by taking these alternatives into account. For a thorough discussion of these mechanisms, the reader is referred to Rooth (1992). Let us for now denote the set of focus alternatives for an expression α by $[\![\alpha]\!]_f$. Focus alternatives for *delayed* in (16) will be, for example, $[\![delayed]\!]_f = \{earlier, in\ time\}$.[5] As the alternatives may depend on the context in which a sentence is uttered, the set of alternatives is not determined uniquely. However, this notion of "context" is not circular, in contrast to the one in section 1. We know this use of "context" from examples that have nothing to do with causation, and we rely on the same kind of "context" in the present examples. The set of alternatives is further restricted on logical and linguistic grounds. There is no danger of misusing it as a waste bin for unresolved cases of causation.

I assume that (16) is uttered with a focus on 'delayed'. The set of focus alternatives is used to compute the set of possible worlds over which we quantify in a counterfactual statement. In short, sentence (18) is interpreted as in (19). I have spelled out Lewis's symbol '□→' of counterfactual implication as quantification over "nearby" possible worlds. Consequently, the world parameter has to turn up at all places where a world-dependent property is ascribed. To this end, an index w is exploited.[6]

(18)   The [delayed]$_{\text{focus}}$ departure caused Bob's rescue.

(19) $\forall w([\neg \exists e(\text{departure}_w(e) \wedge \text{delayed}_w(e) \wedge \exists Q \exists e_1(Q \in [\![\text{delayed}_f\ \text{departure}]\!]_f$
$\wedge\ Q_w(e_1))] \rightarrow \neg \exists e_2(\text{rescue}_w(e_2) \wedge \text{theme}_W(e_2, \text{BOB}))).$

Note that (19) involves existential formulas instead of making reference to events e and r in other worlds. I am open to any reformulation of the meaning of (18) in this respect. What is important is that the set of relevant alternative worlds is restricted by the focus alternatives of the property in focus. Let me comment on this point.

It was already pointed out by Dretske (1972) that focus may restrict the choice of possible alternative worlds. He discussed the following examples, giving a scenario where, because of the focus, (20) is false whereas (21) is true:

(20)   If Clyde hadn't married BERTHA, he would not have qualified for the inheritance.

(21)   If Clyde hadn't MARRIED Bertha, he would not have qualified for the inheritance.

The effect that focus has in these cases is similar to the effect outlined in (19). Thus we do not stipulate a completely new mechanism. On the other hand, it is well known that focus helps to determine the domain of quantification, both for nominal and adverbial quantifiers (see Rooth 1992; Eckardt 1995). This is again in line with the use of focus postulated in examples (18) and (19).

One might object that the foci that I diagnose in pseudocausal statements differ in one crucial point from other cases of focusing: they are rarely indicated by a pitch accent. This is indeed a severe objection because traditionally we assume that focus is made visible by an accent, at least in the normal case. I think that pseudocausal statements differ from normal sentences in that they convey very complex information in an extremely condensed way. Probably the hearer understands a pseudocausal statement only after some tacit reasoning and by making use of world knowledge. Any theory that accepts (10) will have to make some assumption of this kind. The advantage of the perspective developed in this chapter is that we get a straightforward semantic representation of pseudocausal statements with a minimum of guessing. By representing the pseudocausal statement (18) as in (19), sentence (18) becomes true in our world. We have to look at counterfactual worlds where the departure occurs with different properties and where Bob consequently will not be rescued. When (18) was evaluated as a causal statement, it was false. I think that this analysis reflects the data appropriately.

Let us look at some more examples.

(22)   The traffic jam caused Pat's cooking [late]$_{focus}$.

In (22) we face a focused property in the description of the second event. Nevertheless, the effect of focus will be again to restrict the set of possible worlds referred to in the example. The focus alternatives of 'late' might be something like $\{at\ a\ normal\ time, early\}$. We can use such a set of alternatives associated with a single item to compute the resulting alternatives for the more complex parts of the sentence, following the leads developed in Rooth (1985). This will result in a set of alternative properties of events:

> $[\![$Pat's cooking spaghetti late$_f]\!]_f$ = {Pat's cooking spaghetti early, Pat's cooking spaghetti at a normal time}.

I assume that sentence (22) states something like this: "In all nearby worlds where no traffic jam occurred, there would not have been a cooking by Pat that was *late*, but instead a cooking by Pat that was *at a normal time* or *early*". This is formalised in (23):

(23) $\forall w([\neg\exists e(\text{traffic-jam}_w(e) \rightarrow \neg\exists e_1(\text{cook}_w(e_1) \wedge \text{theme}_w(e_1, \text{spaghetti}) \wedge$
        $\text{agent}_w(e_1, \text{PAT}) \wedge \text{late}_w(e_1)) \wedge \exists Q\exists e_2(Q\in[\![$Pat's cooking spaghetti late$_f]\!]_f$
        $\wedge\ Q_w(e_2)))$.

We have now seen example (18), a pseudocausal statement with a focus in the description of the subject event, and example (19), a pseudocausal statement with a focus in the description of the object event. Are there any examples in which both subject and object event description involve a focused property? Yes, I think we can find such examples. The following sentence is of that kind:

(24)   Assume that the coal prices are always low in summer and somewhat
        higher in late autumn because everybody has to buy coal then. Assume

further that this year the winter came surprisingly early, and people were more eager than normally to get coal in time. Then we can say:

The [early]$_{focus}$ beginning of the winter caused the [quick]$_{focus}$ rising of coal prices.

If we interpret (24) as a sentence involving two foci, as indicated in the example, then we predict the following meaning:

(25) $\forall w([\neg\exists e(\text{begin}_w(e, \text{winter}) \wedge \text{early}_w(e) \wedge \exists Q \exists e_1(Q \in \llbracket \text{early}_f \text{ beginning}$
of the winter$\rrbracket_f \wedge Q_w(e_1))] \rightarrow \neg\exists e_2(\text{rise}_w(e_2) \wedge \text{theme}_w(e_2, \text{coal-price})$
$\wedge \text{quick}_w(e_2)) \wedge \exists R \exists e_3(R \in \llbracket \text{quick}_f \text{ rising of coal prices} \rrbracket_f \wedge R_w(e_3)))$.

Thus, sentence (24) says something like this: "In all worlds where there isn't an *early* beginning of the winter, but a *normal* or even a *late* beginning of the winter, in all these worlds (nearby) there isn't a *quick* but only a *normal* or even maybe *slow* rising of coal prices". This reflects our intuitive understanding of (24) in the given scenario. Sentence (24), if understood as a pseudocausal statement involving only one focus, would not match these intuitions, as (25) makes clear.

Assume, for example, that there was only a focus on 'early'. I give the corresponding structure in (26):

(26)   The [early]$_f$ beginning of the winter caused the quick rising of coal prices.

Sentence (26) would be treated like sentence (22) and would result in the following formula:

(27) $\forall w([\neg\exists e(\text{begin}_w(e, \text{winter}) \wedge \text{early}_w(e) \wedge \exists Q \exists e_1(Q \in \llbracket \text{early}_f \text{ beginning}$
of the winter$\rrbracket_f \wedge Q_w(e_1))] \rightarrow \neg\exists e_2(\text{rise}_w(e_2) \wedge \text{theme}_w(e_2, \text{coal-price})$
$\wedge \text{quick}_w(e_2)))$.

However, (27) only states that without an early beginning of the winter, there would not have been a quick-rising-of-the-coal-prices. It leaves the possibility open that the coal prices remain constant in those worlds. That is, either the winter starts early, and the coal prices rise quickly, or the winter starts normally, and the coal prices remain constant. This is not what (24) was originally meant to express.

Can we give a systematic interpretation scheme for pseudocausal statements? The examples discussed in (18)through (27) have shown that we have a certain pattern to follow. All pseudocausal statements are of the following kind:

(28)   *A* caused *B*

where *A* and *B* are event descriptions, and at least one of them contains a focused property. These statements are interpreted as universal quantifications over worlds:

(29)   a. $\forall w(\neg\exists e(\text{A}_w(e)) \wedge \exists Q \exists e_1(Q \in \llbracket \text{A} \rrbracket_f \wedge Q_w(e_1)) \rightarrow \neg\exists e_2(\text{B}_w(e_2)))$.

b. $\forall w(\neg\exists e(\text{A}_w(e)) \rightarrow \neg\exists e_1(\text{B}_w(e_1)) \wedge \exists Q \exists e_2(Q \in \llbracket \text{B} \rrbracket_f \wedge Q_w(e_2)))$.

c. $\forall w(\neg\exists e(A_w(e)) \wedge \exists Q\exists e_1(Q\in[\![A]\!]_f \wedge Q_w(e_1)) \rightarrow \neg\exists e_2(B_w(e_2))$
   $\wedge \exists R\exists e_3(R\in[\![B]\!]_f \wedge R_w(e_3)))$.

Interpretation (29a) corresponds to the statement with only a focus in the subject, (29b) to the statement with only a focus in the object, and (29c) to a double-focused statement. The interpretation in (29) show that the effect of focus is the same in all three cases—namely, that of restricting the set of worlds in question by means of the focus alternatives of the original noun phrase. The verb 'cause' must then be understood as a doubly focus-sensitive operator whose meaning is as described in (30). I do not go any further into the consequences such a definition will have for the syntax-semantics interface.

(30)   cause$(A, B) =$

a. $\forall w(\neg\exists e(A_w(e)) \wedge \exists Q\exists e_1(Q\in[\![A]\!]_f \wedge Q_w(e_1)) \rightarrow \neg\exists e_2(B_w(e_2)))$
   if $[\![A]\!]_f \neq \varnothing$ and $[\![B]\!]_f = \varnothing^7$

b. $\forall w(\neg\exists e(A_w(e)) \rightarrow \neg\exists e_1(B_W(e_1)) \wedge \exists Q\exists e_2(Q\in[\![B]\!]_f \wedge Q_W(e_2)))$
   if $[\![A]\!]_f = \varnothing$ and $[\![B]\!]_f \neq \varnothing$

c. $\forall w(\neg\exists e(A_w(e)) \wedge \exists Q\exists e_1(Q\in[\![A]\!]_f \wedge Q_{ww}(e_1)) \rightarrow \neg\exists e_2(B_w(e_2))$
   $\wedge \exists R\exists e_3(R\in[\![B]\!]_f \wedge R_w(e_3)))$ otherwise, i.e., if $[\![A]\!]_f \neq \varnothing$ and $[\![B]\!]_f \neq \varnothing$.

9. More Examples

In the previous sections I have given a perspective in which two kinds of sentences of the form *A caused B* are distinguished. There are true causal statements, which refer to a causation relation *CAUSE*. *CAUSE* is defined as in (D.II) and relies on the linguistic notion of event. There are, on the other hand, pseudocausal statements, which involve the focusing of at least one property in the event descriptions involved and are interpreted as focus-sensitive counterfactual statements. We were motivated to make a distinction between true causal statements and pseudocausal statements because examples like (9) had shown that without this distinction, definition (D.II) (and similar ones) would fail under any notion of event. Let us now come back to the problematic example (9) and see whether we can analyse it under the present perspective.

There is only one event of cooking by Pat, which actually did occur late but might have occurred earlier in other worlds (see section 7). It also actually did cause the neighbour's call, where 'cause' means *CAUSE* in the sense of (D.II). Therefore we can analyse (9) as follows:

(31)   In all worlds where the cooking, *cs*, occurs earlier, there is no event, *d*, that is the neighbour's calling the police and that is caused by *cs*.

Sentence (9), moreover, meets the presupposition that *cs* actually does cause *d* in the real world.

We can make an interesting comparison between (9) and a parallel example where such a presupposition is not met, according to the theory it stands by now. Consider the sentence

(32)   If the train's departure had occurred in time, it wouldn't have caused
        Bob's rescue.

This sentence cannot be truly uttered in the scenario given for (2). It seems that
in spite of (2) we do not think that the departure literally causes the rescue in the
sense of (D.II). It is interesting that, as noted in section 7, the departure of the
train, according to our present view, indeed does *not* cause (= *CAUSE*) the rescue,
although the cooking of spaghetti still does cause (= *CAUSE*) the call. Therefore
we are able to predict the difference between (9) and (32). Sentence (32) is bad
because the second clause presupposes that the departure *CAUSE*d the rescue in
the strong sense of (D.II). This presupposition is not met in the scenario in (2).
The difference between (9) and (32) is one that no theory that uniformly treats
all causal sentences alike can predict. It is certainly a difference that cannot be
predicted if we use (D.II) together with fine-grained events.

10. Conclusion

We have started from the question of whether the linguist can safely use causa-
tion as a relation between events. Event causation in the tradition of Lewis can-
not be integrated into linguistic theory in a simple way. I have argued that event
causation in the tradition of Lewis has another unwelcome feature—namely, that
the causal relations events stand in have a strong tendency to become essential
properties of the event.

   I have outlined a new perspective on sentences of the kind *A caused B*. We
distinguish true causal statements from pseudocausal statements. The former
involve causation in the strong sense of definition (D.II). The latter are counter-
factual statements that involve the focusing of a certain property. Sentences of
the form *A caused B* can be interpreted in both ways (at least in many cases).
They might be true in one sense but false in the other. Whereas the interpretation
of causal statements is more or less unproblematic, pseudocausal statements are
more vague. I have outlined a theory for the interpretation of pseudocausal
statements that is safely based on current theories of focus interpretation and
allows us to compute the meaning of a pseudocausal statement in a deterministic
way. Thus, the concept of *pseudocausal statement* does not stand for a black box
where all cases of unexplainable causation sentences are collected.

   The predictions of the present theory are confirmed by exactly the kind of
data that were problematic for the original account. Moreover, the linguist is free
to use the relation *CAUSE* for linguistic events.[8]

Notes

   1. Note that I avoid talking about a *killing*. I do not want to take a stand about whether
the killing event is the same as the shooting event, or more.
   2. According to Lewis, an event is "*fragile* if, or to the extent that, it could not have
occurred at a different time, or in a different manner. A fragile event has a rich essence; it

has stringent conditions of occurrence" (1973: 196). According to such a definition, a fragile event is one of the first to be dropped when we are looking for worlds most similar to ours. On the contrary, a *stable* event, because of its less stringent conditions of occurrence, is likely to be found also in worlds that are far away from the actual one.

3. We ignore the possibility of a totally deterministic world. I think that if we really believed in determinism, our intuitions about causation would also be radically different from those we actually have.

4. I do not mean to claim that any event can have any property, in some possible world. I don't think that the departure might have been Peter's birthday. However, I do not think that there is a delayed departure that could not have occurred earlier. This is what the slogan is meant to express.

5. Note that in the notation of Rooth, the focus value would be $[\![delayed]\!]_f = \{delayed,$ *earlier*, *in time*}. We could stay coherent with his theory. However, this would make the semantic representation of pseudocausal statements more complex. I avoid these difficulties for now.

6. In this section I ignore all complications having to do with the fact that there are no "nearby worlds", in absolute terms. A more carefully formulated variant of (19) that comes up for this point might be paraphrased like this: "For all worlds w_1 where there is no *delayed* departure, but a *normal* or *early* one, and where Bob does get rescued anyway, there is a world w_2 where there is no *delayed* departure, but a *normal* or *early* one, and where Bob does not get rescued, and such a world is closer to the actual world than w_1".

7. In the framework of Rooth (see note 5), these conditions have to be replaced by $[\![A]\!]_f = [\![A]\!]_0$ and $[\![A]\!]_f \neq [\![A]\!]_0$, respectively.

8. I want to thank the participants of the 1995 Trento Conference on Events for valuable comments and discussions. My original view of things has been seriously reshaped by a remark made by James Higginbotham, which I understood to its full extent only recently.

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