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NATURAL LANGUAGE METAPHYSICS

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0. Introduction

Metaphysics I take to be the study of how things are. It deals with questions like these:

What is there?

What kinds of things are there and how are they related?

Weighty questions, indeed, but no concern of mine as a linguist trying to understand natural language. Nevertheless, anyone who deals with the semantics of natural language is driven to ask questions that mimic those just given:

What do people talk as if there is?

What kinds of things and relations among them does one need in order to exhibit the structure of meanings that natural languages seem to have?

Questions of this latter sort lead us into *natural language metaphysics.* In this paper, I want to show how we are driven to such questions when we try to give a serious account of the semantics of natural language and I want to say something about possible answers.

Linguistics, like any other field of inquiry, lives off of puzzles. Why can we say this and not that? If I say a certain sentence, does that commit me to the truth of certain other sentences? Why does no language do this and every language do that? Why do languages that put the verb at the end of the clause overwhelmingly tend to use postpositions rather than prepositions? Why are Dutch *weten*, German *wissen* ('know') etymologically related to Latin *video* ('see') (cf. Greek *oida* 'know', present in meaning but perfect in form, thus historically 'I have seen')? Linguists, like other seekers after understanding, usually follow the maxim: Divide and conquer! That is, we try to understand complex phenomena like those just

alluded to by setting up various components in our explanatory theories, by idealizing, and trying to do justice to the complexity of the phenomena by appealing to the interactions among the various subsystems. This sort of strategy has led to many satisfying results and interesting new questions. To the extent that we are successful we think we are finding out something about the nature of language and the users of language.

The general framework for descriptions of natural language that I start from draws upon two traditions: that of generative theory as developed in the last several decades under the leadership of Noam Chomsky and others; that of model-theoretic semantics as inspired especially by Richard Montague. I like to look at the relationship between these two lines of research as encapsulated in two theses:

I. Chomsky's thesis: natural languages can be described as formal systems.

II. Montague's thesis: natural languages can be described as *interpreted* formal systems.

Note that in this way of looking at matters, Thesis II embodies or presupposes Thesis I. (DAVIDSON (1967) must be mentioned along with Montague as one of the first to propose that the methods of interpretation developed by Tarski, Carnap, and others, could after all be applied to the study of natural language semantics.) I interpret 'interpreted' here in the sense of providing models of various sorts that contain non-linguistic objects (in general) that are assigned to linguistic expressions as their "semantic values" (LEWIS, 1972). Thus, I understand 'semantics' in the sense of a theory of the relationship between language and something that is not language.

Now even at this most general level we run into some fundamental problems. If we ask what these non-linguistic objects are that we assume for our model structures, there are two quite different kinds of answers, at least, that have been proposed or presupposed or defended: one tradition, probably the most prominent one in the philosophical tradition, has it that they are real objects and relationships in the world (as well as, perhaps, their analogues in other possible worlds); the other, which seems most prominent in the tradition of generative theory, says that they are mental objects: concepts, representations, or the like. Thus, in his latest major book, Chomsky draws a distinction between 'real semantic interpretations' and properly linguistic or psychological semantic interpretations, presumably of the second sort (1982, p. 324).

Are these two answers genuine alternatives or is there some way to reconcile them? Chomsky's few remarks (*ibid.*) seem to suggest that they

are not incompatible. I quote:

> Note that this step in the process of interpretation [the positing of a domain D of individals in "mental space" EB] ... should be considered to be in effect an extension of syntax, the construction of another level of mental representation beyond LF ['Logical Form'], a level at which arguments at LF are paired with entities of mental representation, this further level then entering into "real semantic interpretation."

Elsewhere (1975), CHOMSKY has suggested that the step from LF to semantic representation (SR) takes us beyond linguistics in that it requires us to bring in systems of 'knowledge and belief.' On the other hand, in a recent book, Jerrold KATZ (1981) makes a plea for what he calls a Platonist conception of linguistics in which the objects that we study are purely abstract, and linguistics is something like a specialized branch of mathematics (cf. Thomason's similar interpretation of Montague's position in his introduction to MONTAGUE, 1974, and the reaction in CHOMSKY, 1980, pp. 29 f). Finally, there are plenty of passages in Chomsky's writings which display the attitude that 'real semantics' has very little or nothing to do with genuine linguistic questions.

Now, it is a frequent move in linguistics, as in other fields, to mark off some domain of questions and — tentatively — leave other questions to be dealt with in some other, perhaps not yet invented discipline or theory. Thus, in the early days of generative grammar it was quite usual to argue that various facts were semantic and not to be represented in a linguistic grammar (i.e. syntax and phonology). Once 'real semantics' began to play an important role in linguistics other wastebaskets were appealed to: 'pragmatics' was one, 'real world knowledge' was another. But each such decision must be backed up at some point by providing or pointing to a genuine theory of some sort about what is left out. If something is claimed to be outside of semantics because it is a matter of pragmatics (in one of its several senses), then we had better be able to work out a pragmatic account or at least give plausibility arguments for why we think a pragmatic theory would provide us with such an account. The present paper is concerned with asking about just such a program or theory with respect to certain phenomena and puzzles that seem to go beyond pure semantics as usually conceived. The first point that I will try to argue for is this: No semantics without metaphysics!

We can come at the sort of questions I want to raise here from a somewhat different angle. Many writers contend that it is possible and desirable to draw a sharp line between what we might call 'constructional' (or 'structural') semantics and lexical semantics. Let me quote a sentence

from Richmond Thomason (MONTAGUE, 1974, p. 48):

But we should not expect a semantic theory to furnish an account of how any two expressions belonging to the same syntactic category differ in meaning.

And in a footnote to that sentence:

The sentence is italicized because I believe that failure to appreciate this point, and to distinguish lexicography from semantic theory, is a persistent and harmful source of misunderstanding in matters of semantic methodology. The distinction is perhaps the most significant for linguists of the strategies of logical semantics.

The idea here is something like this: in constructing a syntax and semantics for a fragment of a natural language like English we start for the most part with unanalyzed chunks of meaning for individual lexical items like *fish* or *walk* or *kiss*. All that we need to know about such items is what *kind* of meanings they have, for example the *fish* and *walk* denote properties or sets of individuals, *kiss* a two-place relation between individuals, and so on. We offer analyses for certain 'logical' words: *the, a, every, be* (cf. MONTAGUE, 1974, p. 261); other words perhaps receive no direct interpretation at all: their semantic effects are exhibited only in conjunction with the rules that introduce them: thus *and, or* as well as grammatical morphemes like past tense markers and the like (so-called syncategorematic items). Now we build up the meanings of complex expressions by stating explicit semantic rules for each of the constructional rules of our syntax, requiring that the resultant semantic value be a function of the semantic value of the component parts. Thus, for a subject-predicate rule that gets us sentence like *John walks* we need to state a general rule that will license the particular theorem: *John walks* is true iff the individual denoted by *John* is in the set of walkers (at the time and world of the evaluation, say). Thomason's point is that this general rule should in no way depend on differences among the meanings of *walk* and *jump* or *run* or *shout* or *exult*. This kind of distinction is reminiscent of the traditional distinction between logical and non-logical constants. And it is subject to similar suspicions, as I will try to show. So the second main point I want to make is this: No constructional semantics without lexical semantics!

There are at least two parts of the enterprise of doing the semantics of natural languages where metaphysical questions rear their (ugly or beautiful?) heads: in making decisions about the general structure and content of our models and their relation to the things in our syntaxes, and at points where it seems that we have to 'go inside' the meanings of particular lexical items in order to state compositional rules of the semantics. Let's consider

some examples of each of these areas in turn. At the end I will return to the more general question: What are these things that we talk about in our models for the meanings of natural language expressions?

1. General characteristics of model structures

By a *model structure* I mean the collection of various kinds of things and possible relationships among them that are used to give an interpretation for a language. Thus, a standard semantics for a first order theory has a very simple model structure: a set of individuals, a set of two truth values (and a set of assignments of values to variables in a Tarski style quantification theory — I will henceforth omit mention of assignments of values to variables, supposing it to be a constant feature of all the model structures I want to talk about). A model structure is then a candidate for the range of a an interpretation function for a language.

Let me use a quick review of the model structure assumed in Montague's best known paper on English as a way of getting into the kinds of worries that I want to consider here (that is, 'The proper treatment of quantification in ordinary English,' henceforth 'PTQ' = Paper 8 in MONTAGUE, 1974). It makes use of the following sets:

A: the set of possible individuals,
I: the set of possible worlds,
J: the set of times, with simple ordering $\leq$ on $J \times J$,
2 ($=\{0,1\}$): the set of truth values.

In PTQ, (disambiguated) English is interpreted indirectly via a translation function that takes English expressions into expressions in a typed intensional logic (IL) which is in turn interpreted by an assignment of elements constructed out of the above sets to the expressions of the logic. (Given the two-step functional relationship between disambiguated English, IL, and the model, we know that there is a direct function from disambiguated English to the model structure. This means that for Montague's purposes, IL is merely a convenient way of exhibiting the structure of the interpretation and is theoretically dispensable.) What kinds of things are made out of these ingredients? The answer is given by a recursive definition that starts with the sets *A*, 2, and the set of *indices* $I \times J$ (worlds cross times) and allows us to construct all total functions from sets of possible denotations to sets of possible denotations and in addition from indices (worlds plus times) to sets of denotations (these are the *senses* or *intensions* that make the logic intensional). This gets complicated very quickly: the denotation of the

English word *John*, for example (given Montague's theory of interpreting noun phrases as generalized quantifiers), is a function from functions from indices to (functions from (functions from (indices to individuals) to truth values)) to truth values (if I got that all straight!) You can imagine (you probably can't) what kind of denotation the preposition *in* has in a sentence like *John kissed Mary in the garden*!

So what answer to the query *What is there?* do we get from PTQ? (Or to the question *What does the speaker of PTQ-ese talk as if there is?*) The answer is: a whole lot! Given that the intensional logical allows variables of all types, if to be is to be a possible value of a variable available for quantification, the PTQ gives us an infinite collection of different kinds of beasts to put into our ontological zoo. Yet all of this is built up in a way that is set-theoretically quite respectable and as far as the primitive elements are concerned quite simple. How well does this apparatus perform when we take it to be a candidate for providing insights into the meanings of natural language expressions? Well, there are problems. And these problems seem to be of two kinds: the system seems to give us too much and too little.

Before getting into the details of these embarrassments of riches and poverty, let me give some quick illustrations (cf. BACH, 1981) of the sort of metaphysical questions that arise just out of the model structure of PTQ itself quite apart from the hierarchy of functions we've just looked at. You will note that the set of times (with its ordering relation) is an independent ingredient in the model structure, that is, it is outside of possible worlds, hence, we can always get a definite answer to questions about the temporal relations of happenings in different possible worlds. Example: *If Mary had left on the space flight yesterday she would now be eating breakfast.* Now, I'm not at all sure that we want to make this sort of a claim even for one world, say *our* world, as part of our semantics. Moreover, even the relatively minimal assumptions about the ordering relation (it is transitive, antisymmetric, reflexive) commit us to certain views about such questions as this: Is time travel possible? Two well-known native speakers of English, Peter GEACH (1965) and David LEWIS (1976), appear to have or have had diametrically opposed views on this matter. (It was worries of this sort that first got me to thinking about English ethnometaphysics.) And physicists make good money thinking seriously about time reversal. Arthur Prior once characterized the job of tense-logicians as being 'lawyers of time' who do up briefs for their clients. Well, we are the clients and we have to think seriously about just what sort of temporal systems we want to adopt in our model structures. A few more such worries follow.

What are the members of J? Montague doesn't tell us. Early tense logic *assumed* that they were something like dimensionless moments or instants (and Montague uses this kind of talk in his paper, 'On the nature of certain philosophical entities,' Paper 5 in MONTAGUE, 1974). There seems to be a growing consensus that intervals are better or at least necessary in addition. Should we take instants as basic and *construct* intervals as convex sets of instants (v. BENTHEM, 1982)? Should we take intervals as basic and construct instants (*ibid.*; KAMP, 1980) in the manner of Wiener, Russell, or Whitehead? Should we say more or less than Montague does about the structure of time? Is it discrete? I would argue that the set of times must be at least countably infinite (cf. BACH, 1981). Then, if time is discrete and homogeneous, as has been argued by some linguists, there cannot both be a first and a last moment of time. Are questions about the Big Bang and the Final Whimper *linguistic* questions? Is time dense, continuous, Dedekindian? Some physicists want to say that time comes in little smallest granules called chronons (one estimate: 10^{-43} seconds). Before anything happened, how long did it last? Can time pass if nothing happens? Native speakers of Standard Average European languages (Whorf's phrase: SAE) differ on this point too (Archimedes and Aristotle, Newton and Leibniz, for example (cf. NEWTON-SMITH, 1980)). WHORF (1936) claims that we speakers of SAE differ on many of these points from speakers of Hopi, we being Newtonian absolutists, they being relativistic. But Einstein was no Hopi! I'll get back to some of these questions below, but let's now return to the main thread.

Montague's semantics makes a nice start toward solving some puzzles. Consider for example his reconstruction of the notion of a property as a function from possible worlds to sets. This analysis allows us to distinguish between the property of being human and the property of being a two-legged rational (?) animal. *Maybe* in this world the two properties pick out the same set of entities. but surely not in every possible world (for example, very likely *not* in this possible world).

Now, it seems that Montague's reconstructions of things like intensional meanings (Fregean senses) don't go far enough along the highroad of intensionality. It's been known for a long time that belief-contexts and the like make for insuperable difficulties for Montague-style propositions, properties, relations-in-intension and so on. Here's a different kind of argument (due to Gennaro Chierchia, cf. CHIERCHIA, 1984) based on rather mundane linguistics facts. Consider English phrases like these:

(1) sold,
(2) bought,

(3) sold by Mary,
(4) bought by Mary.

Everything we believe about linguistic methodology and English syntax urges us to say that phrases like (3) and (4) are built up out of phrases like (1) and (2) by the addition of an agent phrase in *by* to a passive (or passivized) verb phrase or verb. Now it can be plausibly argued that in every possible world in which there is buying and selling the set of things that are bought will be coextensive with the set of things that are sold. But on Montague's analysis this means that the property of being sold is identical to the property of being bought. Ergo, there is no way to get the function that makes the meaning of (3) and (4) to give us a different result when we combine *by Mary* with the two passive phases in (1) and (2). Hence, Montague grammarians have been forced, within the confines of PTQ semantics, to posit two completely unrelated passive rules for cases like (1) and (2) as against (3) and (4) (THOMASON, 1974; BACH, 1981; cf. COOPER, 1979, for a dissenting view which tries to turn this vice into a virtue). Here, I think we have not been paying enough attention to what I like to call Montague's advice: Take natural languages seriously! Perhaps they are trying to tell you something. In this case, as Chierchia very convincingly argues, English is trying to tell us that we need to have in our models properties as entities of some sort that can be distinguished even if they pick out the same sets in all possible worlds. That is, PTQ isn't intensional enough; natural language is *very* intensional.

That was an example showing how PTQ model structures aren't rich enough to do what we need. An opposite sort of example showing that the type structure and the assignment of types to syntactic categories is doing too much, that is, forcing distinctions that make life ugly for the semanticist, is the following: consider the sentence *Mary loves everything!* There is no obvious way in which we can give a meaning to this sentence in PTQ semantics that will allow us to conclude that Mary loves, for example, dancing, Chinese cabbage, the Pythagorean theorem, and Montague semantics (to say nothing of generalized quantifiers, propositions, and Sam). Or consider the sentence: *It's boring to be boring.* We can construct a higher order predicate applicable to (say) properties but on the one hand it can't have anything to do with the predicate in *John is boring* and on the other we can construct sentences *ad libitum* that keep pushing us toward higher and higher order functions: *It's boring for it to be boring to be boring* ... (cf. PARSONS, 1979; CHIERCHIA, 1982; TURNER, 1983). We can see this problem from a slightly different angle. PTQ is a quite rich fragment but is deliberately restricted at its base: there are only singular NP's and sets of

individual concepts at the bottom of the interpretation. As various workers have extended the coverage of the fragments (e.g. BENNETT, 1974, for plurals; DELACRUZ, 1976, for propositional predicates and noun-phrases) it has seemed to be necessary to introduce new sets of syntactic categories and rules for these extensions. But now it becomes a complete accident that the kinds of constructions that English uses for expressions involving these various kinds of new categories resemble the constructions that are used for the simpler categories. Put more plainly, once we learn how to construct sentences about people, cabbages, kings, and pigs, we don't expect to have to learn a whole new syntax to be able to talk about first principles, purposes, propositions, groups, and so on.

Montague's theory requires a functional mapping from syntactic categories to logical types. In some cases this seems good. As we look at new languages we find that the predictions about the existence and behavior of categories like those of sentence and noun-phrase hold good: sentences correspond to truth values (or maybe propositions), noun-phrases to generalized quantifiers, verb-phrases to sets or properties. We are beginning to gain some insight into differences that are not reflected in PTQ semantics among other 'parts of spech' like intransitive verbs, adjectives, and nouns (GUPTA, 1980; CHIERCHIA, 1984). What we don't expect to find are syntactic differences within these broad general syntactic classes (well, maybe some, e.g. mass versus count nouns, etc., but see below) that depend on the kinds of things, actions, qualities denoted by the various lexical items. But the attempt to reconstruct some of these semantic differences on the basis of the type theory inevitably leads to an explosion of syntactic categories.

One move that was made early on by CRESSWELL (1973) arises from reflecting on what sorts of things (and what *sorts* of things) we want to include in our domain of possible individuals (PTQ's A, Cresswell's D_1). Montague is already fairly liberal: there are four individual constants in his fragment that denote (rigidly) the individuals Bill, John, Mary and ninety, and the sets of things countenanced by PTQ include fish, unicorns, men, women, prices and temperatures. Cresswell is not only quite explicit about letting us put into the domain anything whatsoever that we want to talk about but offers us the option of pumping various higher order things like propositions and properties back down into the domain.

Now, once we start putting new and unusual things into our domains, it begins to look as if we might want to do some sorting (THOMASON, 1972; WALDO, 1979). Let me mention some of the sorts that have been introduced into our domain in the last five years or so.

I've already mentioned properties as primitive elements. Here I'm most familiar with the work of Chierchia (already mentioned) who is building on the work of Nino Cocchiarella. This move is also made in the situation semantics of BARWISE and PERRY (1981) and in the work of BEALER (1982). Some other but more recently (re-)discovered species represented in various zoos around the world are kinds and stages (G. CARLSON, 1977), plural individuals and quantities of stuff (LINK, 1983), events, processes, states, situations. Of course most if not all of these animals had been reported to exist at one time or other long since. What is recent is getting them into the model-structures of a certain family of related ways of doing semantics. As these new things come in it is reasonable to want to put a little more structure into our domains. In the next part of this paper I want to take up this kind of question in the area of events and situations. But before doing so, let me mention one more move that seems to be common across several theories: that is 'going partial.'

Theories have been going partial in two (not unrelated) ways. One way is using partial functions in the semantics, the other is in providing for partial worlds, so to speak (both already in CRESSWELL, 1973).

People usually seem to think of worlds as pretty big things, as entire ways in which things — everything — could be. Now for lots of purposes it seems as if it would be nice to have something intermediate in 'size' between individual things and entire worlds in the usual sense. In one way or another, various workers have used the idea of something like a partial world or part of a world in a crucial way. I will mention two theories that I know a little bit about (there are no doubt many more I don't know about): CRESSWELL's (1973) metaphysics of propositions and categorial languages and BARWISE and PARRY's situation semantics (1980).

In keeping with his laudable decision to say something definite about the metaphysics of his possible world semantics, Cresswell offers the following analysis of possible worlds:

> We are to suppose that we are given a set B of 'basic particular situations.' The idea is that any subset w of B determines a world. The elements of B which are members of w might be thought of as the 'atomic facts' of world w. (1973, p. 38)

Although Cresswell writes 'determines' here, elsewhere (e.g. p. 42) the power set of B just *is* the set of possible worlds. That he is really thinking of possibly very small portions of a world as being themselves worlds is clear from the discussion of individuals in a later chapter. For Cresswell, an individual is a function from a world to a subpart of that world (it is thus something more like Montague's individual concept). He writes:

> Strictly, since a subset of a world can itself be a world a basic individual ρ is a function from possible worlds into possible worlds provided that for any world w, $\rho(w)$ is a subset of w. (p. 94)

Cresswell calls the value of the function applied to a world w the "manifestation" of ρ in w.

As its name implies, situation semantics takes seriously the idea of a situation, something like a limited portion of the world (note the definite article). (This discussion is couched in terms of the first presentations of the theory, e.g. in BARWISE and PERRY, 1981. I am not sure to what extent what I say is consonant with the later versions (1983) of the theory.) As I mentioned, the theory accepts properties and relations as irreducible elements of the model structure. Corresponding to situations are situation types, partial functions from ingredients of situations to truth values, the ingredients being ordered n-tuples of ($n-1$ place) relations and individuals. The World Type is a total function of the same sort. There are many points of interest in the theory for people interested in linguistic semantics, but this is not the place to explore the theory. The point I want to make here is that, just as in Cresswell's metaphysics of propositions, we have world-like things that are possibly smaller than worlds, can stand in a part-whole relation to each other and are of the same logical type as worlds. I want to take over much of these theories in the following discussion. For concreteness and because it represents a less radical departure from familiar model-structures I will take Cresswell's proposals as a base.

2. Eventology

I now want to look in some detail at a topic that we might call (rather barbarously) *eventology*. Under this heading I wish to consider two questions. The first is this:

(1) Do we want or need to include something like events in our model structure?

I associate the insistence on the importance of this question as well as a vigorous defense of the answer 'Yes!" above all with writings of Donald Davidson (recently made conveniently available together with further commentary in DAVIDSON, 1980).

The second question, brought into prominence in modern times especially by Anthony KENNY (1963) and Zeno VENDLER (1967), has to do with a classification of what I have called 'eventualities' (BACH, 1981), that is

things that go variously under the names of 'events, processes, states' (my favored terminology), 'activities, accomplishments, achievements' (VENDLER), 'performances' (KENNY). (There is a vast literature, both linguistic and philosophical, on such matters. For a comprehensive discussion from a linguistic point of view and within the same general framework of assumptions as my own, see DOWTY, 1979.) So the second question is this:

(2) What kinds of eventualities are there and what are their properties?

Whatever one thinks about the philosophical, that is, metaphysical answers to these questions, I think there is ample evidence that we want to answer "Yes" to question (1) and provide an answer to question (2) if we want to do natural language semantics.

I think it is reasonable to assume that the proper place in our theories to try to come to terms with the second question is in our semantics rather than (or rather than only in) the syntax. I don't want to deny that the classification can have syntactic correlates, in fact, it is clear that it often does if we look around at the languages of the world. But the distinctions feel semantic. So I want to claim that they are not *just* syntactic. One reason for supposing that this is correct is that the distinctions turn up in language after language as overt or covert categories, but with wildly differing syntactic and morphological reflexes. Thus, our theories of Universal Grammar should provide a place for talk about the classification but it seems hopeless to build such a theory on the basis of pure linguistic form. Another, perhaps more compelling, argument is that the classification plays another role in licensing certain inferences, as we shall see; indeed, this was one of the important species of arguments for establishing the classification in the first place. In general, it is not the case that purely syntactic distinctions license (non-syntactic) inferences, cf. grammatical gender.

Moreover, I am going to start from the position that we want to reflect the classification somehow in our model-structures. The question is how?

Perhaps it would be well to inject a brief reminder of just what it is I am talking about. Consider these eight sentences:

1. Bill loves Mary.
2. Mary finds a unicorn.
3. Bertha builds a cabin.
4. John runs.
5. Bill is loving Mary.
6. Mary is finding a unicorn.
7. Bertha is building a cabin.

8. John is running.

The contrasts in acceptability and 'specialness' of interpretation when we compare English sentences in the simple present and present progressive establishes the distinction between states (1) and non-states on the other (2, 3, 4). Differences in the interpretations of progressives help to establish the differences on the one hand between processes (4) and events (2, 3) and further between momentary or punctual events (Vendler's achievements: 2) and protracted events (3) (I am less secure about the linguistic necessity for the last distinction than I am about the others).

I am not going to argue extensively here for the necessity of including eventualities as entities in our models (cf. DAVIDSON, 1980, passim for events). Let me limit myself to one argument that has the nice property of helping to establish the irreducibility of events. Consider the kind of patterns of inference given by KENNY (1963) as part of the justification for the difference between activities or processes and performances (a species of events).

9. Mary is building a cabin. Therefore, Mary has not built a cabin. (Mary is *V*-ing. Therefore, Mary has not *V*-ed.)

Now, never mind that this inference is clearly not valid, there is a genuinely correct intuition that Kenny is trying to get at and one that we constantly use in our everyday decisions. (Cf. *Bill is dying. Therefore, Bill has not died.* This inference requires additional premises.) Suppose the mechanic at my garage tells me: We are replacing your carburetor. Then I will correctly infer that the car is not yet ready to pick up and will ask some reasonable question like: When do you think you will be done? What is the basis of this inference? Well, the most direct way to say something about (9) is this: If Mary is building a cabin then that cabin-building event is not yet over. This way of talking makes direct reference to something like Davidson's particular ephemeral events.

This example is also nice in that it helps to establish that we need to have different *kinds* of eventualities. Kenny offers the following as a diagnostic for processes (activities):

10. Mary is running. Therefore, Mary has run.

Again there are problems about whether this is a genuine semantic entailment (consider the very first instant of Mary's running — you have to say the first sentence VERY FAST). But once again I think we must admit that there is a real insight here and the sharp contrast with (9) helps establish the necessity to separate processes from events.

Now, if you will grant me the conclusions just drawn, I think you will be able to see why I have some doubts about the advice of Thomason to stay

clear of the meanings of individual lexical iterms. In (9) and (10) we have instances of a quite general constructional rule of English: formation of progressives. But as the examples show, the truth conditions for the resultant expressions might very well depend on the meanings of the individual verbs.

Now the first obvious stab at getting at these distinctions in our model-structures is just to incorporate eventualities into our domain E and say something about their properties (cumulative reference, indivisibility, etc.). I don't claim that it is impossible to construct them out of things otherwise needed, just that all of the attempts to do so that I know about don't seem to work. For example, MONTAGUE in NCPE (1974, p. 6) gave an analysis of events and other kinds of entities on the basis of a model-structure including just worlds, times, and individuals, and there have been many attempts to follow out his ideas. For example, instantaneous events were reconstructed as properties of moments of time, protracted events as properties of intervals, considered as sets of moments (that was just hinted at). But the Kenny intuition about examples like (9) can't be captured in this way. Further (gratia Terry Parsons) what are we to say about two events of the same species that occur at the very same instant? So we might try to add places and think of events as properties of space-time locations. Well that works for some but not others. Suppose Mary suddenly realized that she had forgotten to turn off the power drill. Where did that happen? (Cf. DAVIDSON, 1969: 'The individuation of events' in DAVIDSON, 1980.) Now although there may be real metaphysical doubts about whether the Great Pyramid and the Battle of Waterloo are at bottom entities that are fundamentally different in kind (cf. WHITEHEAD, 1920), natural language seems to advise us to treat them as different, so we will probably want to sort E into at least two main kinds of things: eventualities and objects, with further distinctions in each subdomain. This was the move I adopted a number of years ago in some work on English tense, aspect, and temporal adverbials. At the time it seemed wildly innovative, today it doesn't seem so adventurous. Davidson, again, was my main inspiration. (This work, a very rough draft of some chapters of which was circulated to some extent under the title 'Topics in English Metaphysics,' will probably never see the light of day. Two papers that grew out of that work are BACH, 1980, 1981. The present paper draws in part from a larger work in progress with the same working title. Some of the ideas were presented in a joint seminar with Terry Parsons on tense and aspect at U. Mass., Spring 1978. The basic subcategorization adopted was the one hinted at already: states, processes, events (punctual or instantaneous) and

protracted. In this work all the types of eventualities were treated on a par.)

There have been persistent attempts to take one or another type as basic and to derive the others. Probably the best known is that of VON WRIGHT's logic of change (1963), in which some kinds of events are analyzed as changes of states. Von Wright is himself quite careful not to claim that all events and processes can be analyzed in this way. DAVIDSON (1967) gave good reasons for doubting that this would work for all events: for many events the only state that comes about as a result of the event is the trivial one of the event's having taken place: walking around the block, playing a game of chess. There is apparently a strong tendency to think that states are somehow basic, a sort of filmstrip view of reality which I do not share. If anything, quite the opposite seems to be true. It took about two millennia to come up with a satisfactory way of coping with Zeno's questions about what it could possibly mean to be in a state of motion at an instant or how you could possibly add together dimensionless instants to get changes (you can't).

One immediate bonus of making this move is that we now have all the ingredients to construct a theory of time on the basis of simple relations among events along the lines of Wiener, Whitehead, Russell and others (cf. WHITROW, 1980; KAMP, 1980). The most natural and immediate kind of temporal system that we get out of the primitive relations of precedence and overlap is an interval system but it is possible to define instants with all of the right properties (cf. *ibid.*: instants are proper filters on the set of events, or, if you wish, the intervals associated with them). In this way it is possible to think about possible histories as sets of eventualities and certain specified temporal relations among them.

One interesting metaphysical question is this: is time independent of things happening 'in' it? An ancient question which I don't think should be answered in a semantics for English (cf. WHITROW, 1980; NEWTON-SMITH, 1980). It seems most parsimonious not to assume an independent time-series. As I indicated before, it seems downright wrong to insist that everything that happens in a possible history, let alone separate possible histories, be mappable onto a single time line. If we take sets of events as basic then time can remain nicely imminent. And we need not insist on total connectedness (KAMP, 1980, argues for this freedom on the basis of two applications: the indeterminacy of temporal relations among happenings involving vague predicates of change; the construction of narrative structures where only some of the relations of precedence and overlap are specified).

One way to get at the essential differences among states, processes, and events is to perform Gedanken-experiments in which we imagine various possible histories (BACH, 1981; M. MONEGLIA in unpublished work). Imagine a history in which nothing happens. Clearly, such a history could contain no events or processes, but only states. This is not to say that there are no states that presuppose a dynamic changing universe, there clearly are (cf. being in orbit). But states *per se* do not require change. So let us say that events and processes have the property of temporality, states do not. This observation leads me to the following speculation: states have a different ontological status than events and processes. The latter are the primary ingredients of possible histories (together with the individuals and stuff involved in the events and processes). States have a more derivative and abstract status. Perhaps it is only states that can be profitably thought of as properties of moments — that is, instants — of time. Another one of my native informants was quite insistent on this point. WHITEHEAD (1920) shows how to construct instants out of families of events and then argues that the idea of nature at an instant is something that we need for our theories but does not have the same immediate reality as the processes and events that make up the process-event that we call Nature (putting things this way is very un-Whiteheadian to be sure!).

It is interesting that the sentences that Davidson uses in his arguments for events are all about genuine flesh and blood events: butterings of toast, explosions of boilers, raisings of arms, kickings of Shem and Sean and the like. There are problems lurking in some of the Davidsonian paraphrases: "There was an x such that x was an explosion and x was of the boiler" for

The boiler exploded.

(The problems have to do with some of the conjuncts like 'x was of the boiler.') But stative sentences resist this kind of paraphrase even more:

The satellite was in orbit:

"There was an x such that x was a being in orbit and x was of the satellite."

John loved Mary:

"There was an x such that x was a loving and x was of Mary and x was by John"

Sally was in New York:

"There was an x such that x was a being and x was in New York and x was of/by Sally".

Or maybe x was a being in New York?

Now what is the difference between events and processes? Events are bounded: they have a beginning and an end and maybe a middle. If there

are instantaneous events, their beginnings and their endpoints are identical and they have no middles. Processes need not be bounded. So let us say that events have the property of boundedness. Now a number of familiar properties of events and processes follow. Events are countable, processes as such are not. Events in general cannot be subdivided into subevents of the same kind. Processes may be. (Not ad libitum!) Processes have the cumulative reference property: running + running = running. Events don't. It also follows that events are the primary hooks on which we hang our temporal structures. I think this is the *reason* why events and states act the way they do in narrative structures (KAMP, 1981; HINRICHS, 1981); events move the story line forward, states don't.

Now, all of this reminds us strongly of important distinctions in the realm of things and stuff, a point that has not gone unnoticed in the literature (ALLEN, 1966; L. CARLSON, 1981; HOEPELMAN and ROHRER, 1980; MOURELATOS, 1978): mass, count, plural and so on. Processes are to events as stuff is to things. There seems to be something very basic about this articulation of the world and/or our experience of it. (It is fun to consider the analogies in the realm of sound systems and the most basic distinctive features of phonemes: ontology recapitulates phonology!)

Godehard LINK (1983) has proposed an analysis of the nominal domain that goes like this: The domain of ordinary individuals is extended to include 'plural individuals' with the extended domain making up a Boolean algebra which is complete with an individual-join and part-whole relationship. In addition, the domain includes a special set of atoms, 'quantities of matter,' with its own algebraic structure (a join semilattice with a material part-whole relation). The subdomain of quantities of matter is systematically related to the big domain by a homomorphism. Barbara Partee and I have explored the consequences of carrying Link's ideas over to the domain of eventualities along the lines of the proportion mentioned above: events are linked to 'quantities of process' in much the same way that things are linked to quantities of matter in Link's construction (cf. BACH, forthcoming, for details).

Let me make a parenthetical remark about the formal properties of the kind of distinctions we are drawing here. I have said that events and processes are temporal and that it is not the case that states are temporal and further that events are bounded but processes need not be. In each case we have attributed a certain property to classes of eventualities but it is important to be clear about the claims as they apply to the other classes of eventualities in each case. States *may* be temporal and processes *may* be bounded. The point is that they don't have to be. In linguistic jargon, it

is natural to think of these properties as something like features which may have unspecified values. Semantically speaking, we may think of them as abbreviations of or references to something like meaning postulates, that is, restrictions on the class of admissible models used to interpret natural languages.

2. TNT: The Nicest Theory

Let me now say a little bit about how we might build some of these distinctions into our model-structures for interpreting English. (I am freely stealing from all sorts of people here, and hope only that I haven't forgotten to mention any of the stealees.)

Let us follow CRESSWELL (1973) in taking as basic a set B of basic particular situations and letting the set H of possible histories simply be the power set of B. In order to think clearly about what we are doing we might adopt Cresswell's suggestion of taking each member of B to be a set of space-time points, but in no way do I (nor does Cresswell) want to be restricted to such a physicalist interpretation.

Along with the inherent relations of the Boolean structure H, we must have two further relations: strict temporal precedence ($<$) and overlap (o, as in KAMP, 1980). (I will have nothing to say about modality here, but assume that further relations such as accessibility can be specified to hold among worlds or histories.)

Now let us superimpose on this picture the additional elements of our model: individuals and properties (using this word in a general way to include relations of various adicity). Again following and extending Cresswell, let us say that individuals and properties determine functions from possible histories to parts (subsets) of those histories and let us call the values for these functions for a history h the *manifestations* of the individual or the property in h. I say 'determine' rather than 'are' functions because I want to allow individuals and properties to be different even if they are manifested identically in every possible history. Thus the property of being bought and the property of being sold can be different, and the Morning Star can be different from the Evening Star. We thus need to assume that there is a function — call it EXT — that takes us from individuals and relations to functions from histories to their parts. Notice that at this point there is no difference between individuals and properties (this would please Whitehead, I think). EXT(JOE) and EXT(KISSING)

both pick out subparts of histories: the first, all those space-time points (in our physicalist illustration) which are manifestations of Joe; the second, all of which are kissings.

We now want to notice some differences between these different sorts of entities and others. One important difference between an individual like Joe Blow and a property like Kissing is that Kissings require a kisser and a kissee but Joe Blow manifestations do not require a 'Joe-er' or a 'Joe-ee.' And in respect to the number of such extra things required Kissings differ from Laughings and Rainings. So, following CHIERCHIA, 1984, let us say that there is a function AD defined on the set of properties into the natural numbers. This function tells us how many argument places each property requires, from 0 on up, with the 0-place properties to be thought of as propositions.

Let us notice some other differences among kinds of things as far as properties of their manifestations go. The value of EXT(Joe Blow) in any history will give us either temporally limited sections of a space-time worm, or an entire space-time worm, depending on the size of the history. Moreover, any manifestation of Joe Blow (let me henceforth drop the EXT part when there's no danger of confusion) will exhibit a space-time continuity that we may not find for other kinds of things, for example, presidents of the United States, Mr. America's, and so on. Following Greg Carlson, Chierchia, and others, let's allow our set of individuals to include things like Kinds and Types of Matter. Now the manifestations of Dogs will be lots of continuous and non-overlapping space-time regions and we will notice that given any one of these we can find an individual like Fido, such that that continuous portion of space-time is the value of EXT(Fido) in that history. (PTQ: 'meaning postulate' (2), p. 263 in MONTAGUE, 1974.) Given an individual like Mud we will again find lots of space-time regions as its manifestation in any history (all the portions of mud in the history). Now it is a fact about the interpretation of English that there will be important differences in the interpretation of sentences using predicates like *being a dog* and *being mud* (the indivisibility and cumulative reference properties we notice above). Let me stress that the denotation of "mud" (used as a term phrase) is *not* some scattered individual (all the mud quantities in the history). The latter is the value for the function EXT(Mud) given the history as argument. I assume that the general structure of the models we use for different languages will be the same, although this is just a guess and needs empirical verification. but the mappings from expressions to the model-structures can vary a great deal. Thus the meaning of the Japanese

word *inu* is something like the union of the meanings of the English words *dog* and *dogs*.

Note that manifestations are themselves worlds or histories. Thus we have a built-in basis for a characterization of different kinds of predicates, namely those that take worlds as arguments and those that take other kinds of things (individuals, properties, propositions) as arguments. (I follow CHIERCHIA, 1984, in assuming a one-one relation between properties and their corresponding predicates.) It is tempting to identify this distinction with the stative-nonstative distinction. Thus the semantic value of stative sentences would be exactly propositions in the classical sense, functions from worlds to truth values or equivalently sets of possible worlds. This would solve a longstanding mystery: what is it that unifies the interpretation of such diverse sentences as the following (all stative by the usual tests):

1. Two plus two equals four.
2. Mary is intelligent.
3. Dogs are mammals.
4. Oscar was drunk.
5. Sally was running.
6. Phillip has left.

Moreover, we can explain the differences between (1)–(3) and (4)–(6) on the basis of the "size" of the worlds or histories that they pick out.

Finally, it seems that the approach outlined here, programmatic as it is, offers a properly mysterious status to manifestations, stages, bare happenings, and stuff. They are, in this setup, completely dependent on the linguistic (and conceptual?) functions which pick them out. Thus, the question of what the ultimate stuff of the world is remains comfortably open in our semantic theories: it can be atoms, wavicles, pure mass-energy, pure spirit, or air, fire, earth, and water.

4. What are we talking about?

I've now said a little (but perhaps more than enough) about some of the kinds of things we seem to need in our ontology for English and a little bit (not near enough) about how we might get them into a semantics for English. It would be immoral of me as a linguist (I'm stealing a phrase from Montague) to make claims one way or the other about whether or not these sorts of things correspond to real things in the world, perceptual or conceptual categories that are independent of language, or nothing at all.

But it is impossible for me as a human and puzzler about the world and our place in it to refrain from thinking about these larger questions.

Let me first say that the kinds of distinctions in the realm of things and of events I've illustrated here really do seem to be very basic to Language with a capital L. I have yet to see a language that does not show some reflex of the state-event-process distinction or the thing-happening distinction. I've worked quite a bit on languages that have been claimed not to make a distinction between nouns and verbs (Wakashan languages like Nootka, Kwakiutl, Xa'isla — the language of Kitamaat Village, near Kitimat, B.C.). Well, the distinction is there after all, even though it doesn't come out quite like it does in English. I once foolishly wrote a paper (BACH, 1968) in which I tried to argue that English was basically like Nootka or standard predicate calculus. I couldn't have been wronger. I now think there is more truth than madness in the old idea that nouns are names for persons, places, and things, verbs names for actions and qualities, adjectives for qualities. But the kinds of "semantices" accessible to most of us before Montague were simply not rich enough to give a good fit to natural language meanings. I have only touched on a couple of the big areas that seem at one and the same time to be basic to the semantics of natural language and also basic to our picture of what the world is like: time and the structure of happenings, things and the stuff that constitutes them. Others are space and locational relations, causation and human responsibility. You can see why I sometimes wonder whether what I am doing is linguistics or philosophy: a philosopher once said to me when I was expounding on 'natural language metaphysics' "But Emmon, that *is* metaphysics!" I've puzzled for a long time about what the difference is between certain kinds of philosophy and certain kinds of linguistics and finally decided that the main difference lies in whether you're embarrassed about not knowing about a paper in *Linguistic Inquiry* or the *Journal of Philosophy.*

But then, after all, the academic divisions we make our livings in don't at bottom necessarily reflect the way the world is. In the final judgment we'll all say we were just trying to put it all together by taking little bits and pieces because that's all we could do. Is there a natural language metaphysics? How could there not be? One of our main resources for coming to understand the world is, after all, language, a sort of tool box for doing whatever it is we want to do. Do the fundamental distinctions that are reflected in the overt and covert categories of natural language correspond in any way to the structure of the world? How could they not? But this is where linguistics stops. And so will I.

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