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THE PROGRESSIVE IN MODAL SEMANTICS

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This article presents a semantic analysis of the English progressive as an intensional operator within the framework of modal semantics proposed by Kratzer. This treatment allows a combination of the central idea of Dowty's influential analysis, that the progressive's meaning has a major modal component, with the insights of other scholars (Parsons, Vlach, and Landman). My claim is that using a more sophisticated background theory of modality allows natural solutions for the problems raised for the modal account.*

1. MODALITY AND ASPECT. I will argue in this article that the English progressive has a modal component of meaning, and that the various problems that have arisen in the literature on the progressive can be accounted for if we analyze this component in terms of a sophisticated contemporary theory of the semantics of modal auxiliaries. I will show that the progressive's meaning is both context-dependent and yet monosemous in a way that is characteristic of modals. This result has significance beyond an improved understanding of the semantics of the construction itself: it suggests that we should think carefully about the nature of modality and aspect more generally. Much work in syntax and semantics, of both a theoretical and descriptive nature, takes for granted that we can identify exemplars of these categories across languages, suggesting that they are characterizable in semantic terms. If the categories are actually found to be nondistinct or ill defined in some way, this would affect what types of syntactic or typological questions it makes sense to ask.

What possible relations are there between modality and aspect? Traditional conceptions of aspect take it to relate either to the internal structures of events or some idea of the 'viewpoint' a speaker may take on an event, or both (see Binnick 1991 and Smith 1991 for recent surveys). If one of the central aspectual constructions, the progressive, turns out to be best analyzed within the framework of modal semantics, this could lead to several conclusions. It is worthwhile to mention some of them briefly: Most simply, we might merely have misclassified the progressive as aspectual, though this seems rather implausible. More interesting possibilities would involve coming to terms with the idea that an aspectual morpheme can have a modal semantics. We might hypothesize that 'aspectual' is a functional, in the sense of use-based, rather than a semantic class; that is, we label a construction as aspectual if it is used to say something about the structure of an event, even if its semantics formally classes it with the modals. (Analogously, one might consider English *will* to be functionally a tense but formally a modal.) In this sense, a morpheme could be both semantically modal and function as part of an aspectual opposition. Alternatively, it could be that both aspect and modality are true semantic classes, but that they overlap or one includes the other. With regard to these issues, I think it's worth keeping in mind that many scholars have had doubts about whether aspect is really a unified category, or whether categories like the progressive and perfect, marked in the auxiliary system, should be classified separately from the imperfective and perfective verbal morphology found in Romance and Slavic, for example (e.g. Binnick 1991, Smith 1991). My claim here that the progressive should be analyzed in terms of modal semantics might be seen as giving support to this view.

Indeed, it is also reasonable to ask whether the perfect may have a modal component of meaning; many analyses treat the perfect as indicating a 'result state' of some prior event (e.g. Moens & Steedman 1988, Smith 1991), where I note that 'result' is the opposite of 'cause', which has been given a highly influential modal analysis (Lewis 1973a).

The proposal that the progressive has much semantically in common with modals is of course not new. Dowty (1977, 1979) presents an analysis of the progressive as a combined modal/temporal operator which has become its most influential formal treatment. Concentrating on his analysis of the modal component, it is seen as an ordinary necessity operator. Within the possible-worlds framework that he adopts, treating it as a necessity operator means that it asserts the truth of the proposition under its scope in each of a certain set of possible worlds. Suppose we are interested in the truth of the sentence at an interval of time i in world w (i.e. i and w are the EVALUATION TIME and EVALUATION WORLD; in a simple case i is the speech time and w is the real world). Dowty labels as the INERTIA WORLDS those where what is going on at i in w continues normally or 'develops in ways most compatible with the past course of events' (Dowty 1979:148). Thus, 1 is true if in all those worlds where what was going on during the interval of time described proceeds normally, the squirrel climbs the tree.

(1) The squirrel was climbing the tree.

To put things in somewhat more formal terms, according to Dowty 1 is true at a pair of an interval of time and a world $\langle i,w \rangle$ iff i is in the past and there is an interval i' which includes i as a nonfinal subinterval such that in all inertia worlds w' accessible from $\langle i,w \rangle$, the squirrel climbs the tree at $\langle i',w' \rangle$.

A modal analysis is just as good as its definition of the set of relevant worlds, and various problematic cases brought up in the literature seem to show that the notion of inertia world provides an inadequate definition. This fact has led to two different types of response in the literature on progressives. On the one hand, a number of scholars, including Vlach (1981), ter Meulen (1985), Bach (1986), and Parsons (1990), have responded by rejecting the modal approach, framing the analysis instead in terms of an event-based semantics. They argue that the relation between the kind of events described by a progressive and those described by a nonprogressive is a primitive fact about the domain of events, and not definable in modal terms. On the other, Landman (1992) has suggested a much more complex modal analysis, one that relates the truth conditions of the progressive to the semantics of counterfactuals. However, as we will see below, each of these theories has its own shortcomings.

As this literature on progressives has grown, Dowty's central intuition that the semantics of the progressive is to be framed in terms of the theory of modality has been neglected, I believe. This is not to say that the issue of whether the progressive is an intensional operator has not received the attention it deserves, but rather to point out that scholars have not attempted to relate the difficult cases which have arisen for the analysis of the progressive to more general issues in the semantics of modality. The study of conditionals—in particular counterfactuals, modal forces other than necessity and possibility, and various paradoxes of modal reasoning—has given us a more sophisticated framework for the analysis of modality than that assumed by Dowty. One central idea of these developments, initiated by Stalnaker (1968) and Lewis (1973b) and later taken up by Kratzer (1977, 1981, 1991) and others, is that modal semantics does not simply work with a set of accessible worlds, but that there is a notion of comparison among worlds, so that certain worlds are ranked as more similar to the real world, or as better approximating some ideal, than others.

I will propose a new account of the progressive based on two main ideas. First, I will cast the modal component of the progressive's meaning in terms of this ORDERING SEMANTICS. This will allow a solution to the most important puzzles which have been brought up for Dowty's modal account. And second, I will incorporate reference to events into the modal theory, making it possible to account for some of the data that motivate the event-based theories of Vlach and Parsons. Between them, these two proposals lead to an overall view of the progressive that treats it essentially as a modal operator, though one with a special sensitivity to events which is not shared by the standard modal auxiliaries.

2. THREE ANALYSES OF THE PROGRESSIVE.

2.1. DOWTY'S THEORY. Dowty attempts to state in the terms of interval semantics the intuition that 2 is true iff something was going on that, if it had proceeded normally, would have been a complete house-building by John.

(2)   John was building a house.

Formally the progressive is treated as a sentence operator with the semantics in 3. Here, INR is the function, an 'accessibility relation', which picks out the alternative possible worlds relevant to the semantics of the progressive: INR $(\langle i,w \rangle)$ is the set of inertia worlds for interval i and world w:

(3)   PROG(ϕ) is true at a pair of an interval and a world $\langle i,w \rangle$ iff for some interval
       i' which includes i as a nonfinal subinterval and for all inertia worlds
       w'∈INR $(\langle i,w \rangle)$, ϕ is true at $\langle i',w' \rangle$.

The intuition as to what the progressive means is expressed formally in the following way: the inertia worlds w', with respect to $\langle i,w \rangle$, are those in which what is going on in w during i continues as one would expect it to normally; nothing unexpected happens in these w'. PROG(ϕ) is then true at $\langle i,w \rangle$ iff in all the inertia worlds, i extends into an interval in which ϕ is true.

Certain vague judgments concerning the truth conditions of progressives can be explained in terms of this analysis. For example, many informants are uncertain as to Dowty's example 4, said about an interval during which the coin was still in the air.[1]

(4)   The coin is coming up heads.

The sentence might be taken as definitely false, on the grounds that at the point when it is in the air, it is not determined whether the coin is coming up heads or tails. But the sentence might be considered either true, if the coin eventually does come up heads, or false, if it doesn't, on the grounds that the conditions while it is in the air already determine whether it will come up heads or tails, even though at the time it is impossible to tell which.

This difference in judgments can be seen as reflecting a difference of opinion about which worlds are inertia worlds with respect to the interval i during which the coin is in the air and the evaluation world w. Say the coin does come up heads. If, on the one hand, one considers the state of w during i to be enough to decide this, even though we may not be aware, or even be able to be aware, of all the relevant conditions, only worlds where the coin comes up heads will be in the set of inertia worlds. The sentence will then be true. On the other hand, if the conditions in w during i still leave a high enough role to chance, both worlds where the coin comes up heads and ones where it

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[1] Dowty considers this sentence to be false. As noted in the text, his intuition can be accounted for, but, in my opinion, isn't very firm.

comes up tails will be in the set of inertia worlds. This will lead to falsity. It is in general difficult to know which situation obtains (though certain contexts may bias one towards a particular conclusion, a fact I will return to in §4); this can be seen as accounting for our unclear judgments about the truth conditions of 4.

Dowty, building on the ideas of Taylor (1977), also suggests an explanation for why the progressive is incompatible with those stative predicates that describe a more-or-less permanent property of their subject (Carlson's 1977 'individual level predicates'). (This explanation will carry over to the present analysis as well.) Consider the following data:

    (5)   *John is knowing French.

    (6)   *New Orleans is lying at the mouth of the Mississippi River. (Dowty 1979: 174)

The idea is that these predicates 'indicate a potential for having stage-properties [i.e. temporary properties] at some future or hypothetical time. And this potential exists at any one moment during the whole interval of their truth as much as at any other moment' (179). Part of the progressive's function is to locate a particular time within a longer interval in which the corresponding nonprogressive sentence would be true. But since sentences like *John knows French* or *New Orleans lies at the mouth of the Mississippi River* would automatically be true both of a longer interval and the particular moment or subinterval described within that interval, this distinction is not useful for individual-level statives. According to Dowty, a syntactic restriction has thus arisen preventing the occurrence of the progressive with such predicates. As he emphasizes, this restriction makes some sense, but is not required by anything; thus, one would not be surprised if other languages have a different behavior from English in this respect. The result would be a virtual synonymy between progressive and nonprogressive forms of individual-level stative sentences.

2.2. Parsons's theory. A number of scholars have presented theories of the progressive that rest on the view that the relation between uncompleted and completed events is a primitive fact about the structure of the world (or model) and not, in contrast to Dowty's view, definable in modal terms. Though there are differences among them, I will base my discussion on Parsons's theory, since I think it represents most straightforwardly this core idea. According to Parsons, 7 and 9 receive the translations 8 and 10 respectively. Note that the single difference between the nonprogressive 8 and the progressive 10 is that the latter contains the predicate Hold where the former contains Cul.

    (7) Agatha crossed the street.

    (8) $\exists t[t$ precedes now & $\exists e[\text{crossing}(e)$ & $\text{Subject}(e,\text{Agatha})$ &
         $\text{Object}(e,\text{the street})$ & $\text{Cul}(e,t)]]$

    (9) Agatha was crossing the street.

    (10) $\exists t[t$ precedes now & $\exists e[\text{crossing}(e)$ & $\text{Subject}(e,\text{Agatha})$ &
          $\text{Object}(e,\text{the street})$ & $\text{Hold}(e,t)]]$

Hold and Cul are relations between events and times, and so a crossing event may culminate at a time ($\text{Cul}(e,t)$) or hold at a time ($\text{Hold}(e,t)$). An event of Agatha crossing the street culminates at t iff Agatha finishes crossing the street at t, so that 7 entails that Agatha completely crossed the street. In contrast, such an event holds at t iff Agatha is in the process of crossing the street at t, whether or not she ever does cross. It simply means that a crossing event exists and is ongoing, though it may or may not be completed. Some ideas from Bach 1986 may make clearer the intuition of what it

is for an event to hold. Bach analogizes a partially completed event, one which Parsons would say holds, to a part of an ordinary object. Thus, just as we may speak of a small remaining stretch of elevated sluice, part of an old Roman aqueduct, as 'that aqueduct', we can describe Agatha's activity in which she gets part of the way across the street as an event (which holds) of her crossing the street. To say that this event culminates, in contrast, would be like saying that something is a complete aqueduct.

According to Parsons, the relation between events of a given variety that hold and those that culminate is primitive. There is no way of defining, in terms of culminating crossing events, which events are crossing events that hold (or vice versa). There are two main arguments given for considering the relation to be primitive. The first only applies to Parsons's approach: in a variety of ways, the semantics of the progressive given above fits naturally into a broader system of tense and aspect developed in his work. The second is really an argument against a Dowty-style modal theory; it originates with Vlach and is taken up by the other authors. The problem is that Dowty's explanation of what counts as an inertia world appears inadequate, so that the real world[2] turns out to be a member of the set of inertia worlds in too many cases. Consider 11.

(11) Max was crossing the street.

This is said by Dowty to be true at $\langle i,w \rangle$ iff Max crosses the street in an extension of i in every inertia world with respect to $\langle i,w \rangle$. But imagine that Max does not in fact cross the street because a bus, cruising along P St. at thirty miles per hour, hits him. It seems that, considering the real world w during the interval in which Max gets partway across the street, the normal course of events is for Max to get hit and not cross the street. Hence, it seems that according to Dowty's theory 11 should be false in the situation envisioned, contrary to intuition.

One might object to this line of reasoning by denying that those worlds where Max is hit by a bus should be counted as normal, i.e. as inertia worlds. This would be contrary to an ordinary reading of 'normal', it seems to me, but since the word is merely being used as part of an informal characterization of the set of inertia worlds, we have the right to define the set of inertia worlds in whatever way gets the right results. Why not define them so that they are a subset of those worlds where Max does cross the street—in other words, say that the worlds where Max crosses the street are to be considered 'normal' in the sense required for the progressive? The question here is whether 3, the formalization of the progressive's semantics in Dowty's theory, allows this response.

The function INR, which determines the set of inertia worlds, takes as argument a pair $\langle i,w \rangle$ of an interval and a world. Thus it would seem that any period of time (in a given world) can have only one normal extension. This would incorrectly rule out the possibility that 12 and 13 are true at the same interval. (Suppose that the sink hole which eventually appeared destroyed John's partially built house.)

(12) At 10 a.m., John was building a house.
(13) At 10 a.m., the leaky sewer was creating the sink hole which eventually swallowed up John's property.

One way out of this dilemma would be to consider INR to be sensitive to the topic of the conversation, so that if we are talking about John and his actions, his completing the house is considered normal, while if we are talking about the sewer, the opening of the sink hole and the disaster this caused count as normal. This is essentially the

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[2] Technically, the world of evaluation, the world in which we ask whether the sentence as a whole is true.

approach of Asher (1992), who makes the set of normal worlds dependent on contextually supplied 'perspectives'.[3] The idea here is somewhat similar to the one I will pursue, but this way of stating things leaves a heavy burden on a context-dependent notion of normalcy in which the way that context contributes is not defined. It will be preferable if we can establish firmer criteria for determining what counts as a normal outcome in given cases.

Another option would be to make the progressive operator more sensitive to the proposition expressed under its scope, so that this proposition helps determine the set of inertia worlds. Then 12 and 13 could be differentiated, as in one case we would have the set of inertia worlds with respect to the proposition that John builds a house, something like INR ($\langle$i,w$\rangle$, John-builds-a-house), while in the other we'd have the set of inertia worlds with respect to the proposition that the leaky sewer creates a sinkhole, INR ($\langle$i,w$\rangle$, leaky-sewer-creates-sinkhole). Formally, this gives us the power we need to differentiate the cases, but in order to have explanatory force, the analysis would require some elaboration on exactly how the proposition has an effect. This account is very close to the proposal I will eventually make in this article.

The feature of all of the nonmodal theories that allows them to solve the problem posed by 11 is that they incorporate a notion of event into their ontology. An event, being smaller than a possible world both spatially and temporally, can distinguish what is going on with the bus from what Max is doing in 11, and can say that each has its own normal outcome despite the fact that these outcomes are incompatible. Likewise, one can tell apart the event described by 12 from that described by 13, and say they have incompatible normal completions. There is no reason why this kind of solution cannot be incorporated into the modal theory.[4] Suppose we say that INR takes as its domain the set of events, so that INR(e) is the set of worlds in which e proceeds normally, for any event e. Then we could say that 11 is true iff Max crosses the street in all of those worlds where his walking event proceeds normally. More formally, we might end up with a semantics like 14, where T(e) indicates the time occupied by event e.

> (14) PROG(*Max cross the street*) is true at a pair of an interval and world $\langle$i,w$\rangle$ iff there is an event e in w such that T(e) = i and for all inertia worlds $w' \in$INR(e), there is an interval i' which includes, and extends beyond i, such that *Max cross the street* is true at $\langle i',w' \rangle$.

There are various other ways one might work out the general idea that events are the things whose normal continuations we must consider in the semantics of the progressive. We might evaluate the truth of a sentence with respect to an event, rather than a world, or with respect to event-world pairs; we might make events arguments of predicates, along the lines of Davidson 1967 and much subsequent work, including Parsons. For now, I will work with the version in 14, however, as it alters in the most minor way Dowty's original formulation.

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[3] For Asher, a perspective is simply a proposition describing the progressive sentence's eventuality. The notion of normalcy with respect to a perspective is formalized in terms of the same operator used in a logic for default reasoning. In this way PROG(ϕ) has the same meaning as 'there is some salient perspective π such that, as a default, π leads to the conclusion that ϕ'. However, there is no independent characterization of normalcy or what should be considered a valid default inherence, and so this approach suffers from the weakness noted in the text.

[4] Asher (1992) and Cipria and Roberts (1996) make proposals along these lines (the latter for Spanish, but the issues of concern are similar). Portner (1992) works out parallel ideas in terms of situation semantics.

2.3. LANDMAN'S THEORY. The two analyses we have looked at in detail so far differ in two fundamental ways. Dowty's theory is modal and does not incorporate events, while Parsons's is nonmodal and is based on events. We have already seen that Dowty's approach can be combined with an event semantics, while still maintaining its modal character. Thus, the issue of whether the progressive is modal or not appears to be independent of the data Parsons brings up in favor of an event-based approach. Landman (1992) also supports a modal account that incorporates a sensitivity to events.

Landman's argument in favor of a modal theory is somewhat involved, critiquing as it does some specifics of Parsons's analysis. In its fundamentals, though, it is quite simple. He points out that examples like 2, repeated here, create an intensional context for an indefinite NP within the scope of the progressive. Thus, in contrast to 15, 2 does not imply that a house eventually exists:

(2) John was building a house.
(15) John built a house.

In this way, the progressive is parallel to an undisputed intensional verb like *seek* in 16 or a modal, as in 17.

(16) John is seeking a unicorn.
(17) John should build a house.

Neither of these sentences entails the existence of an entity described by their object.

Landman's specific proposal about the semantics of the progressive is an interesting mixture of the modal and event-based analyses. Consider again Vlach's example 11.

(11) Max was crossing the street.

Remember that Max didn't cross the street because a bus hit him. However, according to Landman, 11 is true because he would have crossed the street if the bus hadn't hit him. But suppose that behind bus #1 was bus #2, also speeding and ready to hit Max. Example 11 would also be true in this situation because he would have crossed the street if bus #1 hadn't hit him and bus #2 hadn't subsequently hit him. And if there was some other peril lurking for Max after bus #2, 11 would still be true if he would have crossed the street if bus #1 hadn't hit him and subsequently bus #2 hadn't hit him and after that the other peril hadn't stopped him. This series of counterfactual shifts removing the various dangers that threaten to stop Max's street-crossing forms what Landman calls the CONTINUATION BRANCH of Max's street-crossing.

The term continuation branch is supposed to conjure up a metaphorical understanding of the event e of Max trying to cross the street growing through the 'branches' of a set of possible worlds. The idea is based on Dowty's (1979: 151 ff.) notion of BRANCHING TIME. Consider Figure 1. The three possible worlds shown here all are just alike when it comes to event e, Max's walk into the street up until just before bus #1 hits him in world 1. This is represented by having them share e. But at the point when they are no longer alike, the events branch apart. In world 1, the street-crossing event stops once the bus hits Max, but on the other branch it continues. A subsequent split divides world 2 from world 3, where the event stops in world 3 but continues to its completion in world 2.

The continuation branch for some event e will be its extension through the tree of possible worlds in which it avoids all of the ways in which it might be interrupted. Or almost all—Landman points out that sometimes the forces out to stop an event are just too strong to allow a progressive sentence to be true. One of his examples of this is 18.

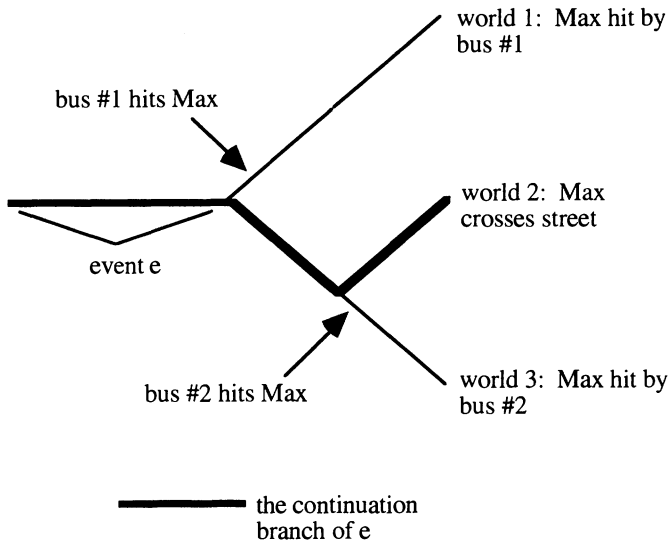(18) Mary was wiping out the Roman army.

FIGURE 1.

Suppose that Mary is violently opposed to Roman occupation of her part of Gaul, and one day decides that it is her duty to do as much damage to the army as she can; she enters the town barracks one day at noon and attacks whomever she sees. There is really no chance that she can wipe out the well-trained local garrison, much less the whole army. Though the continuation branch of Mary's purported wiping-out of the Roman army may reach a point at which she has killed a few dozen soldiers, eventually the possibilities envisioned just get too absurd, and it never reaches the point of being a complete obliteration of the local force, much less all of the legions. In other words, those possible worlds where she does wipe out the Roman army are too unreasonable from the point of view of the real world to be accessible to the continuation branch. Unfortunately, Landman does not define the relevant notion of reasonableness, but rather leaves it as a theoretical primitive. This is suspicious as far as the overall theory goes, since it appears to be a modal term itself: a world is unreasonable if it is improbable from some perspective. Probability is a modal notion on a par with possibility or necessity (consider the alternation *it is possible/probable/necessary that p*). It would be more natural if the irrelevance of such unreasonable worlds followed from a central modal component of meaning attributed to the progressive, rather than from an independent, apparently ad hoc restriction governing the growth of the continuation branch.

The major argument Landman gives in favor of his theory he calls 'the problem of non-interruptions'. This problem is based on the fact that a progressive sentence will be judged true if the potentially uncompleted event actually is completed, no matter how unlikely it seemed beforehand that it would be: 18 will be judged true if Mary has in fact, against all odds, wiped out the Roman army. (A more intuitive example, suggested to me by Ginny Brennan, would be *David was slaying Goliath.*) This fact is difficult for Dowty to account for, because it would appear that in such a case neither the real world, nor any other world where Mary wipes out the Roman army, ought to be considered an inertia world. The real world is, if Mary wipes out the Roman army

in it, a quite abnormal unexpected world. However, the problem of noninterruptions is not a problem for Landman, since the continuation branch need never leave the real world if Mary's fight never gets interrupted by her death.

Formally the continuation branch of an event e in a world w is a set of event-world pairs. The definition works with the notion of a STAGE of an event; an event e is a stage of e′ iff e′ contains e as a part and moreover e′ can be considered a further development of e. The event e′ of each of the pairs of the continuation branch of e has e as a stage of e′. Landman defines the continuation branch C(e,w) of e in w in the following way:

1. For every event e′ in w such that e is a stage of e′, $\langle e′,w\rangle \in C(e,w)$
2. If the maximal event e_m such that $\langle e_m,w\rangle \in C(e,w)$ stops in w, then look at the closest world w′ where e_m does not stop.
   (a) If w′ is not a reasonable world with respect to $\langle e,w\rangle$, the continuation branch stops.
   (b) If w′ is a reasonable world with respect to $\langle e,w\rangle$, then $\langle e_m,w\rangle \in C(e,w)$.
3. For every event e″ in w′ such that e_m is a stage of e″, $\langle e″, w′\rangle \in C(e,w)$
4. If the maximal event $e_{m′}$ such that $\langle e_{m′}, w′\rangle \in C(e,w)$ stops in w′, then look at the closest world w″ where $e_{m′}$ does not stop.
   (a) If w″ is not a reasonable world with respect to $\langle e,w\rangle$, the continuation branch stops.
   (b) If w″ is a reasonable world with respect to $\langle e,w\rangle$, then $\langle e_{m′},w\rangle \in C(e,w)$.
   etc.

Given the notion of continuation branch, 19 provides Landman's semantics for the progressive. The idea is that *Max was crossing the street* is true iff Max's walking event grows on its continuation branch into an event where he crosses the street. To state this formally, we would say that PROG denotes a relation between events and properties of events.

> (19) PROG(e,P) is true in world w iff for some event e′ and world w′, $\langle e′,w′\rangle$ is part of the continuation branch that starts in w with e and P(w′)(e′) = 1.

So, for example, assuming 20 as the translation of 11, 21 gives its meaning (ignoring tense). $^\wedge \lambda x[Max\text{-}cross\text{-}the\text{-}street(x)]$ represents the property of being an event of Max crossing the street.

> (20) $\exists a[PROG(a, ^\wedge \lambda x[Max\text{-}cross\text{-}the\text{-}street(x)])]$
> (21) For any world w, $\| \exists a[PROG(a, ^\wedge \lambda x[Max\text{-}cross\text{-}the\text{-}street(x)])] \|^w = 1$ iff for some events e and e′, and some world w′, $\langle e′,w′\rangle$ is on the continuation branch that starts with e in w and e′ is an event of Max crossing the street in w′.

Twenty-one says that 20 is true in w iff some event in w has an event of Max crossing the street on its continuation branch.

Landman's theory of the progressive combines some of the ideas of the two previous types of theories. It shares with Dowty's approach the attempt to define in modal terms what it is for an event of a certain type to be in progress. It also shares with the theories of §2.2 the assumption that uncompleted events of a given type have a primitive, undefinable relation with their completed counterparts. This latter point is harder to see. This feature comes in with the relation 'stage of', necessary for explaining the notion of continuation branch. In order to say when the continuation branch of an event e in world w leaves w and goes to a world in which it does not stop, it is necessary

to know what counts as stopping. According to Landman, e stops in w iff in some other world e is a stage of some larger event e′. For example, with Max's apparently interrupted street-crossing e in the real world, we know that e stops, and doesn't just continue on as an event of him being hit by a bus, taken to a hospital, carried back to his house, and whatever else, because his apparent failed walk across the street is not a stage of such an event, but rather is a stage of an event e′ in some other world in which he manages to cross the street. Saying that e is a stage of such an e′ is very close to simply saying that e is primitively an uncompleted street-crossing. This fact will only be a weakness of the theory if it is possible to do better, of course, but I will argue below that it is possible to do better.

A final point that should be made about Landman's proposal is that it is completely unique. Its explicit construction of the set of relevant event-world pairs through the definition of the continuation branch looks nothing like anything that has been proposed for other intensional operators, or for that matter other aspectual morphemes such as the perfect. Not even counterfactuals have been given an analysis parallel to that which Landman proposes for the progressive, despite the fact he builds up the continuation branch through a series of counterfactual shifts. This situation does not necessarily tell against it, but it seems to me that if an analysis can be given which, like Dowty's, makes the progressive a more ordinary, familiar-seeming kind of element, such an approach would be preferable since it would allow for a more constrained overall inventory of sentential operators.

3. BACKGROUND ON MODALITY. I would like to show that the central primitive of Dowty's theory, that of INERTIA WORLD, can be explicated in a way that makes a modal account of the progressive superior to any of its alternatives discussed above. I will argue that if it is analyzed in terms of an appropriately sophisticated theory of modality, in this case that of Kratzer (1977, 1981, 1991), the major problems posed for it cease to be problems. In this section I outline a somewhat simplified version of Kratzer's semantics for modality. We begin with ex. 22.

(22) In view of what the law provides, Mary must not steal Bill's car.

Sentence 22 is interpreted with respect to a background set of propositions L(w) indicated by the phrase *in view of what the law provides*. The propositions in L(w) are each the content of one of the laws in world w. Each proposition in L(w) contains the set of worlds in which that law is fully satisfied—the law against murder is represented by the set of worlds where there is no murder, the law against car theft by that where there is no car theft, and so on. If the law is consistent, some worlds are in every proposition in L(w). These worlds are ideal from the point of view of the law in w, since every law is followed perfectly; we can indicate the set of such worlds with ∩L(w). The sentence 22 is true in w because, in every world in which the law is followed perfectly, i.e. every world in ∩L(w), Mary does not steal Bill's car. At this point we have what may be called the classical possible-worlds semantics for modality.

Next, suppose that Mary actually does steal Bill's car and that, because of this, 23 is true.

(23) Mary must go to jail.

Example 23 cannot be analyzed directly in terms of L(w) in the same way 22 was. Mary does not go to jail in any world in ∩L(w), because in any world in which the law is perfectly satisfied, no crime occurs and nobody goes to jail. Since all the worlds in ∩L(w) are ideal from the point of view of the law, they have nothing useful to say about those nonideal circumstances where Mary steals Bill's car. The problem is that

a fact, that Mary stole Bill's car, is incompatible with one (or more) of the propositions in L(w).

One solution that might be suggested would be to put the law 'everyone who steals a car goes to jail', into L(w). But this won't help. In the first place, this law is automatically satisfied in any world in ∩L(w); nobody steals a car in such worlds, since they are the ideal worlds that make 22 true. Thus, it is trivially the case that all car-thieves go to jail there. And furthermore, since Mary doesn't steal a car in those worlds, and so doesn't go to jail, 23 will still be false. Thus we need a more complex semantics.

Let M(w) be the set of facts in world w relevant to the interpretation of 23. For our world w, one element of this set is the proposition that Mary stole Bill's car. A semantics for 23 should only care about worlds in which all of these relevant facts hold. These worlds can be indicated as ∩M(w). For example, we are not concerned with any worlds in which Mary did not steal Bill's car, since it is established that she did steal it. That is, we are not concerned with such a world because it is not in ∩M(w).

Among the propositions in L(w), let us suppose, are something like 24:

(24) L(w) = { ..., 'There is no jaywalking', 'There is no theft', 'There is no murder' ..., 'Jaywalkers pay a fine', 'Car thieves go to jail', 'Murderers go to jail', ... }

The worlds which are ideal from the point of view of the law are those in which every proposition in L(w) is true, but among the nonideal worlds, some are better than others. If Mary steals Bill's car and gets away with it, two laws in L(w) are not satisfied: 'There is no theft' and 'Car thieves go to jail'. If she steals the car but gets sent to jail, however, only one of these laws is not satisfied. The set of laws can be seen as establishing an order on any set of worlds, where we write $w' <_{L,w} w''$ if, according to the law in w, w' is a better world than w''. Kratzer suggests that $<_{L,w}$ can be defined solely in terms of L and w, as in 25:

(25) a. For any worlds w, w', and w'', $w' \leq_{L,w} w''$ iff every proposition in L(w) which is true in w'' is true in w'.

   b. For any worlds w, w', and w'', $w' <_{L,w} w''$ iff $w' \leq_{L,w} w''$ and it's not the case that $w'' \leq_{L,w} w'$.

The discussion below does not need to take a stand on precisely how $<_{L,w}$ is established; for purposes of concreteness I will assume that it is defined as Kratzer says, though it may be that the ordering is semantically primitive, with Kratzer's definition providing only a partial definition of $<_{L,w}$.[5]

Returning to 23, the reason this sentence is true is that, in the best worlds in which Mary has stolen Bill's car, Mary goes to jail. Figure 2 may be helpful.[6] If it is not assumed that Mary stole Bill's car, the best worlds compatible with the facts are those in A. Thus 22 is true. But if Mary did in fact steal Bill's car, the worlds in A are no longer relevant. At that point, the worlds in B are the best relevant worlds, and so 23 will be true.

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[5] It seems clear that if Kratzer's definition ranks w' as better than w'', we must have $w'<_{L,w}w''$, but there might be cases where we would want to rank one world better than another even though she would treat them as not comparable or equivalent. This might be the case if we considered one law to be more important than another, for instance.

[6] The diagram is technically inaccurate in a number of ways, however. Most significantly, the ordering source provides a partial ordering, not a total one, as the picture may seem to suggest.
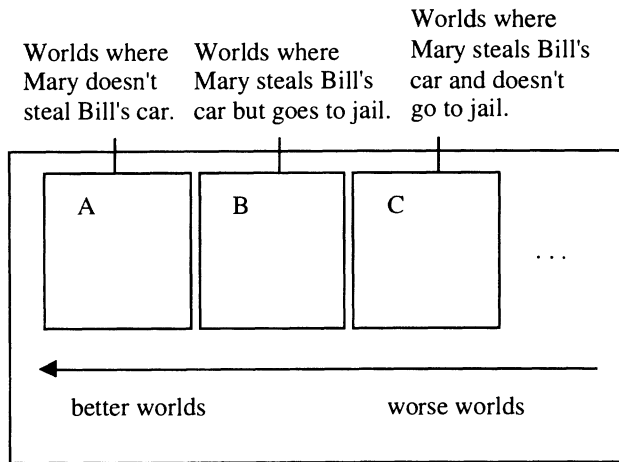
FIGURE 2.

More formally, we can say the following:

(26) Best(M, L, w) = the set of worlds w′ in ∩M(w) such that there is no w″ in ∩M(w) where w″ $<_{L,w}$ w′.

(27) ‖ Mary must go to jail ‖ ^{M,L} = that proposition p such that, for any world w, p(w) = 1 iff, for every world w′ in Best(M, L, w), Mary goes to jail in w′.

The formulation in 26–27 assumes that there is a unique best set of worlds. Lewis (1973b) has considered cases in which this assumption may be wrong, for example when there is an infinite sequence of ever-better worlds. Kratzer provides a semantics for modality which is adequate for these cases as well, but 26–27 represent the main ideas of her treatment, and are much simpler than hers, so I will present my discussion in terms of the level of sophistication represented by 26–27.

In this presentation of Kratzer's semantics for modality, I have made use of two special parameters of interpretation, M and L. Each of these is a function from worlds to sets of propositions. The function M provides (as ∩M(w)) a baseline set of worlds relevant to the interpretation of the sentence; Kratzer labels M the MODAL BASE for the sentence. In contrast, L provides (as $<_{L,w}$) an ordering of the worlds in ∩M(w) according to how well they fit with the propositions in L(w); Kratzer calls L the ORDERING SOURCE. The identities of the modal base and ordering source are the central theoretical primitives of this theory. As semanticists we do not try to give an account of how they arise. The set of facts relevant to the interpretation of *must* in the examples is a matter for judges, and the set of laws which constitute its ordering source are the responsibility of legislators; linguists have little to contribute on these points. We must take these parameters as simply being provided by the extralinguistic context. In some situations the modal base and ordering source at issue may be fairly clear: for instance, in a setting for legal reasoning, a judge may have determined that there is only one fact relevant to his or her decision. But in other situations, one may have to make do with a certain amount of vagueness or difficulty in determining what is relevant. Of course modal sentences are vague, and discussions over their truth or falsity may be quite labored as the participants seek to reach an understanding about what background facts

are relevant. And even once the relevant facts are determined, they may be so numerous (even infinite in number) or may interact in such complex ways that it is difficult as a practical matter to decide whether the modal sentence is true. This theory of modality predicts that a modal sentence's truth will be vague or difficult to ascertain exactly to the extent that its modal base and ordering source are difficult to determine or work with.

Different varieties of modality are distinguished by characteristic types of modal base and ordering source. Formally speaking, any set of propositions could function as a modal base or ordering source, but in fact those that do get used can be classified into various groups. The deontic modality discussed above has what Kratzer calls a CIRCUMSTANTIAL modal base, representing relevant facts, and a DEONTIC ordering source, representing a set of rules; more specifically, the rules in this case are laws, as opposed to, for example, moral constraints. Contrast this with Kratzer's 28 (1991:645), which involves an epistemic interpretation of *must*.

(28) She must have climbed Mount Toby.

This sentence has an EPISTEMIC modal base, containing a set of known propositions, and a STEREOTYPICAL ordering source, representing the normal course of events. Suppose we know that on Saturday Mary climbed either Mount Toby or Mount Mansfield. She was at home Friday evening and Sunday morning. It's about an eight hour drive to Mount Mansfield, but a short trip to Mount Toby. Sentence 28 is intuitively true in such a situation. But it's not true because in all worlds compatible with what we know, she climbed Mount Toby; she could have driven to Mount Mansfield all night Friday, climbed all day Saturday, and driven back all night Saturday. But in our stereotypical ordering source there is a proposition something like 'People sleep at night'. Because of this, worlds compatible with what we know where Mary sleeps at night are going to count as better than those where she doesn't. In all of the best worlds where everything we know is true, she climbs Mount Toby. Thus, the sentence is correctly predicted to be true.

My proposal involves introducing a new type of modal base and ordering source for service in the semantics of the progressive. The modal base will be a variety of circumstantial one, but it will be sensitive to the sentence's description of an event in a way that the circumstantial modal base of *must* is not. The ordering source will encode the idea, inspired by Landman's definition of the continuation branch, that the event described by the sentence is not interrupted. The progressive will utilize these contextually provided parameters of interpretation in a way completely parallel to ordinary modals.

4. A MODAL BASE/ORDERING SOURCE SEMANTICS FOR PROGRESSIVES.

4.1. THE CENTRAL IDEA. Let us begin by seeing how it is possible to give a semantic analysis of the progressive in terms of the theory of modality outlined above. As just mentioned, the progressive uses a circumstantial modal base. Suppose that the modal base for 29 includes propositions representing Mary's physical abilities, sense of perseverance, etc. as well as propositions expressing what Mary was doing up until 7 o'clock.

(29) At 7 o'clock, Mary was climbing Mount Toby.

The modal base for 29 might look something like the following:

(30) M(w) = { 'Mary is in good physical condition', 'Mary does not give up easily', 'It was raining lightly on Mount Toby at 7 o'clock', 'Mary was one third of the way up the Mount Toby trail at 7 o'clock', 'Mary was headed the right way on the trail at 7 o'clock', ... }

For the time being, think of the propositions in M(w) as the set of facts about Mary relevant to the issue of whether the material under the scope of the progressive, *Mary climbs Mount Toby*, is true. It is obvious that things like whether she is in good shape and whether she is lost on the trail will be relevant.

It is clearly not correct to say that 29 is true iff Mary climbs Mount Toby in all of the worlds compatible with this modal base. A bear might come out of the forest and get her. She might slip and hurt her ankle. Landman's intuition here is correct, I believe: 29 is true because, if she is not interrupted, Mary will climb Mount Toby. In the treatment I propose, the ordering source is responsible for focusing on those worlds where she is not interrupted. We need an ordering source where such worlds count as better. The following would therefore be appropriate for 29:

(31) O(w) = {'Mary does not get eaten by a bear', 'Mary does not slip and hurt her ankle', 'A surprise summer blizzard does not start on Mount Toby', 'Mary does not get lost', . . . }

The propositions in O(w) can be seen as the set of outside factors that need to go right for Mary if the proposition *Mary climbs Mount Toby* is to be true. According to 30–31, the worlds compatible with all the propositions in the modal base—those where Mary is in good physical condition, does not give up easily, has picked a day for the climb with good weather and so on—and where Mary does not get eaten by a bear, does not slip and hurt her ankle, etc., comprise Best(M, O, w). I claim, roughly, that the progressive sentence 29 is true because all such worlds are ones where Mary climbs Mount Toby.

Parallel to Figure 2 above, the situation with 29 may be illustrated with Figure 3. The best worlds compatible with the modal base are those in set A. Since in all of these worlds, Mary climbs Mount Toby, 29 is true. With a different modal base, the worlds in set A might no longer be relevant. For example, suppose that it is snowing heavily on Mount Toby at 7 o'clock, so hard that Mary could never make it to the top, but that everything else is going along the same: in particular, Mary is still trying hard to climb the mountain, and the ordering source is thus still the one given in 31. In this
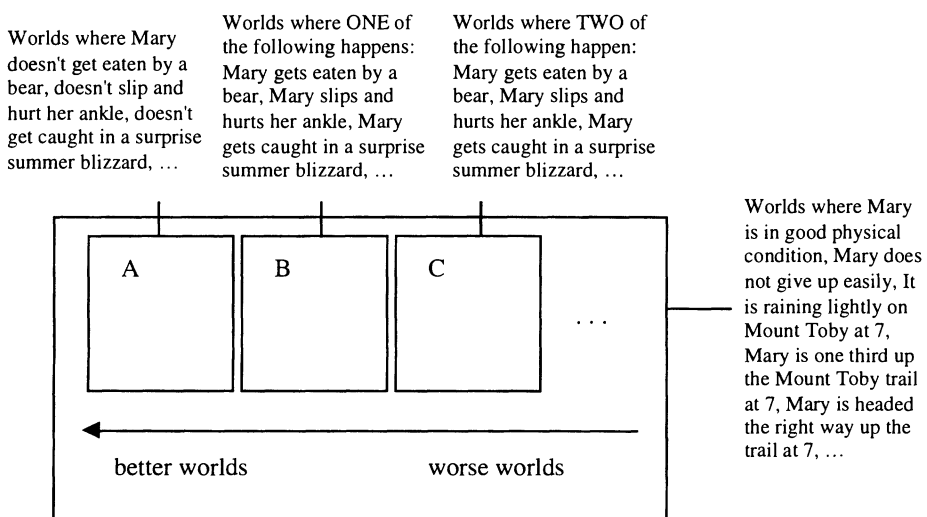

FIGURE 3.

case, the best worlds compatible with the modal base are those in set B, and 29 is no longer true.

4.2. GENERATING THE MODAL BASE AND ORDERING SOURCE FOR PROGRESSIVES. In order to turn the above reasoning into an explicit analysis, I will use the modal base/ ordering source ideas to refine the Dowty-style definition for the progressive given in 14. Doing this will involve integrating the notions of event and inertia world into the modal base/ordering source semantics.

Let's begin with the modal base. Consider the event e which Mary was engaged in there on the mountain. Following what I said in the last section, the modal base should be the set of facts relevant to whether e is completed as an event of Mary climbing the mountain. As was the case with ordinary modal auxiliaries, the precise identity of the propositions in the modal base is not a matter for semantic investigation. Instead, it is contextually determined, based on the actual facts of the matter at hand in combination with the knowledge and interests of the speaker and hearer. For purposes of discussion let's assume that the set is the one given in 30 and refer to it as Circ(e) ('the set of circumstances relevant to whether e is completed').

Next let's turn to the ordering source. It should incorporate all of the propositions that express that the event e is not interrupted. Again, the precise membership of this set is contextually determined. I'll refer to it as NI(e) ('the set of propositions which assert that e does not get interrupted') and assume that it includes all of the propositions in 31.

The inertia worlds for an event e are all the ones that are best with respect to this modal base and ordering source. With 29, they are the best worlds with respect to 30's M(w) and 31's O(w). Given that Circ and NI refer to the appropriate modal base and ordering source, respectively, this is the same as saying that the inertia worlds are those in Best(Circ, NI, e)—i.e., the worlds compatible with what's going on up until 7 o'clock (those in ∩Circ(e)), in which she is not interrupted (ideal with respect to $<_{NI,e}$). Putting this all together, 32 gives the resulting interpretation of the progressive.

> (32) PROG(ϕ) is true at a pair of an interval and world $\langle i,w \rangle$ iff there is an event e in w such that T(e) = i and for all worlds w' in Best(Circ, NI, e), there is an interval i' which includes i as a nonfinal subinterval, such that ϕ is true at $\langle i',w' \rangle$.

According to 32, the sentence 29 will be true at $\langle i,w \rangle$ iff there is an event going on during i in w which, if it's not interrupted, will become an event in which Mary climbs Mount Toby.

I can now show how this analysis handles the cases that were problematic for Dowty's original analysis in terms of inertia worlds. The first kind of example is 11 *(Max was crossing the street)* where, recall, Max did not cross the street because he was hit by a bus. The problem here was that the trajectories of Max and the bus appear to make it the case that any worlds in which Max is not hit are quite abnormal. The inertia worlds analysis thus seems to predict 11 to be false. In terms of 32, we need to consider what propositions are in the modal base Circ(e) and the ordering source NI(e) for Max's failed street-crossing e. Circ(e) contains the relevant circumstances in e, in particular Max's and the street's physical condition. The bus is not part of event e, however, and so we may assume that no facts about it are in the modal base. The inertia worlds may therefore be different from the world of e when it comes to the bus. NI(e) should contain the set of propositions expressing Max's failure to succumb to all of the many ways he could be interrupted: he does not slip and break a leg, he does not have a

stroke, he does not get hit by a bus. The sentence is true because in all of the worlds compatible with the circumstances in e which are ideal from the point of view of this ordering source, e extends into a situation in which Max crosses the street.

The other serious difficulty for Dowty's analysis was the problem of noninterruptions discussed by Landman. If Mary actually succeeds in wiping out the Roman army, 18 (*Mary was wiping out the Roman army*) will be true, even though the real world would appear not to be a normal world in such a case.

In terms of the present analysis, we again have to consider the modal base Circ(e) and the ordering source NI(e) for Mary's fighting event e. NI(e) should contain propositions like {'Mary defeats the first soldier', 'Mary defeats the second soldier', . . .}. Clearly a situation in which she does wipe out the Roman army would be ideal from the point of view of this ordering source. The question is whether any such worlds are compatible with the modal base. If Mary is a more or less normal person, we would expect the Circ(e) to contain (or entail) some propositions like 'Mary can't fight for more than 48 hours straight' and 'Mary can't defeat more than 100 soldiers an hour'. There will be no worlds compatible with this kind of modal base in which she destroys the whole army; the best worlds will have her kill at most 4,800 of her enemy. Hence the intuition that in an ordinary sort of situation, 18 is false.

If somehow Mary succeeds in destroying the whole Roman army, however, we know that she is not an ordinary person. The kind of modal base assumed above must be wrong; in putting propositions like 'Mary can't fight for more than 48 hours straight' and 'Mary can't defeat more than 100 soldiers an hour' into it, we have vastly underestimated her abilities. She must be a special kind of hero, or a god in disguise. The part of the circumstantial modal base which represents Mary's abilities must be revised. It must attribute to her herolike or godlike abilities. With such a modal base, the best worlds according to NI(e) will be those in which she defeats the whole army. Thus, the sentence is predicted to be true. Never mind whether we'd want to call these worlds normal—Mary is no normal individual, at least on this day. This fact must be reflected in the circumstantial modal base.

This analysis can also be applied to cases where the progressive is combined with an activity sentence, as in 33 or 34.

(33) Max is running.
(34) Mary was building houses.

Dowty (1979) gives an extensive listing of the properties of activity sentences; for our purposes it suffices to note that they comprise the nonstative atelic clauses. Following Dowty, their characterizing feature is that they are true of all 'long enough' subintervals of an interval at which they are true. Thus, if *John runs* is true from 1:00 until 2:00, it is also true from 1:15 until 1:45. (It is not clear whether it would be true for a one-nanosecond interval, or for durationless moments, whence the restriction to long-enough intervals. For further details, see Dowty 1979 and 1986.) In terms of an event-based semantics, this requirement is a bit more complex to state. In contrast to intervals, events can be divided up both temporally and spatially. For example, a war can be divided spatially into fronts or theaters, temporally into periods, or spatiotemporally into battles. All of these things are intuitively speaking subevents of the whole war. In order to do the work of the term SUBINTERVAL, we need a notion of a TEMPORAL SUBEVENT, a piece of event you get by chopping an event up by time, rather than by place or other criteria. With such a notion, the condition on activities can be stated as follows: if e is an activity, all large enough temporal subevents of e are activities of the same sort. Thus, if e is an event that makes

Max runs true, any long-enough temporal subevent of e is an event that makes *Max runs* true as well. (More formally: 'e' is a temporal subevent of e' can be defined as: 'e' is a part of e and T(e') is a subinterval of T(e), and any other part e″ of e such that T(e″) = T(e') is part of e″. Then, if α is an activity predicate and α(e) is true, then α(e') is true for all long enough temporal subevents e' of e.)

The progressives of activity sentences differ from those of telic sentences in that they entail their perfect aspect counterpart.[7] Thus, 33 entails *Max has run,* even though *Max is crossing the street* does not entail *Max has crossed the street.* This behavior of activity sentences follows within the present analysis. Let us refer to the event which makes 33 true as e, and consider Figure 4. *Max is running* is true because in all inertia worlds, there is an appropriate event e' which makes the tenseless *Max runs* true. The basic chain of reasoning goes as follows: event e' is a Max-runs event. Because all (long-enough) temporal subevents of an activity are activities of the same sort, the bolded part x of e' is also a Max-runs event. Now, x is just like e, so e is also a Max-runs event. Finally, because it is a temporal subevent of e, the piece y of e which precedes the utterance event is a Max-runs event. That is, all of the following are Max-runs events: e' → x→ e → y. Thus, *Max has run* will be true based on y, a past Max-runs event.

Real World   ———

                          utterance event

                  y

                    event e

Inertia Worlds

                  x

                    event e' which makes
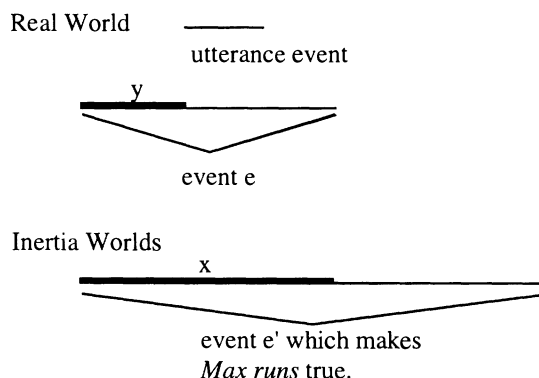   *Max runs* true.

FIGURE 4.

This argumentation can be stated a bit more precisely: 33 is true because in all of the inertia worlds, that is in all of the 'best' worlds compatible with Circ(e), there is an event e' which makes *Max runs* (tenseless) true. Consider the bolded part of x of e' which occupies the same temporal stretch as e. Provided that it is long enough, the characterizing property of activity sentences will assure us that x is an event which makes *Max runs* true as well. Next, recall that all of the inertia worlds must make true every proposition in Circ(e). Because Circ(e) contains all of the propositions pertaining to the internal structure of e, we know that x is just like e. If it were not, some proposition

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[7] 'Futurate progressives' like (i) are exceptions.

    (i) Max was running the next day (but he got sick and had to stay in bed).

These could be handled within the present system in terms of a preparatory or planning event. The idea is that Max's event e of planning/preparing to run may be sufficient to make it the case that he runs in all worlds in Best(Circ, NI, e). In particular, we need to allow for a notion of interruption that applies to preparatory events, and say that Max's preparations were interrupted by his getting sick. This approach to (i) is entirely derived from Dowty's account of futurate progressives, so I refer the reader to his work for more detailed discussion.

in Circ(e) describing what e is like would fail to describe it. Since e and x are just alike, if the latter is an event which makes *Max runs* true, the former must as well. Finally, the characterizing property of activity sentences can again be invoked to show that the part y of e which precedes the utterance event is an event which makes *Max runs* true, once again assuming that it is long enough. As Taylor (1977) and Dowty point out, at the time 33 is uttered y is all the speaker has to go on as evidence that Max is running; it is reasonable to assume that if it is long enough to be perceived as an event of Max running, it is long enough to make *Max runs* true.[8] (It is certainly not a durationless moment or just one nanosecond long.) Based on y, it is thus clear that *Max has run* is true in the real world. This is what I wanted to show.

4.3. ADDITIONAL FACTORS DETERMINING THE MODAL BASE. The modal base Circ(e) provides an enumeration of the facts pertaining to, in particular describing the makeup of, a given event, while the ordering source NI(e) provides a definition of what it is for a given event not to be interrupted. Between them, these two sets determine what counts as a 'completion' of e. Given that the domains of Circ and NI are simply the set of events, this reasoning claims that looking at an event is itself sufficient to determine what counts as a completion and what counts as an interruption of that event. This is an assumption it shares with all of the event-based theories of the progressive. As noted above, those theories take it to be a primitive fact about the model whether a given event has 'culminated' (Parsons) at a certain time, or conversely whether it has 'stopped' (Landman). In a sense, it would thus be fair to announce at this point that the theory is merely making an assumption common in the literature, and go on to discuss any advantages it may have. However, there are reasons to believe that the assumption is in fact not tenable.[9] In this section, I will discuss some of these difficulties and see how they may be solved within the present framework. As a consequence, I will refine the notion of completion, as it is represented in the modal base and ordering source.

The first type of problematic case arises when we consider certain complex events. Consider example 35.

(35) John was winning the race.

What event is described by this sentence? Two possibilities suggest themselves, and I would like to consider each in turn. The first is that John appears to be the agent of the sentence; 35 should therefore pick out an event of which John is the agent. The most obvious such event is that of John's running (assume it was a running race, and not a car race, for example). But if the eventuality described by 35 is John's running event, it seems clear that it does not contain enough information to determine the worlds the progressive operator must quantify over. Given the way we have defined Circ(e) and NI(e), the sentence will be true iff John won the race in all of the worlds where his running was not interrupted. But John's running could go along fine, and yet he could have lost the race if some other runner managed to pass him. The point here is that the truth of 35 depends not just on John's running event, but on those of all the contestants in the race.

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[8] Because of this step in the reasoning, *Max is running* is not predicted to strictly entail *Max has run*. If the interval from when Max started running until the speech time were sufficiently short, the former would be true but the latter false. The claim is rather that it is always, as a practical matter, a good inference from *Max is running* to *Max has run*. If there are grounds to assert the former, there are just as good grounds to assert the latter.

[9] I thank an anonymous referee for bringing up a number of these points.

These observations suggest that the event described by 35 is not identical to John's running event. Instead, this event is a complex eventuality composed of the actions of all the individual runners in the race. We might say that the event described by 35 is 'the race' itself. It is plausible to say that 35 is true at interval i because John wins the race in all of the worlds compatible with the circumstances of the races at i (John is in first position, traveling at speed v, Mary is in second position, travelling at speed v', etc.), and where the course of the race does not suddenly change (John doesn't twist an ankle, Mary doesn't suddenly get much faster, etc.). Thus 35 can be dealt with under the correct assumption about the nature of the event described.

While I believe that it is correct to treat 35 in terms of a complex event having other events as parts, this has a consequence that it is important to point out: unless one makes some controversial assumptions about the identity criteria for events or the nature of thematic relations, it is incompatible with a neo-Davidsonian semantics like Parsons's whereby arguments of a predicate are related to the event described by a set of thematic role relations. For instance, we could not represent 35 in terms of a condition like 36.

(36) ... Agent(e, John) ...

The problem with 36 arises from the idea that the event described is what we would intuitively label 'the race'. If the race is the event for 35, it should also be the event for 37.

(37) Mary was losing the race.

Parallel to 36, a neo-Davidsonian account of 37 would want to have Mary as the agent of the event described. But we cannot have both Mary and John as the agent of this event.

One way to solve this problem would be to multiply thematic roles, saying perhaps that John bears the 'winner' role while Mary bears the 'loser' role. Such a move appears to be completely ad hoc as well as to undermine the idea, basic to Parsons's use of theta theory, that thematic roles have a semantics independent of the meaning of the verb. The only other way out of this dilemma for the neo-Davidsonian would be to propose that the winning event described by 35 and the losing event described by 37 are not identical, and so that they are separate events from the race itself. There are a number of theories of events that allow for such a distinction; essentially they all work by allowing for events to be distinguished in as fine-grained a way as the predicates and arguments which make up their descriptions, for instance Kim 1973, 1974 or the tradition of situation semantics, (Barwise & Perry 1983).

I will avoid these controversies here. I will pursue the analysis in terms of conservative, Davidsonian assumptions about the nature of events: they are concrete particulars, on a par in the ontology with ordinary individuals, and not defined in terms of properties, propositions, or anything else. In many cases, it may be unclear whether two sentences describe the same or different events, as with 35 and 37 above; I believe that the best we can do here is to let intuition be our guide, and to be as conservative as possible in proliferating events. In other words, unless it is obvious that two sentences describe different events, for example because the spatiotemporal locations or participants are different, one should assume that they describe the same one. Of course if one prefers a more finely-grained structure for events than the one assumed here, this will not undermine the proposed analysis of the progressive. Finally, I will assume that a predicate relates its arguments to the event it describes directly, not in terms of thematic roles. This means that the core argument structure of 35 and 37 can be unproblematically represented as in 38, where event e is the racing event.

(38) a. win(e, John)

    b. lose(e, Mary)

Thus far in this section, I have considered one type of challenge, that posed by 35, to the idea that it is possible to define what it is to interrupt an event purely in terms of the nature of the event itself. The conclusion was that this case did not undermine the semantics in terms of Circ(e) and NI(e), but only required a clear understanding of the nature of events. There is another type of example we must consider, however, and this will eventually require a change in our understanding of the modal base function Circ. Compare example 11, repeated here, with 39.

(11) Max was crossing the street.

(39) Max was walking into the path of an oncoming bus.

At first glance, these two sentences appear to describe the same event. Moreover, they both are intuitively true in the situation envisioned. According to our analysis, 11's truth requires that, if the event is not interrupted, Max crosses the street. Similarly 39's truth requires that, if it is not interrupted, he gets hit by a bus. Thus, we appear to have placed contradictory requirements on the values of Circ(e) and NI(e), for Max's crossing/walking event e.

One way out of this problem, of course, is to deny that 11 and 39 describe the same event. That is, one could say that 11 describes a crossing-the-street event, while 39 describes a walking-into-a-collision event. I prefer to work with less controversial assumptions concerning the identity criteria for events. Thus, I will not assume that 11 and 39 describe different events. Instead I will propose that the function Circ is sensitive not just to the event, but also to the event description formed by the VP under the scope of the progressive. Intuitively what I would like to say is this: 11 is true because we evaluate it with respect to a modal base that focuses on the event as a street-crossing, and so excludes consideration of the bus; given that being hit by a bus counts as an interruption, this means that the best worlds with respect to NI(e) are going to be ones where he crosses the street. In contrast, 39 is true because we evaluate it with respect to a more global modal base which includes the fact that the bus is coming down the street; the best worlds compatible with this modal base will not be ones where Max crosses the street, but rather ones where he isn't interrupted in any way except by being hit by the bus.

Formally we may encode the ideas above by saying that for 11, the modal base is a function from events and properties of events to sets of propositions. We generate the property argument from the material under the progressive's scope.

(40)
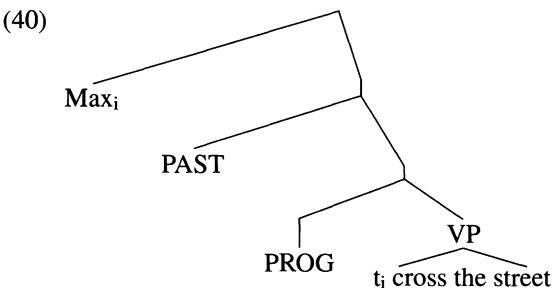
Max is interpreted in the position of t_i, its trace, and the VP would then denote the property of being an event of Max crossing the street, $^\wedge \lambda e[cross(e, Max, the\text{-}street)]$. Then Circ can take this property as an argument. The modal base for the event e of Max crossing the street, with respect to the description 'is an event of Max crossing the street' is given in 41.

(41) Circ(e, ^λe[cross(e, Max, the-street)]) = {Max is in good physical condition, Max intends to cross the street, Max is not drunk and can walk straight, ... }

In contrast, with 39 we have 42, where the modal base for the same event e is given with respect to the description 'is an event of Max walking into the path of a bus' (^λe∃x[bus(x) & W(e, Max, x)]).

(42) Circ(e, ^λe∃x[bus(x) & W(e, Max, x)]) = {Max is in good physical condition, Max intends to cross the street, Max is not drunk and can walk straight, A bus is travelling down the street on a path to hit Max, ... }

Why does 42 contain the proposition that a bus is travelling towards Max, but not 41? As has been mentioned several times already, I do not believe that in general we can provide a precise algorithm for determining the correct modal base for a given progressive sentence, any more than we can for sentences containing ordinary modal verbs. But we do see in these examples that the overt content of the sentences plays an extremely important role. In the case of 39, the explicit mention of the bus in the event-description indicates that facts pertaining to the bus are counted as relevant for the interpretation of the sentence, as in 42. In contrast, the lack of such mention in 11 indicates that one should take a narrower view, excluding facts pertaining to the bus from the modal base, as in 41.

   We can see the effects of using the modal bases in 41 or 42 in terms of an illustration of the kind used earlier, as in Figure 5. The ordering source provides the ranking of A< B < C. Note that I have shown some of the internal structure of set B, dividing it into B-1, where Max is hit by a bus, B-2, where he decides to turn around, and so forth; these subsets are all worse than A. Sentence 11 has a modal base which is compatible with all of the worlds in A, B, and C. Thus, the best worlds compatible with this modal base are ones in which Max crosses the street, and the sentence is true. In contrast, sentence 39 has a modal base compatible only with B-1 and that subset of C where the bus continues on its actual path into Max. The best worlds compatible with this modal base are ones where Max is hit by the bus; this sentence is thus true as well.

   Another way to explain how this analysis works is to relate it to explicitly conditional sentences. The following are approximate (but only approximate) paraphrases of 11 and 39.

(11) Max was crossing the street. ≈
       If you consider just what Max was doing, he was crossing the street.
(39) Max was walking into the path of an oncoming bus. ≈
       If you consider what both Max and the bus were doing, Max was walking into the path of an oncoming bus.

These two conditional sentences seem to describe the same event—one could easily imagine them being said in sequence, to describe different points of view on Max's actions. The *if*-clauses explicitly indicate the relevance or irrelevance of set A in Figure 5.[10]

   Even more complicated scenarios can give rise to cases where the best worlds compat-

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   [10] It is not clear to me whether the *if*-clauses directly determine the set of worlds relevant to the progressive, or whether there is a covert epistemic modal operator in these sentences, with which the *if*-clauses associate. This is why I insist that the paraphrases may be only approximate.
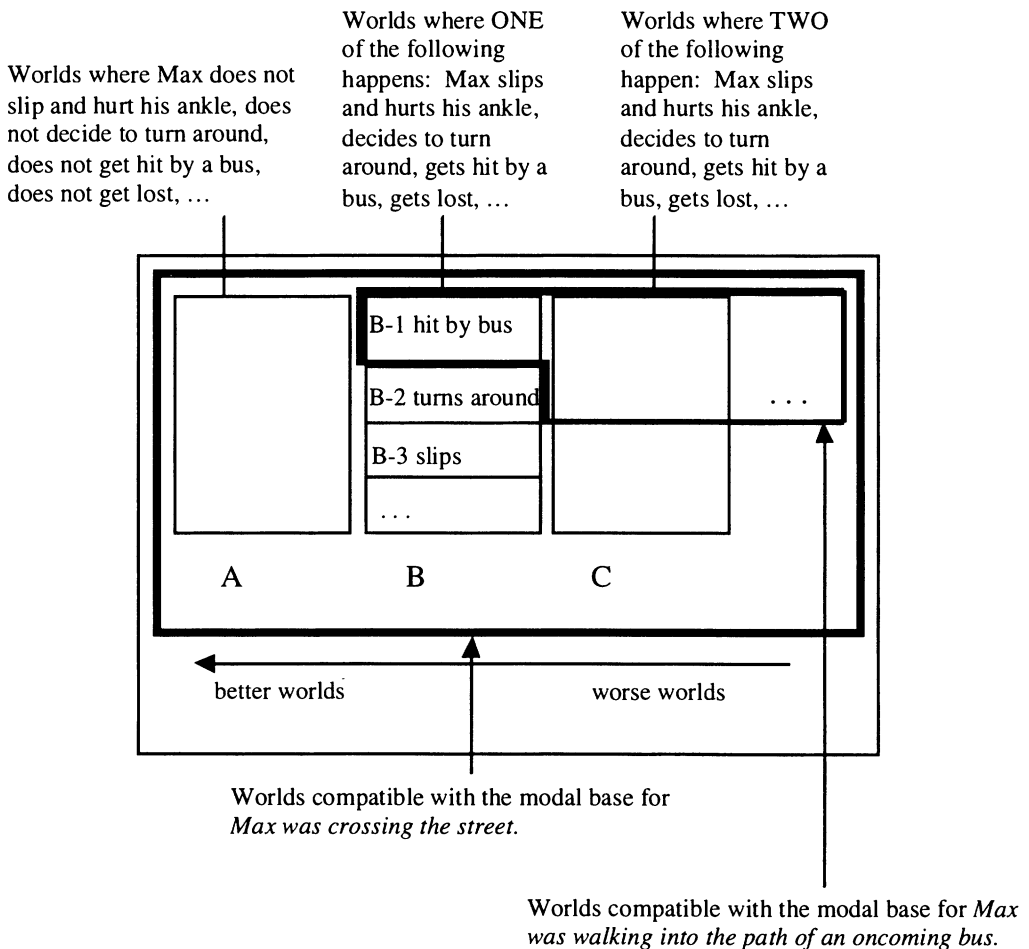
Worlds where Max does not slip and hurt his ankle, does not decide to turn around, does not get hit by a bus, does not get lost, ...

Worlds where ONE of the following happens: Max slips and hurts his ankle, decides to turn around, gets hit by a bus, gets lost, ...

Worlds where TWO of the following happen: Max slips and hurts his ankle, decides to turn around, gets hit by a bus, gets lost, ...

B-1 hit by bus

B-2 turns around

B-3 slips

. . .

. . .

A   B   C

better worlds   worse worlds

Worlds compatible with the modal base for *Max was crossing the street.*

Worlds compatible with the modal base for *Max was walking into the path of an oncoming bus.*

FIGURE 5.

ible with the modal base could be within set C or some even less favored set.[11] Suppose, for example, that the modal base contains the propositions that there is a pothole in the street, and that Max steps into it, twists his ankle and falls in front of the oncoming bus. In this situation, the best worlds compatible with the modal base are in set C, since his walk across the street is interrupted in two ways, by the bus, as before, but also by the twisted ankle (let us assume that the twist is so bad he would not manage

[11] This case also shows why we would not want to have the ordering source contain a single proposition, 'Max's walk is not interrupted', as was suggested to me (independently) by Ginny Brennan and Peggy Speas. Such an ordering source would only divide the set of possible worlds into two groups, a group where Max isn't interrupted and one where he is, with no further distinctions within the latter; in that case we couldn't handle the three different levels of differentiation represented by 11, 39, and 43. This argument only goes through, however, on the assumption that the three examples have the same ordering source, because they describe the same event. A different approach to generating the ordering source, for example based on a different theory of events, might be able to make do with dividing the set of possible worlds into only two groups. Note that such a consequence would also undermine the analogy to the semantics of ordinary modals, since modals, as pointed out above, require a full ordering, not merely a bipartition.

to cross the street even if he weren't hit by the bus). Here sentence 39 continues to be true, but 43 is true as well, as it would not be if the best worlds compatible with the modal base were those indicated in Figure 5.

(43) Max was walking into the pothole which would destroy his ankle's tendons.

It is possible to produce examples where worlds even less favored than those in set C are relevant, but the scenarios are admittedly cartoonlike and rather absurd.

To summarize, I have argued that the modal base is sensitive not just to the event being described, but also to the way in which that event is described. We can represent this as in 41 and 42 by treating Circ as a function from events and event descriptions to sets of propositions. Formally, this means that we might assume the progressive operator to have scope over an event and a property of events, rather than a proposition. For example, the logical structure of 11 could be as in 44. Recall that $^\land \lambda e[cross(e,$ Max, the-street)] is the property of being an event of Max crossing the street.

(44) $\exists e[PAST(e) \ \& \ PROG(e, \ ^\land \lambda e[cross(e, Max, the-street)])]$

Alternatively, we could have a representation where the progressive only has scope over an event-description.

(45) $PAST(PROG(^\land \lambda e[cross(e, Max, the-street)]))$

In that case, the quantification over events of 44 would be built into the semantics. I will work with the more transparent 44.[12]

In terms of 44, the analysis of the progressive may be formalized as in 46.

(46) a. Best(Circ, NI, e, P) = the set of worlds w' in $\cap Circ(e, P)$ such that there is no w'' in $\cap Circ(e, P)$ where $w'' <_{NI,e} w'$.

  b. PROG(e, P) is true at a world w iff for all worlds w' in BEST(Circ, NI, e, P), there is an event e' which includes e as a nonfinal subpart, such that $P(w')(e')$ is true.

The function Best now has a fourth argument in 46a, since what counts as the 'best' worlds is now relative to the event-description under the scope of the progressive. The progressive operator, applied to event e and property P, asserts that if e is not interrupted, it will become an event of the kind described by P. What counts as a relevant interruption for the event depends on the content of the modal base, where the identity of the modal base depends both on e's intrinsic nature and on P, i.e. the way e is described.

In §§4.2 and 4.3, I have tried to understand how the set of inertia worlds is derived for a variety of sentences. The most difficult part of this was to come up with the right modal base, and in several cases I had to do a fair amount of work to see where it came from. But one helpful fact was that the truth conditions for the sentences were always fairly clear. There are other types of examples, though, where the truth conditions for the sentences are sufficiently vague as to make it difficult to determine the precise identity of the modal base. This situation comes up clearly when we consider progressive sentences containing various kinds of adjunct clauses.

(47) a. Given that the bus was going to hit him, Max was in fact not crossing the street.

  b. Despite the fact that the bus was going to hit him, Max was crossing the street.

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[12] In an interval semantics framework, the semantics for PROG would be:

(i) PROG(P) is true at $\langle i,w \rangle$ iff for some event e, $T(e) = i$ and for all worlds w' in Best(Circ, NI, e, P), there is an event e' such that $T(e') = i'$ and i is a nonfinal subinterval of i' and $P(\langle i',w' \rangle)(e')$ is true.

I believe that 44 represents the ideas I wish to convey more straightforwardly.

If the proposition that the bus is going to hit Max is in the modal base, we expect 47a to be true and 47b false. I find 47a plausibly true and 47b extremely difficult to judge, though on balance probably false. Overall, the precise truth conditions of these types of examples are rather unclear. According to the present analysis, this fact is due to the vagueness in determining what constitutes the modal base. In the case of 47b in particular, the content of the VP supports excluding consideration of the bus, since it is the same as the VP in 11, while the overt mention of the bus in the *despite*-clause supports including it. This makes it hard to know whether it is in the modal base or not.

A similar kind of vagueness can be observed just based on contextual considerations, as with 4 (*The coin is coming up heads*). Recall that this sentence is to be understood as uttered while the coin is still in the air, and that it eventually does come up heads. Whether it is seen as true or not depends on the precise nature of the modal base, and in this instance the context of use plays a central role. If the modal base for the sentence contains sufficiently detailed information about velocity and position of the coin, the environment, and physical laws, it may entail that the coin does eventually come up heads. If it does, then the sentence will be true. The kind of conversation that would tend to support this modal base is one between Newtonian physicists. On the other hand, if the modal base contains only the kind of information observable to an ordinary person, it will not entail that the coin comes up heads; the sentence will then be false. A conversation between gamblers might tend to have this kind of modal base. In still other contexts, such as when one simply reads it off a printed page, it will be difficult to decide which is the right modal base, and thus the truth or falsity of the sentence will be difficult to determine. This type of vagueness and context dependency in the truth conditions for progressive sentences is parallel to what we find with ordinary modals, as discussed above. Thus it is expected under the modal theory of the progressive.

To summarize, I have argued that the ordering semantics for modality provides significant advantages to the modal theory of the progressive. It allows us to fix on several factors that help determine the relevant worlds and explain precisely how they enter into the semantics. I have identified two major factors that contribute: the nature of the event and the way it is described by the VP under the progressive's scope. These two factors are formally tied to the determination of the modal base and ordering source through the functions NI and Circ. As with modal auxiliaries, however, other factors can affect matters as well. Their role can be understood in terms of a contextual effect on the modal base, i.e. on the function Circ, even though the way they contribute is not reducible to a precise algorithm.

5. COMPARISONS. The theory developed in the last section expresses an intuition that can be brought to light through a comparison with the previous modal theories of Dowty and Landman. Beginning with Landman's, the present approach is not subject to the criticisms that were applicable to his: it reanalyzes his stipulation that the continuation branch not include any worlds which are unreasonable into the simple fact that the only relevant worlds are those compatible with the modal base. It identifies the 'inertia worlds' through two familiar parameters of interpretation, the modal base and ordering source, rather than through an independent definition of the continuation branch. And finally, it no longer requires a primitive relation, encoded via stage, between completed and uncompleted events of a given sort; rather, what counts as a completion is defined in modal terms, as in Dowty's theory.

Despite these differences, there is a deeper connection between the two theories worth remarking on. The connection arises because we have utilized a background modal theory of the kind designed for counterfactuals, and thus the relevance of counterfactuals to the progressive, demonstrated amply by Landman, is not so surprising. Landman builds up his continuation branch through the explicit introduction of counterfactual statements into the semantics. The present theory, in contrast, uses a modal base and ordering source that are closely related to the reasons why one might assert the very counterfactuals Landman appeals to. To clarify this, let us consider again 11 (*Max was crossing the street*). The situation, again, is that Max was hit by a bus as he was in the middle of the street, and let us suppose that the bus was the only thing that prevented him from making it across. Landman proposes that 11 is true because in the closest world to the real world where the event e described by 11 is not interrupted by the bus, e is a stage of an event of Max crossing the street; in other words, if e hadn't been interrupted, it would have been a complete street-crossing. The key point here is that the semantics makes use of an explicit counterfactual shift as part of 11's truth conditions.

In contrast, my theory states that 11 is true because in all of the worlds compatible with Circ(e, P) which are ranked as best according to NI(e), Max crosses the street. Since Circ(e, P) encodes Max's abilities, the conditions of the street, etc., which are certainly compatible with him crossing the street, and NI(e) includes propositions like 'Max isn't hit by a bus', clearly the set of best worlds will entail that he crosses the street. Next consider the counterfactual 48, evaluated in the same world as 11.

(48) If Max hadn't been hit by a bus, he would have crossed the street.

As a modal sentence, 48 must be interpreted with respect to a modal base and ordering source itself. According to Kratzer's (1981, 1991) analysis of counterfactuals, based on those of Stalnaker (1968) and Lewis (1973b), it will utilize an empty modal base and a TOTALLY REALISTIC ORDERING SOURCE O such that O(w) includes sufficient propositions to distinguish w from all other worlds, for each world w; among the elements of O(w) are all linguistically relevant propositions true in w. Thus, if w_e is the world of evaluation for 48, O(w_e) contains all of the propositions in our Circ(e, P), as well as others encoding Max's intentions, the lack of other obstacles to his crossing the street, etc. Sentence 48 will then be true because in all the best worlds compatible with the proposition that Max wasn't hit by the bus (the *if*-clause proposition), he crosses the street.

The relation between the progressive sentence and the counterfactual may then be seen as follows: because the totally realistic ordering source of the counterfactual includes all of the propositions in the progressive's circumstantial modal base, the truth of the counterfactual provides evidence for the truth of the progressive.[13] Since the *if*-clause in 48 does not pertain to Max's abilities, if the sentence is true in w_e we know that the set of propositions in O(w_e) that do is compatible with Max's crossing the street. Furthermore, we know that nothing else in the real world w_e was hindering his trip across the street, including his intentions, the condition of the street, or other unforeseen external circumstances. Thus we can be sure that all of the worlds in Circ(e, P) that are ideal with respect to NI(e) (which, recall, entail that he was not hit by the bus or interrupted in any other way) are worlds in which he crosses the street.

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[13] This way of thinking about Landman's proposal was suggested to me by a comment of James Higginbotham (University of Maryland colloquium series, November 15, 1996), but he would not subscribe to a modal analysis of the progressive of the kind developed here.

Matters would be different with a counterfactual like 49, where the *if*-clause does pertain to Max's abilities.

(49) If Max were in better shape, he would have crossed the desert.

(50) Max was crossing the desert.

Sentence 49 does not support the truth of 50 as strongly as 48 did that of 11 because 49 implicates that Max failed to cross the desert because he lacked the endurance to do so. It suggests that $O(w_e)$ contains (or entails) the proposition that Max was in too poor shape to cross the desert. Thus, it tells us that $Circ(e,P)$, which includes propositions pertaining to Max's conditioning, is not compatible with his crossing the desert, and so that 50 is false.[14]

In sum, according to this point of view Landman's counterfactual theory is more about the kind of evidence one may present for the truth of a progressive than a semantic analysis of the construction itself. By adopting an ordering semantics as the basis for the modal analysis of the progressive, one can relate the progressive's semantics to that of counterfactuals. It is then possible to account for Landman's data because of this relation to counterfactual semantics.

I would also like to recap the relation between the present account and the Dowty's original modal analysis. The central point I have made is that, once we frame the modal component of the progressive's meaning in terms of ordering semantics, the ways in which the set of accessible worlds is fixed based on contextual and linguistic factors become much more understandable. The main intuition Dowty gives us for what counts as an inertia world is that it should be 'normal' or 'most compatible' based on prior events. But when we are faced with an example like Vlach's 11, the notion of normalcy appears to give the wrong results, or at best to be quite unhelpful. Similarly, Landman's example 18 is one where the inertia worlds ought not to be those where events come out 'normally', in any commonsense application of that term (*Mary was wiping out the Roman army*). And finally, the vagueness of 4 and the fact that 11 and 39 can simultaneously be true shows that the identity of the inertia worlds is partially a context-dependent matter.

(39) Max was walking into a collision with an oncoming bus.

Within Dowty's theory, however, it is not clear in precisely what way context plays a role in fixing the set of inertia worlds.

These problems can be addressed within ordering semantics, in contrast, because it specializes in understanding how contextual influence and shifts in accessibility relations come about through the contextually supplied parameters of modal base and ordering source. In all of the cases, the ordering source $NI(e)$ provides a characterization of what would be an ideal realization (or completion) of the event being described. The modal base, in contrast, is sensitive to a variety of factors as it determines how ideal a realization is going to count as relevant for the sentence in question. Thus, with example 11, we focus only on factors internal to the event itself; because of this, the completely ideal realization where Max crosses the street is what's relevant. With 39, however, the overt content of the sentence points out the relevance of the bus; relative to the information relevant for 39, a totally ideal realization of the event is not achievable, and we focus on the outcome that is normal from a broader perspective. Finally, 18 represents a case where a completely unexpected fact, that Mary defeated the whole

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[14] Landman would have to stipulate here that the event ends when Max drops from exhaustion, and doesn't merely stop.

Roman army, is incorporated into the modal base. Because it is there, we get to focus on completely ideal realizations of Mary's fight, where she defeats the whole army, even though in no sense would these realizations be considered normal. There are a number of other examples (see §4.3) where the identity of the modal base allowed us to understand precisely how certain possible worlds become relevant for the progressive.

   In summary, then, I have argued that the semantics of the progressive should be understood in terms of modal semantics because this framework best allows an explanation for how linguistic and contextual factors contribute to its meaning. This conclusion raises a number of significant questions about the relation between aspect and modality more generally. This article represents a small contribution to the ongoing attempt to understand the nature of these two categories.

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