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SUSAN ROTHSTEIN

FINE-GRAINED STRUCTURE IN THE EVENTUALITY
DOMAIN: THE SEMANTICS OF PREDICATIVE
ADJECTIVE PHRASES AND *BE**

This paper presents an account of the semantics of copular *be* as displayed in its behaviour in *be* + AP configurations. I begin by arguing against the Partee/Dowty distinction between a semantically null *be* of predication and a thematically relevant agentive *be*, and I propose that there is one semantically relevant verb whose grammatical role is to turn an AP predicate into a verbal one. The denotation of *be* must thus be a function from denotations of Adjective Phrases to denotation of Verb Phrases. I argue that these denotations are crucially different in kind: verbs (and thus VPs) denote eventualities, which are count entities and which are temporally locatable, while adjectives (and thus APs) denote mass entities, which are states and which are not temporally locatable. *Be* thus denotes a locating function which maps from the mass to the count domain, and is the analogue of the 'packaging' function in the nominal domain. After a comparison between the mass/count distinction in the verbal and nominal domains, I show how this theory accounts for properties of *be* in small clause and progressive constructions which have hitherto been explained by positing a so-called agentive *be*.

1. THE PROBLEM

The traditional, essentially Aristotelian, view of the verb *be* is that it makes no semantic contribution to a predication sentence in which it appears. (1) asserts that Mary has the property of being very clever; the individual Mary is introduced by the subject NP, the property very clever is given by the Adjective Phrase (AP), and application gives the required proposition.

- (1) Mary is very clever.

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Be adds nothing to the meaning, and is a mere “sign of predication” (Russell 1919). *Be* is obligatory in English in matrix predication sentences because of the dual requirements that each sentence bear a tense and that a tense marker must be affixed to a verb. Thus, in circumstances where tense is not obligatory, a bare ‘small clause’ is permitted. We find examples of this in English in the complements of Exceptional Case Marking (ECM) verbs, as in (2a), and in matrix predication sentences in languages such as Hebrew, where each sentence need not bear a tense marker, as in (2b).

- (2) a. Mary believes/considers Jane (to be) very clever.
 b. dani nexmad me’od.
 Dani nice very
 ‘Dani is very nice.’

This construction contrasts with the so-called ‘identity sentences’ illustrated in (3a), where the nominal following *be* is referential. In the embedded ECM construction parallel to (2a), illustrated in (3b), the verbal element cannot be deleted, and in the construction parallel to (2b) some explicit spell-out of the Infl node is required, as in (3c):

- (3) a. The duty nurse is Rina.
 b. I believe/consider the duty nurse *(to be) Rina.
 c. ha-ax Seli *(hu) dani.
 the brother of me Infl Dani
 ‘My brother is Dani.’

One analysis of the contrast is that *be* in (3a, b) is a transitive verb denoting a genuine two-place relation, the identity relation $\lambda y \lambda x. x=y$, and since this *be* has a lexical meaning, it is obligatory. However, this is unlikely to be correct for a number of reasons, one of which is the fact that the corresponding obligatory node in Hebrew is Infl, which presumably does not denote a lexical relation.

A strongly compositional interpretation of (1) would not allow *be* to be ignored. Williams (1994) and Partee (1987) give an analysis of predication *be* which meets the demands of strong compositionality. *Be* is of type $\langle\langle d, t \rangle \langle d, t \rangle\rangle$ (where *d* is the type of individuals); in other words, it takes a *d* and a $\langle d, t \rangle$ as arguments and has as its meaning ‘apply function’. It denotes the function $\lambda P.P$, and it yields as its value exactly the same property as it takes as its argument. It is thus the identity function on properties. *Be* is optional in (2) because it can be dropped when there is

no independent syntactic reason, such as the realisation of tense, to force it to appear. For Partee, there is no independent *be* of identity, and the same verb appears in (2) and (3). However, since the complement *Rina* in (3a) is of type *d*, it must be raised into a predicate of type $\langle d, t \rangle$ by a LIFT rule, which she calls ‘ident’ and which is given in (4) (where *d* is the type of individuals):

- (4) a. *ident*: $d \rightarrow \langle d, t \rangle$
 LIFT (α) = $\lambda x.x=\alpha$
 b. LIFT (MARY) $\rightarrow \lambda x.x=\text{MARY}$

Assuming that type-raising is triggered by *be*, we can then explain why the copula is obligatory in (3b): it triggers the type-raising which allows *Rina* to be predicated of the subject. Presumably Infl has the same trigger effect in (3c).

There are a number of problems with the view that predicational *be* makes no semantic contribution to the sentence, and this is going to lead me to reject the approach. Note that in the discussion of the problems, and in proposing my solution, I am going to talk only about predicative *be* with adjectival complements (APs). I assume that the semantic account I give can be extended to *be* with other complements, in particular NPs and PPs, but doing so requires a study of the semantics of NPs and PPs which is beyond the scope of this paper.

Here are four problems for the claim that predicative *be* makes no semantic contribution to the sentence it appears in:

1.1. *ECM Verbs*

On the approach given above, the two forms of (2a) repeated here in (5a,b) should be synonymous:

- (5) a. Mary considers Jane very clever.
 b. Mary considers Jane to be very clever.

Since the verb *be* is the identity function on predicates, the denotations of *very clever* and *be very clever* should be identical. Yet it has often been commented that small clauses like (5a) ‘feel’ more ‘individual level’, inherent, or general than their inflected verbal counterparts in (5b). This cannot be related to the stage/individual-level distinction itself, since in a sentence like (6a), a temporary stage-level property is predicated of the subject in a bare small clause, while in (6b) the inflected form is used to make an individual-level predication:

- (6) a. The doctor considers Mary quite sick/very fluish.
 b. I believe Mt. Everest to be the highest mountain in the world.

1.2. *The Distribution of Bare Infinitive Clauses and Bare AP Clauses*

Another question can be raised about the pair in (5). If *be* expresses just function application, then it should be possible to add it freely to any predicate clause. However, adding *be* without the infinitival marker *to* is impossible, as (7) shows:

- (7) *Mary considered Jane be polite.

One might think that (7) is unacceptable because there is no Infl in (7), while *be* is supposed to be a bearer of Infl, but if we look at bare infinitival clauses, then we see that the so-called ‘naked infinitive’ form of *be* is frequently possible, for example in the complement of *make*, as in (8). (9) shows that sometimes an uninflected *be* is obligatory:

- (8) a. Mary made Jane polite.
 b. Mary made Jane be polite.
- (9) a. Mary let Bill *(be) rude.
 b. *Mary let Bill to be rude.

As (10) shows, the possibility of having a bare *be* correlates with the possibility in general of having a bare VP complement:

- (10) a. Mary made Jane wash her face.
 b. Mary believes Jane *(to) need/want help.

In contrast with *consider*, which allows a bare AP or an infinitival in the complement clause but not a bare VP, *make* does not allow an infinitival complement:

- (11) *Mary made Jane to be polite.

The constraints on what the internal structure of non-tensed complement clauses can be are dependent on the selectional properties of the matrix verb. Assuming three different types of non-tensed clausal complements – *to* VP, bare VP, or bare AP – there are seven different relevant selectional possibilities; a verb which takes a non-tensed clausal complement can select one of the above, any combination of two of the above, or all three of the above. Five of these possibilities are realised:

1. A verb may select a small clause with only a bare AP predicate. This kind is instantiated by *keep*:

- (12) a. Mary kept Jane polite.
 b.*Mary kept Jane be polite.
 c.*Mary kept Jane to be polite.

2. A verb may select a small clause with only a bare VP predicate. *Let* and the perception verbs do this:

- (13) a.*Mary let/saw/heard Jane polite.
 b. Mary let/saw/heard Jane be polite.
 c.*Mary let/saw/heard Jane to be polite.

3. A verb may select a complement with only *to* VP as predicate. *Cause* and *allow* behave in this way:

- (14) a.*Mary caused/allowed Jane polite.
 b.*Mary caused/allowed Jane be polite.
 c. Mary caused/allowed Jane to be polite.

4. A verb may select a small clause with a bare AP or a bare VP complement. This class is represented by *make*:

- (15) a. Mary made Jane polite.
 b. Mary made Jane be polite.
 c.*Mary made Jane to be polite.

5. A verb may select a complement clause with a bare AP or *to* VP for a predicate. There are two groups here. One includes the ECM verbs *consider* and *find*, which do not allow a non-tensed CP complement nor a null embedded subject, as illustrated in (16), and the other includes the so-called 'subject control' verbs such as *prefer*, *want*, and *like*, which do allow CP complements and null embedded subjects, as illustrated in (17).

- (16) a. Mary found/considered Jane polite.
 b.*Mary found/considered Jane be polite.
 c. Mary found/considered Jane to be polite.
 d.*Mary found/considered (then) for Jane to be polite.
 e.*Mary found/considered to be polite.

- (17) a. Mary prefers Jane polite.
 b.*Mary prefers Jane be polite.
 c. Mary prefers Jane to be polite.
 d. Mary prefers/likes (now) for Jane to be polite.
 e. Mary prefers/likes to be polite.

Note that *cause*, featured in (14) above, behaves with respect to these latter two properties like *consider* and *find*:

- (18) a.*Mary caused/allowed (then) for Mary to be polite.
b.*Mary caused/allowed to be polite.

Missing is a verb which selects a complement with VP or *to* VP as predicate and a verb which allows all three possibilities. Of course, if the first gap is non-accidental and there is some principled reason why a verb does not allow both *Jane be polite* and *Jane to be polite* as a complement, then the second gap follows automatically.

(A possible counterexample to the claim that bare VP and inflected VP forms do not occur with the same verb is *help*:

- (19) a.*Mary helped Jane polite.
b. Mary helped Jane be polite.
c. Mary helped Jane to be polite.

However, (19c) looks like an instance of an object control construction such as (20), where the object NP and the *to* VP do not form a constituent but are both sisters of the V:

- (20) Mary asked Jane to be polite.

Both (20) and (19c) entail the simple transitive of the form NP V NP. (20) entails (21a) and (19c) entails (21b), while, in contrast, *cause Jane to be polite*, *consider Jane to be polite*, and *prefer Jane to be polite* do not entail the respective transitives in (22):

- (21) a. Mary asked Jane.
b. Mary helped Jane.
(22) a. Mary caused Jane.
b. Mary considered Jane.
c. Mary preferred Jane.

It looks as if *help* selects a small clause with only a bare VP complement, while in (19c) the NP is the direct object and not within a small clause. The contrasts in (23) support this view:

- (23) a.#The volcanic eruption helped the rain to fall.
b. The volcanic eruption helped the rain fall.

(23a) sounds a little odd because it treats *the rain* as a direct object of *help*, and to think of a 'help' relation holding between a volcanic eruption

and a natural phenomenon such as rainfall is odd unless we ascribe some sort of agency to the rain. In (23b) the object of *help* is the small clause *the rain fall* and no direct relation between the rain and volcanic eruption is posited.

Help is, in any case, unusual among English verbs. It is the only verb, as far as I know, which can take a bare VP complement without an explicit subject, as in (24a). It is also the only verb that can take an infinitival complement with a null subject where the value of the subject is given contextually, since (24a,b) clearly do not mean that Mary helped herself (to) build the house; however, as an anonymous reviewer points out, the contrast in (24c,d) indicates that the situation is more complicated:

- (24) a. Mary helped build the house.
 b. Mary helped to build the house.
 c. Mary helped convict herself.
 d. *Mary_i helped convict her_i.

There is no space for further discussion of this here.)

The question, then, is how to represent the selectional properties given above. We could assume that the features of the predicate of the small clause percolate to the dominating node, and that the three kinds of complements should be realised along the lines of (25). (Stowell (1983) suggests something like (25a,b) as the structure of small clauses.)

- (25) a. [NP to VP]_{IP}
 b. [NP VP]_{VP} (or VP')
 c. [NP AP]_{AP} (or AP')

Feature percolation in (25a) is straightforward, since there is an explicit inflectional head. The verb selects a non-tensed IP complement (or, in the examples in (17), a non-tensed C complement). I assume that these denote propositions of a type distinct from those denoted by tensed CPs. (25b) and (25c) must involve feature percolation from the predicate of the small clause. (25b) resembles the type of auxiliary verbs such as *must* and *should*, as in *John must/should leave*, with the difference that in English, auxiliary verbs take subjectless VP complements, while these verbs (with the exception of *help*, noted above) take small clauses with explicit lexical subjects. (25c) doesn't resemble any other construction, as far as I can tell.

(25b,c) raise a technical problem for an attempt to represent these head-complement relations through syntactic subcategorisation. Normally,

the features of a head percolate as far as the maximal projection of that head, and it looks syntactically as if the predicate in (25b,c) is a maximal projection. The small clause itself cannot be questioned, nor moved, while the predicate can, and this shows that it is the predicate AP or VP and not the small clause which is behaving like a maximal XP:

- (26) a.*What did the witch consider/make? Mary very clever.
 b.*Mary very clever is what John considered/made.
 c. What did the witch consider/make Mary? Very clever.
 d. What the witch considered/made Mary was very clever.

And, while I am not going to discuss bare NP (or DP) small clauses here, examples like (27), based on Stowell (1991) and Moro (1997), make a relevant point:

- (27) They considered that act the enemy's most serious violation of their sovereignty.

Here, the nominal small clause *that act the enemy's most serious violation of their sovereignty* constitutes the small clause complement of *consider*. However, the complete set of thematic roles that the derived nominal *violation* has to assign is assigned within the DP *the enemy's most serious violation of their sovereignty*, indicating that this constituent is the extended maximal projection of the nominal head.

It is obviously possible to find a technical mechanism which will allow percolation to take place, so that distinction between the complement types in terms of syntactic subcategorisation are possible. However, without an interpretation of the features involved, this is not very insightful. Turning to the semantic denotations of the complements under discussion, there are some obvious syntactic-semantic correlations. The bare VP complements can be analysed as denoting sets of events, following Vlach (1983) and others. The IPs are naturally given a propositional interpretation (though not of the same kind as tensed propositions). But if we want to explain the selectional restrictions in semantic terms, then the bare AP complements must have a distinct interpretation as well. I am going to argue in this paper that they do. I shall propose that VPs, and small clauses with bare VP predicates, denote sets of locatable eventualities, while APs and their corresponding bare complement clauses denote sets of unlocatable states. We can sum up the selectional facts in the table in (28), where verbs are sorted according to possible forms of the verb in their complement phrases:

(28)

	no verb	<i>be</i>	<i>to be</i>
<i>keep</i>	+	–	–
<i>let/see/hear</i>	–	+	–
<i>cause/allow</i>	–	–	+
<i>make</i>	+	+	–
<i>consider/find</i>	+	–	+
—	–	+	+
—	+	+	+
syntactic selection	selects [NP AP] _{SC}	selects [NP VP] _{SC}	selects [–tense] CP/IP
semantic selection	sets of states??	sets of events	propositions

This means that the meaning of *be* in VPs of the form *be* + AP must be a function mapping from the unlocatable states denoted by the AP complements into sets of locatable eventualities denoted by the VP. What these states and events are, and what this mapping operation is, is the subject of this paper.

1.3. Agentive Implications in Bare Infinitives

We have discussed two problems for the ‘no semantic contribution view’, namely differences in meaning that *be* seems to introduce with ECM verbs and the difficulty of accounting for the distribution of *be* in complement clauses. The third and fourth problems extend the discussion to the well-known issue of agentivity effects in small clauses and in the progressive.

First, let’s look at the agentivity effects in bare infinitives. It has often been noted that when an optional *be* is present, it seems to induce a meaning change. There is a contrast between the examples in (15a,b), repeated here; (15b) has strong implications that Jane is acting in an agentive way and performing some act of politeness; this implication is missing in (15a). If *be* is a purely grammatical formative, then these two sentences ought to mean the same.

- (15) a. Mary made Jane polite.
b. Mary made Jane *be* polite.

On the other hand, note that the meaning difference which seems to be introduced by *be* here is different from its effect in the *consider* complements

in (5) above, where the bare AP complement had a more ‘individual-level’ feel to it. We expect the account of *be* to explain these differences in meaning.

1.4. *Be with the Progressive*

Fourthly, there is the matter of the progressive. There are two issues here. First, *be* also seems to introduce agentive implications where it is the complement of the progressive. Out of the blue, (29a) implies that Jane is generally a polite person, while (29b) implies that she is consciously behaving in a polite way, and that she is actively responsible for her behaviour:

- (29) a. Jane is polite.
- b. Jane is being polite (to her great-aunt).

Second, when it is in the progressive, *be* can have only certain predicates as its complement. Lakoff (1970) distinguishes between active and stative APs and NPs and proposes that only the former can occur in the complement of progressive *be*.

- (30) a. Mary is being noisy/mean/*awake/*healthy.
- b. John is being a nuisance/*a murderer.

Partee (1977) notes that as well as constraining properties of its complement predicate, *be* in the progressive also selects for properties of its subject. The examples in (31) seem to indicate that the subject must be animate. (Partee claims that (31d) is ungrammatical and stars it, but I will treat it as infelicitous and explain the reasons for this later.)

- (31) a. John is noisy.
- b. John is being noisy.
- c. The river is noisy.
- d.# The river is being noisy.

There is no general constraint restricting subjects of the progressive to animates, as we see in (32):

- (32) a. John makes a lot of noise.
- b. John is making a lot of noise.
- c. The river makes a lot of noise.
- d. The river is making a lot of noise.

In fact, animacy is not enough. Partee shows from the examples in (33) that the subject of progressive *be*+AP must be a volitional participant in having the property denoted by the VP, and not merely animate. In (33), the children cannot be said to be volitional about being quiet if they are asleep. Again, (34) shows that this is a constraint on progressive *be* and not on the progressive generally:

- (33) a. The children are being quiet right now because they want a story.
 b. ?The children are being quiet right now because they are asleep.
- (34) The children are making so little noise right now because they are asleep/want a story.

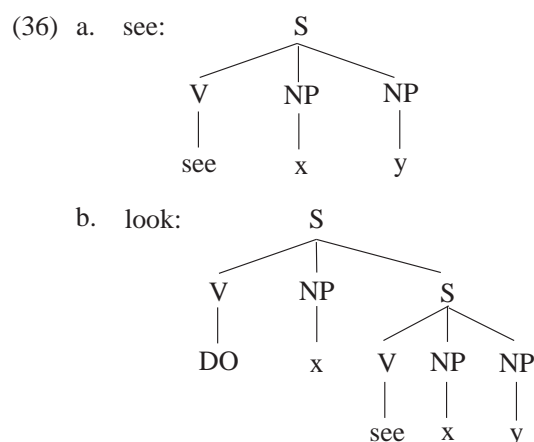
2. THE AGENTIVE *BE* SOLUTION

Partee (1977) captures these intuitions in the claim that there is a distinct verb *be*, homophonous to predicative *be*, but marked [+active]. It combines with adjectives that allow an animate or volitional subject, and itself requires an animate subject. Its meaning is like the meaning of the verb *act*, as in *John is acting foolish*; thus it is anomalous if the subject is not capable of acting to produce the property of the predicate. The subject of *be* is thus a thematic position, assigned the role of 'agent' by the verb, and the contrasts indicated above are predicted. In addition, Partee shows that the contrast in (35) is explained:

- (35) a. John is easy to please.
 b. It is easy to please John.
 c. John is being easy to please.
 d. *It is being easy to please John.

Although *be easy to please* can usually take either a raised lexical subject or a pleonastic *it*, as in (35a,b), the progressive form can take only a lexical subject, strongly suggesting that the subject position is a thematic position. This is predicted on Partee's account since *be* in the progressive must be the form which assigns an agent role to its subject.

Dowty's (1979) account of progressive *be* is based on the 'two-verbs-*be*' approach, and he too distinguishes agentive *be* from predicative *be*. His account is developed as part of a compositional analysis of predicates. He proposes that active verbs, but not statives, can be decomposed into a two-place abstract verbal predicate DO and an embedded sentential complement. *Look* is analysed as the active 'counterpart' of *see*; their lexical structures are compared in (36).



In the case of active verbs, the embedded verbal predicate is raised, and DO is absorbed into the lexicalised raised predicate. But DO can also be independently lexicalised; it is realised as *do* in VP deletion constructions like (37a) and as *be* when the main predicate of its complement is an adjective (or nominal) as in (37b,c). In the latter case it is directly followed at S-structure by an AP or NP.

- (37) a. John looked (at the view) and so did Bill.
 b. Jane is polite.
 c. Jane is a heroine.

Both forms of lexicalised DO can occur in the progressive, like any other verb:

- (38) a. John is looking at the view, and Bill is doing so too.
 b. Jane is being polite/is being a hero.

There are some problems with this compositional account – in particular, the question of where the *do* comes from in VP deletion contexts involving non-active verbs, as in (39):

- (39) a. John saw Mary and so did Bill.
 b. Jane knows the answer and so does Jill.

But I am not going to discuss these here. Rather, I am interested in the question of what the meaning of DO can be. As Dowty shows, pseudo-clefts such as those in (40) indicate that DO does indicate some agentivity when it surfaces as *be*.

- (40) a. What I did then was be as polite as possible.
 b.?? What he did then was be a hero and refuse to budge.

But he goes on to point out that, while examples like (41a) indicate that progressive *be* + AP goes very naturally with expressions of intention, (41b) indicates that DO cannot be analysed as simply ascribing volitionality or intentionality to its subject. Nor can it indicate the occurrence of an action, where action is taken to involve some change of state, since there is no such change of state in, for example, (41c).

- (41) a. John is deliberately/intentionally being obnoxious.
 b. John is unintentionally being impolite.
 c. John is being a hero by standing still and refusing to stir.

What the examples in (41b,c) show is that John may be being impolite or heroic by failing to do something, and that the failure to do something can be either deliberate or unintentional.

Dowty proposes that DO+predicate indicates that the property denoted by the predicate can be “willed away” by the subject, and that it is “under the unmediated control of the agent.” Going back to (29b), repeated here, we get the feeling not only that politeness is a property currently in evidence, but that it is an activity which is “in some sense under the control of the individual.”

- (42) Jane is being polite (to her great-aunt). (= 29b)

We feel that if Jane is being polite even without noticing it, and “someone points it out to [him], [s]he can if [s]he so wishes, stop doing it at once” (p. 115). It is this implication of control by the subject which Dowty argues is contributed by DO, realised as *be*.

Dowty notes that some non-stative verbal predicates, such as *make a lot of noise* in (32), pass the tests for activities or accomplishments, yet they do not necessarily imply control or agentivity by the subject, even though they too must have a DO component. So the proposal given so far cannot be complete. Dowty proposes distinguishing the verbs which do not involve agentivity on semantic grounds; though they have no agent, they all involve physical activity with either a change of position or internal movement which has results that can be perceived. He therefore gives a disjunctive definition of DO: either (i) DO implies unmediated controllability, which is relevant when the embedded complement is headed by nouns, adjectives, or verbs like *ignore* and *refrain*, or (ii) if the complement of DO is verbal, it must express physical activity or movement, involving an “internal change of state that has visible, audible or tactile consequences” (p. 165). Partee’s observation about the contrast between (31b,d) and (32d), repeated here, is explained:

- (43) a. John is being noisy. (= 31b)
 b.# The river is being noisy. (= 31d)
 c. The river is making a lot of noise. (= 32d)

(43c) is felicitous because the complement *make a lot of noise* expresses a physical movement or action with (at least) audible consequences, thus satisfying (ii). (43b) is ungrammatical because, first, the complement of DO is the stative adjective *noisy*, and thus (ii) is not satisfied; and second, the property of noisiness is not under the unmediated control of the (non-animate) subject *the river*, and thus (i) isn't satisfied either. (43a) on the other hand is OK because, with an animate subject, it satisfies (i).

There are at least four problems with the 'two-verbs-*be*' solution:

1. As Partee herself points out, there is a certain inelegance in solving the problem of progressive *be* – both its 'agentivity' effects and its apparent selectional restrictions on adjectival complements – by positing a second verb *be*. There is little supporting evidence for the existence of the homonym. Categorially, the two verbs *be* select AP (and other XP) complements. Agentive *be* exerts a further restriction on the complement, namely that the head of the AP assign a [+animate] and maybe [+volitional] feature to its subject, but this is a selectional restriction of a very non-standard kind.
2. Dowty's weak notion of 'unmediated control' is still too strong to define the relation between the subject and the property expressed by the adjective, as the following examples show:

- (44) a. The baby is being difficult this evening; I think she is teething.
 b. The birds are being very noisy this morning.
 c. The pigeons in this square are being very obnoxious.
 d. The car is being very noisy this morning; I think we may need to buy a new muffler.

Each of the examples in (44) is acceptable, but in none of them is the property expressed by the adjective under the control (unmediated or not) of the subject. In asserting (44a), I make the suggestion that teething is causing the baby physical pain, which leads to her being noisy and crying and being difficult to deal with; but I am not assuming or implying that, at a few months old, her behaviour is under her control – that she is able to control the crying or to stop being noisy or a bother. In (44b), the birds are particularly noisy, but this is not under their control; they are just behaving as birds are naturally wired to behave. Similarly, in (44c), if people drop chunks of bread in Trafalgar or some other square, the pigeons will react by swooping down and eating them: we may find this obnoxious

behaviour, especially if we want to eat our own sandwiches, but it is not behaviour which we could call either volitional or under the control of the subject. (44d) is also felicitous, although the subject is not even animate.

3. Partee and Dowty explain the meaning change when *be* occurs in small clause complements in terms of the selectional restrictions on agentive *be*. But postulating a second agentive *be* doesn't explain why you can't use the predicative form of *be* in *Mary made Jane be polite* (= 8b). If *be* is ambiguous, there should be a second, non-agentive reading, in which predicational *be* is used, but it looks as if, when *be* is optional, it must be agentive *be* which is being used. One would equally expect predicative *be* to be available in all small clause complements, including those in (45), which as noted above are impossible:

- (45) *Mary considered/found/kept Jane be polite.

One could try arguing that predicative *be* can only occur with inflection, and that it is banned in naked infinitive small clauses. But, this is a strange condition on a verb; even if its grammatical function is only to be the bearer of tense – as opposed to other verbs which have a lexical function as well – then untensed *be* should be redundant, but not ungrammatical; and we would expect the sentence in which it appears to be awkward, and maybe pragmatically inappropriate, but not ungrammatical, as the examples in (45) are.

4. The agentive *be* theory leads us to expect that the distribution of agentive *be* should be the same in small clause and progressive constructions. Since implications of agentivity occur both with the progressive and with small clause complements, we would assume a single explanation to account for this phenomenon in both contexts. (46) shows that things don't work this way:

- (46) a. I made the children be ready at three.
 b.#The children are being ready at three.
 c. I made Jane be awake for the visit.
 d.#Jane is being awake for the visit.
 e. I made the river be noisy.
 f.# The river is being noisy.

Partee claims that the anomaly of sentences like (46b,d,f) is due to the fact that the subject of *be* is not capable of acting to produce the property of the predicate. But if the same *be* occurs in (46a,c,e), which is presumably the claim that one wants to make, then the identical combination of subject+ *be* +adjective ought to be unacceptable there too. The fact that the set of adjectives which combine with *be* easily in one construction is

not the same as the set which occur in the other indicates either that two separate constraints are involved – a solution we want to avoid as wasteful – or that the apparent selectional restrictions follow from the interaction of *be* with other properties of the two constructions. In that case, syntactic and semantic selectional restrictions are not exercised by matrix verbs on the complements of their complements, and the restrictions must be the result of semantic and pragmatic restrictions exercised by the environment in which they occur. This is the solution which we will come to in sections 8 and 9.

3. VERBS AND ADJECTIVES

3.1. *The Theory*

The analysis of *be* which I shall propose is based on the hypothesis that there is a basic difference in the kinds of entities that verbs and adjectives denote, and that this is reflected in differences in their argument structure. AP and *be*+AP will denote different entities, and the distinguishing properties of VPs headed by copular *be* which we have discussed above will follow from this.

What I am going to propose is that the domain of eventualities is divided into two. The division is analogous to the division of the nominal domain into count and mass entities. Verbs have a “Davidsonian” event argument ranging over atomic, count-like eventualities, and they denote properties of these eventualities. I shall argue below that the domain of atomic count eventualities includes processes, such as those given by *sleep* and *dance*, and stative, such as those given by *know* and *love*, as well as the more obviously countable telic eventualities.

The domain of adjectives, on the other hand, is a set of non-atomic, mass, state-like eventualities. Strictly speaking, we should probably call the denotations of verbs ‘c-eventualities’ (for ‘count-eventualities’) and the denotations of adjectives ‘m-eventualities’ (for ‘mass eventualities’). But in order not to add confusing terminology and to keep distinctions clear, I shall call the denotations of adjectives ‘M-states’ and use ‘eventuality’ in the restricted sense to refer to the denotations of verbs. On the rare occasions where I use ‘eventuality’ in the more general sense to cover the denotations of both kinds of lexical entities, it should be clear from the context.

Adjectives, then, have a state argument (represented by the variable ‘s’) ranging over M-states, and they denote properties of M-states. Crucially, as we will see, M-states are non-countable, non-atomic entities, and thus

differ from the countable, atomic, stative eventualities given by *know* and *love*.

As I will argue in section 4 below, the verb *be* denotes a function from the domain of M-states to the domain of Davidsonian eventualities and has the effect of ‘packaging’ a non-atomic M-state into an atomic eventuality. ‘Packaging’ was the name given by Pelletier (1979) to the mechanism which allows a nominal mass term to be used as a count term, as in (47):

- (47) At the cafe, they ordered three beers, two teas, and ice creams all round.

Like any verb, *be* introduces a Davidsonian eventuality argument, but unlike lexical verbs, it does not express any property of that argument. Instead, it combines with an AP complement, as in *be polite*, in effect creating a complex verb where *be* introduces the eventuality argument and *polite* expresses a property of that eventuality, the M-state which it instantiates. The AP *polite* denotes the politeness property, and the VP expression *be polite* denotes the set of eventualities that instantiate the politeness property.

I will return below, in section 4.2, to the question of how exact the parallelism is between the mass/count division in the nominal domain, on the one hand, and in the verbal/adjectival domain, on the other. At that point I will also discuss the relation between this proposal for structuring the domain of eventualities (in the wider sense of the term) and that of Bach (1986), who was, as far as I know, the first to make an explicit formal analogy between the mass/count distinctions in the nominal and the verbal domains. Before getting to that, I want first to present evidence that the atomic/non-atomic distinction really does exist, and that *be* can be treated in the way I have just described.

3.2. *The Data*

What kind of distinctions between mass and count terms would we expect to find in the verbal domain? Presumably distinctions which parallel the differences in behaviour between mass and count nouns, taking into account the inherent grammatical differences between verbs and nouns. For example, many differences between mass and count nouns show up in the choice of determiners with which they may appear, but verbs don’t appear with determiners. Also, count nouns do and mass nouns don’t take plural morphology – but verbs don’t show plural morphology anyway (except as a consequence of agreement). However, both these tests, the syntactic and the morphological, are grammatical reflections of the basic fact that atomic entities can be counted, and we would expect to find some grammatical

reflection of this in the verbal domain too. In the four tests below, I show four ways in which the denotations of verbs and of adjectives differ. All the tests indicate that the denotations of verbs are sets of atomic entities, while the denotations of adjectives are not. In each case, the adjectival predicate is contrasted with a stative verb, since the latter is the least count-like of all verbal eventualities, and in each case the contrast shows up. As I said, I'll return to a more systematic comparison between the verbal and the nominal domain below.

Test 1: The Countability Property – Counting Adverbials. Count nouns do and mass nouns don't appear with numeral determiners. This countability property shows up in the verbal domain in the distribution of counting adverbials. In context, all verbs, including statives, can be modified by counting adverbials like *three times*, while adjectives cannot be modified by explicit counting adverbials. This is explained if verbs denote sets of atomic eventualities which can be counted, while adjectives denote non-atomic, mass-like entities. The contrast shows up clearly if we look at the behaviour of adverbials which explicitly count events in small clauses, such as the complements of *make* and *see*:

- (48) a. I made Mary know the answer three times.
 b. I made Mary angry/clever (in class) three times.

(48a) is ambiguous. *Three times* can modify the matrix verb *make*, giving the reading that there were three acts of 'making Mary know the answer', but there is also the reading in which there was one event of 'making', which caused Mary to know the answer three times, for example if a witch gave her a magic potion which had as its effect that she could answer correctly in class three times. In this latter case, *three times* modifies the embedded verb, and we are counting instances of a stative eventuality type. (Note that it can, but need not, be the same answer that Mary knows in (48a); for example, I can, by careful coaching, make Mary know the answer to a particular question three times, though afterwards she will forget it again.) In contrast, (48b) has only the first reading, and *three times* cannot modify *clever*.

Test 2: Temporal Locatability. What kinds of inherent properties do atomic entities have that non-atomic entities don't have? For eventualities the property seems to be temporal locatedness: atomic eventualities are temporally located, while non-atomic M-states are not. This means that modifiers expressing temporal location cannot modify bare adjective phrases.

- (49) a. Yesterday, the witch made John know the answer last night and forget it this morning.
 b. *Yesterday, the witch made John clever last night and stupid this morning.

This indicates that a crucial property of an eventuality is that it can be given a temporal location, while a state cannot be temporally located. Notice that temporal location doesn't necessarily mean temporal boundedness. If the witch made John know the answer last night, it doesn't necessarily mean that he didn't know it either before or since; it might just mean that she made sure that he had the knowledge at some crucial point last night, leaving open what happened before or after. But then the relevant situation in which John has the property of knowing the answer is temporally locatable, though his having the property is not necessarily properly contained within that temporal location. So, while stative eventualities can be unbounded, they are still temporally locatable. In (50), John's knowing the answer may be an eventuality which is unbounded at each end (although, pragmatically, it seems likely to start and end at least with the beginning and ending of John). What the sentence asserts is that the witch made there be a relevant, possibly proper, sub-part of that eventually which held at three o'clock.

- (50) The witch made John know the answer at three o'clock.

Returning to M-states, note that these may have a duration without being temporally located, as the contrast in (51) shows. *At three o'clock* in (51b) must modify *made*, but *for three hours* in (51a) most naturally modifies *clever*:

- (51) a. Yesterday the witch made John clever for three hours.
 b. Yesterday the witch made John clever at three o'clock.

Small clause constructions such as those in (52) also show that adjectival predicates cannot be temporally located.

- (52) A: You saw Mary recently, in fact last night. How do you think she looked then?
 B: a. *I think Mary well-dressed last night (but less well-dressed this morning/now).
 b. I thought Mary well-dressed last night but less well-dressed this morning/*now.
 c. I think Mary looked well-dressed last night, and looks well-dressed this morning.

Of the sentences in B, (a) is ungrammatical, since *last night* cannot modify the adjective and is incompatible with the matrix verb; (b) is acceptable with *last night* and *this morning* modifying the matrix verb. The contrast between *this morning* and *now* in the second conjunct shows this also; the acceptability of the sentence is dependent on the adverbial being compatible with the matrix verb. If the sentence is uttered later than this morning, the adverb *this morning* is compatible with *thought*, but *now* is always incompatible with a past tense verb. (53) also shows that temporally locating modifiers modify only the matrix verb and not the predicate within the small clause. *Last night* can only modify the matrix verb in (53a); we can see this from (53b), which is unacceptable because the modifier *an hour ago*, which can also only modify the matrix verb, is incompatible with *last night*:

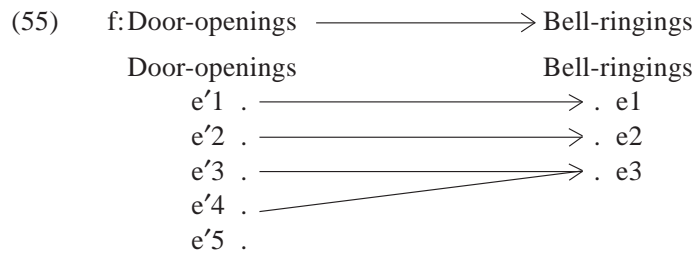
- (53) a. What did you believe Mary t last night?
 b.*An hour ago I believed her a genius last night (but now I'm not so sure).

The fact that temporal locatedness is crucial follows from a theory of event individuation such as that of Parsons (1990). In Parsons' theory, events are individuated via the kind of event they are, the participants they have, and their temporal location. An event of Jane running to the store today is distinguished from an event of Jane walking to the store today. It is also distinguishable from an event of John running to the store today at the same time as Jane, and from an event of Jane running to the store yesterday. The first two of these individuating criteria – what kind of event it is and what participants it has – are dependent on the lexical properties of the head. The quality of occurring in time at a particular time is a property that events have independent of their lexical character, and the data in (48)–(53) support this.

Test 3: Adverbial Modification by Event Quantifiers. Assuming that adverbials express properties of eventualities and/or states, we might expect some domain selection here. In other words, if there is a count domain of eventualities and a mass domain of M-states, then we might expect other adverbials, besides the counting or temporally locating ones, to distinguish between them. Adverbial quantifiers over events in the 'every time' construction, discussed in Rothstein (1995a), do just that: they occur as modifiers of eventualities, but not with M-states. An instance of the normal case of the 'every time' construction is given in (54a). Rothstein (1995a) shows that (54a) is true if there are at least as many events of Mary opening the door as there are events of bell-ringing, and argues that the correct representation of the meaning is the one in (54b):

- (54) a. Mary opens the door every time the bell rings
 b. $\forall e[[\text{RING}(e) \wedge \text{Th}(e)=\text{THE BELL}] \rightarrow \exists e' [\text{OPEN}(e') \wedge \text{Ag}(e')=\text{MARY} \wedge \text{Th}(e')=\text{THE DOOR} \wedge \text{M}(e')=e]]$

The analysis argues that there is a ‘matching function’ (designated by ‘M’ in the representation), which maps from events in the set given by the matrix V onto the set of eventualities given by *time the bell rings*, where every event of bell-ringing must be the value of at least one argument of M, as illustrated in (55):



English does not allow matrix small clauses or small clauses immediately dominated by CP. Since *time* is modified by a CP relative clause, there is therefore no way to see whether a bare AP can give the range of the function as well as a VP, though we predict that it can't. But it is possible to compare whether small clauses with a bare VP (stative for minimal contrast) and with a bare AP predicate can both give the domain of the function, and this is what we do in (56):

- (56) a. I made Jane worry every time the bell rings.
 b. *I made Jane nervous/excited every time the bell rings.

In (56a), *every time the bell rings* is an adverbial modifier of the embedded verb *worry* (stative in Dowty's (1979) classification), and the sentence asserts that there was an event of Jane's worrying for every event of the bell ringing. The adverbial cannot modify the matrix verb *make*, because, as I showed in Rothstein (1995a), the tense of the matrix verb and the tense of the verb in the relative clause must be the same. (56b) is ungrammatical. Here too, the matching tense requirement means that the adverbial cannot modify the matrix verb, but it cannot modify the embedded adjective either. Note that if the tense of the verb in the relative clause matches that of the matrix verb, we get the previously unavailable reading where the adverbial modifies the matrix verb, mapping instances of making Jane nervous onto the set of events of bell-ringing. (56a) becomes ambiguous, and (56b) becomes grammatical but has only this one reading.

- (57) a. I made him worry every time the bell rang.
 b. I made him nervous/excited every time the bell rang.

Other stative verbs pattern with event verbs and contrast with adjectives:

- (58) a. The witch made her feel fond of/love/hate the prince every time
 he drops in to visit.
 b.*The witch made Mary fond of the prince/obnoxious to the prince,
 every time he drops in to visit.

Test 4: Distributivity. If eventualities are atomic and M-states are non-atomic, then we might expect a difference in whether they can distribute over their subjects. The occurrence of the floating quantifier ‘each’ shows that there is such a difference:

- (59) a. The medicine made Jane and Mary each feel sick.
 b.*The medicine made Jane and Mary each sick.

Together, these four tests provide clear evidence for the mass/count distribution I am proposing. The atomic, verbal domain can be counted (test 1). The entities in that domain have an individuating property, temporal locatedness, which entities in the domain of M-states don’t have (test 2). There are linguistic functions, such as the matching function in the ‘every time’ construction, whose domain is restricted to the atomic eventuality domain (test 3). And the atomic entities can explicitly distribute over individuals, whereas the mass entities cannot (test 4). So the evidence given in this section shows that the kind of event argument introduced by even a stative verb, which intuitively is the most mass-like, has its denotation in a set of entities which are countable, individuable via the property of temporal location, and distributable, while M-states have none of these properties. In section 4, I’ll discuss in greater depth what these data mean, but first, some formal issues.

3.3. *The Representation*

Formally, I continue to assume a neo-Davidsonian theory of verbs, where verbs denote properties of eventualities and introduce a set of thematic roles (possibly empty, as in the case of *snow*) denoting functions from *e*, whose value is given by the theta-marked syntactic argument. Arguments internal to VP are satisfied at the V’ level, and VP denotes a set of eventualities; the variable which is the value of the external theta-role, which I’ll consistently call ‘*x*’, is abstracted over by a grammatical process independent of the structure of the V (see Rothstein 1995b, 1999). Vs (and VPs) thus

denote sets of events and are of type $\langle e, t \rangle$, where e is the type of events. The schema for the translation of the verbal projection before predicate abstraction is (60a), and predicate abstraction gives (60b). (θ is a variable over thematic roles.)

- (60) a. $\lambda e.V(e) \wedge \theta_1(e)=x$
 b. $\lambda x \lambda e.VP(e) \wedge \theta_1(e)=x$

I restrict myself to a discussion of predicate adjectives. Adjectives (and APs) have a state variable and denote sets of M-states of type $\langle s, t \rangle$. I assume that adjectives introduce a set of ‘argument roles’, parallel to the thematic roles introduced by verbs, and that the argument roles denote functions from states to their participants. I’ll use ‘ Arg_1 ’ to name the external argument of the adjective, and ‘ Arg_2 ’ to name the complement, and reserve θ for a variable over thematic roles by verbs. This is because I don’t want to say anything about whether the participants in adjectivally-introduced states have the same kind of relation to the states that they participate in as the participants in verbally introduced eventualities have to those eventualities. The adjectival schema parallel to (60) is thus (61):

- (61) a. $\lambda s.A(s) \wedge \text{Arg}_1(s)=x$
 b. $\lambda x \lambda s.AP(s) \wedge \text{Arg}_1(s)=x$

A natural proposal would be that the difference between verbs, denoting sets of events, and adjectives, denoting sets of M-states, is simply that the latter do not have the extra, Davidsonian argument. We might hypothesise that the schema for the interpretation of an AP (before XP abstraction) is (62):

- (62) a. $\text{ADJ}(x)$ [or $\lambda x.\text{ADJ}(x)$ after abstraction].
 b. $\text{TALL}(x)$ [or $\lambda x.\text{TALL}(x)$ after abstraction].

However, (62) doesn’t work, because of modification facts. Assume, following Davidson (1967) and Parsons (1990), that the Davidsonian argument is used in adverbial modification, as demonstrated in (63). (Two possible representations for the locative modifier are given in (63b) and (63c); the first is Parsons’ and the second based on a suggestion in Landman 1998.)

- (63) a. Anthony visited Cleopatra in Egypt.
 b. $\exists e[\text{VISITED}(e) \wedge \text{Ag}(e)=A \wedge \text{Th}(e)=C \wedge \text{IN}(e)=\text{EGYPT}]$
 c. $\exists e[\text{VISITED}(e) \wedge \text{Ag}(e)=A \wedge \text{Th}(e)=C \wedge \text{LOC}(e) \sqsubseteq \text{IN EGYPT}]$

Adjectives too can be modified by durational and locative adverbials, as we saw in (51a), and as is shown by the examples in (64):

- (64) a. The psychologist considers the child well behaved/happy at school and badly behaved/unhappy at home.
 b. The drug (immediately) made her quiet for hours.

In (64a) the locative adverbial *at home* can only be interpreted as modifying the adjectives in the predicate of the small clause, and not the matrix verb; similarly in (64b), the temporal *for hours* modifies *quiet*. I therefore assume that adjectives have a state argument parallel to the eventuality argument, but whose value is in the mass rather than the count domain. The schema for the interpretation of an adjective must be as in (61), and the representation of *quiet for hours* is given in (65):

$$(65) \quad \lambda s. \text{QUIET}(s) \wedge \text{Arg}_1(s)=x \wedge \text{DURATION}(s)=\text{HOURS}$$

What the representation shows, then, is that adjectives are very similar to verbs in that they both introduce sets of eventualities which have participants and which can be modified. The difference between them is in the properties of these eventualities. The data in 3.2 show that the eventualities introduced by verbs have properties that are associated with count entities, while the M-states introduced by adjectives lack these properties. This leaves open the question of what the crucial difference is between them which makes the verbally introduced eventualities atomic and the M-states non-atomic. I'll show in the next section that the crucial property is temporal locatability.

4. *BE* AND THE MASS/COUNT DISTINCTION

4.1. *Be*

Assuming then that there is a mass domain of M-states whose elements are the denotations of adjectival expressions and a count domain of eventualities whose members are the denotations of verbal expressions, what interests us next is the relations between these domains.

The relation between sets of M-states and sets of eventualities parallels the relation between mass and count nominal predicates proposed in Link (1983). Link basically assumes that both the count and the mass domain have the structure of a Boolean semilattice, structured by a sum operation ' \sqcup ' and a part-of relation ' \sqsubseteq ', where the count structure is an atomic Boolean semilattice of singular (atomic) and plural individuals. There is a function mapping from individuals to the stuff of which they are composed, which maps from the count domain (C) to the mass domain (M), mapping individual entities onto the join of their material parts. Lewis called this the

‘grinding function’ g (cited in Pelletier 1979). The definition in (66) (and in (69) below) is the one used in Landman (1991):

- (66) The *grinder* function is that function $g: C \rightarrow M$ such that for every $c \in C: g(c) = \sqcup \{x \in M: xKc\}$, where K is the relation ‘material part of’.

This function is a homomorphism, preserving crucial ordering relations, so that if a is a part of the plural individual $a + b$, then the stuff making up a is a part of the stuff making up $a + b$. It is the function that we use in (67), where the count term *bicycle* is used as a mass term.

- (67) After he had been working for an hour, there was bicycle all over the garage floor.

Pelletier (1979) also discusses ‘packaging’ (p), which maps from the mass to the count domain, mapping quantities of stuff onto count individuals made from that stuff. It is used in sentences such as (47), repeated here as (68):

- (68) At the cafe, they ordered three beers, two teas, and ice creams all round.

Landman’s formulation of the packaging operation, given in (69), characterises it by its crucial property; if you grind down the result of packaging, you get exactly the same stuff that you started out with.

- (69) The *packaging* operation is $p: M \rightarrow AT$ such that for every $m \in M: g(p(m)) = m$, where AT is the set of atoms out of which the count domain is built.

The packaging operation presents the mass stuff from a count perspective. Note that while grinding back down a packaged mass entity gives you the original stuff, the converse doesn’t hold. Packaging a ground-down count entity does not necessarily give you back the individual that you started with. This is because mapping from the count to the mass domain is a function: grinding down a count element gives you only one possible result, namely the stuff that the count element is made of (although there are some problems, noted in Bach (1986), such as whether a snowman grinds into the snow that it is made of or the water that the snow is made of). Grinding is a many-to-one function; so for example, the individual ‘John’ and the sum of cells making up John are mapped onto the same chunk of stuff. Packaging is less predictable, and Link doesn’t assume that it is a function; this is because the same chunk of stuff can be mapped onto the individual John or onto the sum of cells making up John. Chunks of stuff

may also be packaged into something for which the language does not have a name: for example, the stuff making up John will be mapped onto the individual denoted by *John*, but the stuff which together makes up John's right leg and his left arm will not map onto any individual recognised and labeled by the language.

Bach (1986), citing examples from Pelletier (1979), makes a further point, namely that packaging in English doesn't fully determine interpretation. Packaging does put stuff into units, but we rely on context to tell us what the nature of the units is. In (70), the context tells us whether *three beers* means three portions of beer or three kinds of beer:

- (70) a. I drank three beers and enjoyed them all.
 b. I tasted three beers and enjoyed them all.

I will assume that packaging is a function, but that instead of there being one packaging function p , we should assume a set of such functions P_C , with 'C' a contextual variable. But nothing crucial rests on this assumption.

The packaging, or mapping from the mass to the count domain, that occurs in the nominal domain occurs in the verbal domain too. In the nominal domain, the use of a count determiner and/or a plural marker indicates that packaging has occurred. In the verbal domain, the packaging is explicitly introduced by the verb *be*.

Intuitively, what *be* + AP does is to package, or present from a count perspective, the set of M-states, or state type, denoted by AP. It does this by presenting them as a set of eventualities. The crucial property which is added when the M-states are packaged in this way is that like all other eventualities, they become temporally located (even if the temporal location is not explicitly mentioned in the sentence). Thus, *be* denotes a particular kind of packaging operation, namely, a locating function which maps from the domain of M-states to the domain of located eventualities. I call this locating operation 'instantiation'; it maps an M-state onto a located eventuality which displays an instance of the M-state. Formally, *be* denotes the relation INST (for 'instantiate'). Let 'l' be the locating function and 'S' a variable of type $\langle s, t \rangle$. The instantiation relation is given in (71):

$$(71) \quad \text{INST} = \lambda S \lambda e. \exists s \in S: e = l(s)$$

Note that the domain of l is the set of M-states and its range is the set of events, i.e., $l: S \rightarrow E$. In other words, $l(s)$ is not a location, but a located eventuality in E .

Compare (71) with the denotation of a verb like *walk*, which looks something like $\lambda e. \text{WALK}(e) \wedge \text{Ag}(e)=x$. We see that *be*, like any other verb, introduces a Davidsonian eventuality argument. Unlike other verbs, it

doesn't tell us what kind of event it denotes, nor does it introduce thematic roles which tell us what participants it has. (This is what is at the root of the intuition that a copula has no lexical content.) Instead, it selects a set of M-states and it denotes the relation between an eventuality and a set of M-states which holds if the eventuality instantiates a member of the set. Thus, while an AP has its denotation in the non-atomic, mass domain, *be* + AP has its denotation in the atomic, count domain. A VP headed by *be* denotes a set of atomic eventualities instantiating the set of states denoted by the complement of *be*; an eventuality *e* instantiates a set of states *S* if it is an eventuality in which some M-state *s* holds, where *s* is a member of *S*.

- (72) a. $\text{clever} \rightarrow \lambda s.\text{CLEVER}(s) \wedge \text{Arg}_1(s)=x$
 b. $\text{be clever} \rightarrow \lambda e.\exists s[\text{Clever}(s) \wedge \text{Arg}_1(s)=x \wedge e=l(s)]$

Syntactically, *be clever* is a verb; it denotes a set of atomic eventualities with all the properties of count entities; we predict that *be* + AP should behave like any other verb with respect to counting, temporal location and adverbial modification. If we look again at the tests that we discussed in the previous section, we see that this is exactly what happens.

Test 1: Counting Adverbials. (73) is ambiguous, with *three times* modifying either the matrix verb or the embedded verbal predicate *be clever* in the small clause. In this, it is exactly like (48a), and contrasts with (48b), where *three times* can only modify the matrix verb and not the bare AP in the small clause.

- (73) I made Mary be angry/clever in class three times. (ambiguous)
 (48) a. I made Mary know the answer three times.
 b. I made Mary angry/clever (in class) three times.

Test 2: Temporal Locatability. (74) is acceptable, with *be clever* and *be stupid* each independently temporally located. In this (74) patterns like (49a), where the embedded predicate is a stative verb, and unlike the unacceptable (49b), where the bare APs cannot be independently temporally located:

- (74) Yesterday, the witch made John be clever last night and be stupid this morning.
 (49) a. Yesterday, the witch made John know the answer last night and forget it this morning.
 b.*Yesterday, the witch made John clever last night and stupid this morning.

Some speakers find (74) and (49a) less than perfect; as a reviewer pointed out, events of causation usually only allow temporal adverbials that span both the causing event and the caused event, and this would mean that the temporal modifier of the matrix verb and that of the complement verb must not conflict. Nonetheless, even for these speakers, (49b) is much worse than either (74) or (49a).

Test 3: Adverbial Modification by Event Quantifiers. In (75) *be nervous* can be modified by the event quantifier *every time the bell rings*. In this it behaves like the stative verb *worry* rather than the bare APs *nervous* and *excited*:

(75) I made him be nervous/excited every time the bell rings.

- (56) a. I made Jane worry every time the bell rings.
b.*I made Jane nervous/excited every time the bell rings.

Note also that the domain selection illustrated in (75, 56) shows up in “ordinary” adverbial modification too. In (76a), *quickly* can modify *made* but not the AP *quiet*, but in (76b) it can modify either the verbal complex *be quiet* or the verb+particle *quiet down*:

- (76) a. Mary made the child quiet quickly.
b. Mary made the child be quiet quickly/quiet down quickly.

Test 4: Distributivity. In (77) we see that the distributive adverbial can occur with predicates of the form *be* + AP. *Each* thus treats *be* + AP like an ordinary verbal and not like a bare adjective.

(77) The medicine made Jane and Mary each be sick.

- (59) a. The medicine made Jane and Mary each feel sick.
b.*The medicine made Jane and Mary each sick.

We see, then, that *be*, like any other verb, introduces an eventuality variable, ‘e’. It presents a set of M-states from a count perspective and allows us to treat them as members of the count domain. The fact that *be* essentially introduces a change of perspective is what is at the root of the intuition that *be* is a grammatical formative and not a ‘content word’ like other, lexical verbs. Assuming the meaning for *be* given in (71), ‘Jane was clever last Monday’ will have the representation in (78):

- (78) $\exists e \exists s [\text{CLEVER}(s) \wedge \text{Arg}_1(s) = \text{JANE} \wedge e = l(s) \wedge \text{PAST}(e) \wedge \text{LAST MONDAY}(e)]$

(78) will be true if there was an eventuality which can be located in the past on last Monday and it was an eventuality in which Jane had the cleverness property.

Two further points about the nature of the locating function. First, I assume that fine-grainedness in the Parsonian sense holds in the domain of eventualities, and that it extends, of course, to the eventualities in the denotations of VPs of the form *be* + AP. In the nominal domain, two atomic entities under different descriptions can be identical. But fine-grainedness as analysed by Parsons (1990) means that an eventuality – an entity from the domain of events – is not identical with an eventuality under another description. So while the event of Mary's passing a very difficult math exam may be the evidence for there being an event instantiating her being clever, Parsons would not analyse them as identical. The eventuality instantiating the state of Mary being clever is an independently individuated event; the instantiation relation sets up new eventualities and doesn't "take a free ride" on already individuated eventualities. We can show this with an argument from Chierchia (1984).

Chierchia (1984) argues that every selling event is matched with a buying event. If John sold Bill the book, then Bill bought the book from John. The selling event talked about has the same participants as the buying event, namely John, Bill, and the book, and it takes place at the same time. Nonetheless, these must be two separate events, since they can have different properties, indicated by the fact that in each sentence different modifiers can appear. Thus, if Bill bought the book with a credit card, it doesn't follow that John sold the book with a credit card. Parsons (1990) gives a different example: suppose that in a billiards game, with one stroke, John hits the 8-ball into the corner pocket and the 9-ball into the side pocket. We would want to say that two different hitting events have occurred, distinguished by their participants, each with a different theme. Again, each event can be modified independently; for example, the hitting of the 8-ball into the corner pocket was gentle and unintentional, and the hitting of the 9-ball into the side pocket was violent and intentional.

By the same criteria, an event which is the output of the locating operation is not going to be identified with any other event. For example, if we assert that Jane is helpful, we assert that there is an event instantiating Jane having the helpfulness property. Suppose that the evidence for our assertion is that she helpfully drove her aunt to the shops, then is the instantiating event that we talk about the same as the event of her taking her aunt to the shops? The modification argument indicates that these are two separate events. Suppose that Jane is happy about being helpful to her aunt, but reluctant about driving her to the shops (maybe it's rush hour

and the traffic is appalling). Then the event instantiating the state of Jane's being helpful is one she has a happy relation with, while the event of driving to the shops is one she has a reluctant relation with. So the instantiating event and the driving-to-the-shops event cannot be identical.

Second, the locating operation must be a function, because of the abstract nature of events. An M-state, being a mass entity, is dense (each subpart of a state *s* is also a state *s*). It is mapped by the locating operation onto the temporal location at which it holds (while it may itself be a proper subpart of a bigger state of the same type). Since this new located eventuality has no inherent properties other than those provided by the state, then if a state were mapped onto more than one event there would be no way of distinguishing them, and they would de facto be identical. This emphasises the fact that the locating function is a linguistic construct expressing primarily a change of perspective on the state. Two states which are members of the denotation of a single lexical expression will be identical if they hold at exactly the same time. Because a state is dense (as is time) there will be an infinite number of instantiation functions (though their values may overlap). This parallels the way that an operation maps water onto quantities of water. While there are an infinite number of ways of dividing a mass up into smaller quantities, any two quantities which occupy the same space-time location must be the same "chunks of stuff."

One might ask whether verbs can be lexically decomposed analogously to the way in which *be clever* can be decomposed into the meaning contributed by *be* and the meaning contributed by *clever*. This would give *walk*, for example, a lexical representation, like that in (79a), in which the verb is analysed as denoting an instantiation relation between an eventuality variable and a state WALK. But this implies that the meaning of the verb can be broken down into the elements in (79b):

- (79) a. $\lambda e.WALK(e)=\lambda e.\exists s[WALK(s) \wedge e=l(s)]$
 b. $\lambda S\lambda e.\exists s[S(s) \wedge e=l(s)] (\lambda s.WALK(s))$

This decomposition would not be visible in either the syntactic or the semantic representations. If this decomposition were typical, then all verbal meanings would have the function expressed in (79b) as an element of their meaning, and they would differ in the set of states to which this function was applied. This function is exactly the meaning we gave to *be* in (71). So, the meaning of *be* would then be the same as the invariant part of the meaning of a lexical verb. And the difference between *be* and lexical verbs would be that the functional application which takes place covertly in the construction of the lexical meaning in the case of (79) takes place explicitly in the syntax in the case of *be*. Whether verbal

meanings can ultimately be analysed in this way is a question which I leave open.

4.2. *A Comparison between the Mass/Count Distinctions in the Nominal and Verbal Domains*

I have been arguing that the denotations of APs are sets of mass states (M-states) and that the denotations of VPs are sets of atomic eventualities (and sums of atomic eventualities), and that we can therefore find in the verbal/adjectival domain a mass/count distinction which parallels the distinction within the nominal domain. In this section I want to look more closely at how exact this parallelism is.

The relation between mass and count which I am assuming is that set out by Link (1983) in his discussion of the relation between mass vs. count nominal predicates. Link argues for a structured domain of individuals, which includes a domain (i-domain) of singular individuals denoted by count predicates: these include the denotations of *Mary* and *Jane* and *my ring*, and also plural individuals such as those denoted by *Mary and Jane*, *my two wedding rings*, and *Fred's and my wedding rings*. He argues also for a d-domain of quantities of “stuff” such as the silver that my rings are made out of and the gold that my rings are made out of and the stuff which is the join of these two portions of matter, in other words the denotation of *the silver and gold that my rings are made out of*. The count domain forms an atomic Boolean semilattice structure, with the singular individuals being the atoms, while the mass domain of stuff forms a non-atomic (and possibly atomless) Boolean semilattice structure. There are mappings between the domain of individuals (atomic and plural) and the domain of stuff; a ‘packaging’ operation maps quantities of stuff onto individuals made up of the stuff, and a ‘grinding’ operation maps individuals onto the stuff of which they are made up. The mapping relations between the two structures show that a particular spatio temporally located entity can appear as stuff in the mass domain and, under a different description, as the denotation of a count term in the atomic domain: the distinction between mass and count is thus a distinction between predicates, or entities under a particular description, and not a distinction between kinds of entities.

The semantic properties that Link's structure is intended to capture are two: countability and homogeneity. Countability is self-explanatory: a countable domain is one in which one can count the elements; this is the case when the elements of the domain occur in units – the atoms. This means that addition preserves the structure: if one puts two units together one

can see that the result has two parts. If you put one dog together with another dog, then you can see that the result has two elements, the two dogs, and count them. In a non-atomic, homogenous domain, putting two entities together is not structure preserving. If you pour two glasses of water into a bigger glass, the result is a glass of water. The elements which contribute to it are lost in the operation and you cannot count them. This is what we might call ‘upward homogeneity’. There is also a property which we can call ‘downward homogeneity’: it is a characteristic of a quantity of mass stuff like water that if you split it into two parts, both parts can still be called water (as long as you don’t split too small). This does not hold generally of count nouns. Normally, if you split a dog or a table, you won’t get two dogs or two tables. (We ignore the reproductive processes of amoebae here.) There are two caveats about the splitting of denotations of count nouns. One, pointed out by a reviewer, is that if one takes a small enough part of a dog or a table, one will still be left with a dog or a table. But this is because the small enough part is “too small to be important,” and the original count term will apply only to the larger entity that one is left with. This means that the contrast with mass stuff still holds. When we split water into parts, we are interested precisely in the cases in which all parts are “big enough”; in these situations, there are no constraints on the relative sizes of the parts and all resulting parts are called water. A second, and more important, issue is that there are count nouns denoting entities which can be split in the same way that water can be split. This observation is attributed to Mittwoch (1988) in a footnote (fn. 24), and to Barbara Partee, in p.c. to Manfred Krifka, who discusses it in Krifka (1989). Mittwoch points out that ‘line’ and other mathematical concepts are downward homogeneous; a line can be broken into two parts, both of which are lines, with exactly the same caveat as for mass terms, namely that both parts must be big enough. Krifka (1989) and Zucchi and White (1996) discuss Partee’s observation that nouns such as *sequence*, *twig*, and *quantity of milk* may have proper parts which are sequences, twigs, and quantities of milk respectively. Examples like these will be central in our discussion of the comparison between the nominal and verbal domain, and we’ll return to them below.

Ignoring them for the moment, however, we see that the differences in ‘downward homogeneity’ in the mass and count domains are related to the fact that the count domain has a set of atoms as its minimal elements, while the mass domain is atomless. Thus while part of a quantity of water is still water, a part of a unit of dog is not a dog. So, the nominal count domain is countable and non-homogenous and the nominal mass domain

is non-countable and homogenous, and this follows from the fact that the count domain is atomic and the mass domain non-atomic.

Predicates are count or mass depending on what domain they find their denotation in. A singular count predicate is one that has its denotation in the set of atoms; for example, the predicate *dog* can apply to Spot and to Max. It is non-homogenous because it does not apply to parts of Spot or Max, nor does it apply to the sum of Spot and Max. For that we need a plural predicate, *dogs*. *Water* is a mass term. It does not apply to atoms of water, but to non-countable quantities, and it is homogenous: if you split the water in a bucket into two, both will be water, and if you take two bodies of water, then the predicate *water* will apply to their sum. That the mass/count distinction is a distinction in the way linguistic terms work is shown by the existence of near-synonyms such as *coins/change* and *shoes/footwear* (see Pelletier 1979 and references there).

These semantic properties have grammatical reflexes. Chierchia (1998) lists ten well-known “main empirical properties that jointly characterise the different behaviour of mass and count nouns” and which “appear to be tendentially universal, i.e. they turn up whenever such a contrast can be detected.” (his section 1.2) We have, in section 3, identified a number of linguistic properties which distinguish adjectival from verbal predicates, and I claimed that these differences follow from a mass/count distinction. It is interesting to look at these properties and see how they match with the empirical properties which Chierchia, in his summary, expects to see characterise any mass/count contrast.

The first three properties that Chierchia mentions clearly reflect the countable/non-countable (i.e. atomic/non-atomic) contrast. Count nouns take plural morphology, can cooccur with numeral determiners, and do not (usually) occur with classifiers. Mass nouns, on the other hand, do not pluralise (except as a result of packaging), do not occur bare with numeral determiners, and require classifiers if they are to be counted:

- | | |
|------------------------------|-------------------------------|
| (80) a. chair, chairs | a'. furniture, *furnitures |
| b. three chairs | b'. *three furnitures |
| c. *three pieces of chair(s) | c'. three pieces of furniture |

((80c) can be interpreted as applying to parts of a chair that can be put together or to parts of a broken chair, but on this reading, ‘chair’ has undergone grinding, and that’s not the reading we are interested in here.) Pluralisation is a morphological operation applying to nouns, which doesn’t work in English in the verbal count domain – verbs denoting plural eventualities are not morphologically marked as plural – so in English, the

first property cannot have a parallel in the domain of eventualities and M-states. (There may well be crosslinguistic variation here, since there may be inflectional affixes on verbs, marking such things as iteration, which one would want to count as pluralisers. This would be a place to look for contrasts between adjectives and verbs.) The second property is realised in the verbal domain: the parallel to numeral determiners can reasonably be assumed to be the counting adverbials we discussed in test 1 in section 3, which distinguishes between verbal and adjectival predicates exactly as Chierchia would predict. The question of classifiers is slightly more complicated. If classifiers are seen as inherently nominal elements, then again independent restrictions on the distribution of nominals would rule out classifiers with either verbs or adjectives. This is because nominal classifiers are restricted to taking as their complements (and thus to classifying) expressions which have the form '[of NP]_{pp}'. Neither adjectives nor verbs can be complements of a P. However, if we see classifiers as lexical elements introducing some form of packaging function, then we might want to identify *be* itself as essentially a classifier.

The second group of properties that Chierchia talks about revolve around the determiner system. Determiners can select for only count nouns (singular or plural), only mass nouns, mass nouns and plurals, or can be unrestricted. The four possibilities are illustrated in (81):

- (81) a. each/every/a book; several/few/many books; *every/*several water
- b. little/much water; *little/*much book(s)
- c. a lot of/plenty (of) water; a lot of/plenty (of) books; *a lot of/plenty (of) book
- d. the/some book(s); the/some water

I just suggested that counting adverbials have the function in the verbal/adjectival domain which numeral determiners such as those in (80b) have in the nominal domain. Carrying this through, we might expect to find adverbial modifiers which exert selectional restrictions parallel to those illustrated in (81). Since there is no lexical distinction between verbal expressions denoting singular and plural eventualities, we might expect to find adverbials selecting only mass expressions, adverbials selecting only count expressions, and adverbials which are unrestricted. We have seen that expressions of temporal location and adverbials such as '*every time . . .*', and the floating adverbial quantifier *each*, modify only count expressions. This is what we would expect since temporal locatedness is, by hypothesis, only a property of count expressions, and the quantifier *each*, as a distributor, should occur only in an atomic domain. We have also

seen that there are adverbial expressions which are unrestricted, for example, adverbials which are expressions of temporal duration like *for two hours* (see examples (51) and (64)). A reviewer suggests that some differences may be seen in intensifiers and degree modifiers. Thus the degree modifier *a bit* seems to modify both adjectives and verbs (with the modifier preceding the adjective and following the verb), while *a lot* seems to modify only verbs. In (82e), where the modifier follows the adjective, it modifies only the matrix verb.

- (82) a. We made/let Mary sleep a bit.
 b. We made/kept Mary a bit sleepy.
 c. We made/let Mary sleep a lot.
 d.*We made/kept Mary a lot sleepy.
 e. We made/kept Mary sleepy a lot.

There are also degree expressions which seem to modify only adjectives, and some of these have ‘pseudo-adverbial’ forms:

- (83) a. The birthday party made Dafna extremely/very happy.
 b.*She laughed extremely.

Also, while *enough* as a verbal degree modifier can have either a temporal reading or a reading as an intensifier, it seems that as an adjectival modifier it has only use as an intensifier. (84a) easily has a reading in which they made the quantity of Mary’s sleeping or laughing sufficient in duration or frequency, and also (especially with *laugh*) in intensity, but (84b) has only the reading in which her sleepiness or happiness is sufficient in intensity. (Both, of course, have a reading where *enough* modifies the matrix verb.)

- (84) a. They made Mary sleep enough/laugh enough.
 b. They made Mary sleepy enough/happy enough.

So taking into account the syntactic categorial differences, there does seem to be some evidence that lexical items can select for mass or count elements in the verbal/adjectival domain as well.

Chierchia’s last three tests concern the relation between nouns and their denotata. Crucially, the mass/count distinction is independent of the structure of matter, and this is demonstrated by the fact that even within languages, and certainly across languages, the same items can be denoted by either mass or count expressions. Chierchia cites the following as near-synonyms in English: *shoes* vs. *footwear*, *clothes* vs. *clothing*, *coins* vs. *change*, and *carpet* vs. *carpeting*. The tests that Chierchia discusses involve the relation between mass predicates and count predicates as expressed

by the packaging and grinding functions. These are correlations of the fact that the linguistic distinction is independent of the structure of matter: since the mass/count status of the lexical noun is a linguistic property and is not reflected in the structure of matter, the language can easily allow the change of perspective which is expressed in the grinding and packaging operations.

The first two of these properties clearly show up in the verbal/adjectival domain. The count/mass distinction in the eventuality/M-state domain is independent of the structure of 'the world', and must be so because of the abstract nature of events. Eventualities and states are a way of organising the world into entities. The fact that there is a function mapping from the mass domain of M-states to the count domain of eventualities shows that the difference is one of perspective, of the way we classify situations. As for packaging, I have argued that it clearly exists in the form of the locating function. It is less obvious that there is a grinding function, mapping events onto unlocated states. However, there are two places where we might look for it. One is in lexical decomposition operations such as the one involved in the decomposition in (79). The other we will come back to below in our discussion of the mass-like properties that Bach argues are displayed by activities/processes.

So we see that the kinds of differences that we have observed between adjectives and verbs are of the kind that we expect to find at the mass/count fault, and parallel the differences between mass and count nominals. The two categories, adjectives and verbs, denote entities from sortally different domains, and linguistically represented functions (denoted by adverbials) recognise and distinguish between these domains. Counting adverbials and adverbial 'floating quantifiers' like *each*, which modify only verbs, are the clearest indication that verbs denote atomic, countable entities, while adjectives do not.

However, Chierchia's tests don't tell us anything about how the property of homogeneity is realised in the domain of eventualities and states. This is because the property that really indicates whether the domains are homogenous for nominals is plurality, and this is a morphological property which doesn't apply outside the nominal domain. We saw above that the evidence that *water* or *wine* denote homogenous entities is that the term applies equally to a chunk of stuff, to subparts of the chunk of stuff, and to sums of two or more chunks of stuff. And crucially, these chunks can be discontinuous. So, I can easily say things like the examples in (85):

- (85) a. The wine for dinner is in the fridge and on the balcony.
- b. The water in both lakes is fresh water.

We can see that the count domain is non-homogenous because of the requirement that terms which apply to sums of atoms are marked as plural. We can only say (86a) or (86b) and not (86c):

- (86) a. Spot is a dog and Max is a dog.
- b. Spot and Max are dogs.
- c.*Spot and Max are a dog.

The fact that counting adverbials modify verbs and do not modify adjectives shows that we do have pluralities of eventualities and strongly implies that we don't have pluralities of M-states, and therefore that the domain of the first isn't homogenous and the domain of the second is. This means that in the domain of eventualities, when we put together instances to make a sum, the sum should in essence be a different thing from the singular entity; indeed we should be able to see that sums of eventualities are sums of atoms, and to have access to their atomic structure. In the domain of M-states, this should be impossible.

It is very difficult to test for this because neither verbs nor adjectives are marked for plurality. Thus the standard test in the nominal domain, illustrated in (85, 86), namely whether or not the same predicate applies to the singular and plural entity, is just not relevant. Plural markers on verbs indicate agreement with plural subjects, but this does not necessarily mean that a verb marked plural denotes a plurality of events, because a singular event can have a plural subject, as in the example in (87):

- (87) The boys carried the piano upstairs together (once).

Discourse anaphora doesn't help either, since the plural pronoun *they* never has its denotation in the domain of events. (I gather that this is different in American English; a reviewer offers *they* in (88b) as grammatical, but in my dialect, and for other speakers of British English, only *it* is possible, as indicated by the diacritics.)

- (88) a. The three girls each jumped once. It/*They happened between three and four o'clock.
- b. I had a difficult afternoon: The dishwasher overflowed. The cat had kittens. The lights fused. And it/*they all happened at once.

What we do see is that in examples like (89), we can make reference to a sum of eventualities and still have access to the atomic structure. (89a) is an example with an activity verb and (89b) one with an accomplishment. I am interested in the non-cumulative reading of (89b), where there was a plurality of events of eating three apples, and each girl ate three.

- (89) a. The girls ran in turn. It happened over a period of an hour at five-minute intervals.
 b. There were three girls. In turn they ate three apples. It took half an hour.

In (89a) *it* makes reference to the sum of running events which lasted an hour and the adverbial *at five-minute intervals* makes use of the atomic structure. In (89b) we see that the telic predicate *eat three apples* applies to the singular atomic events of which the sum denoted by *it* is composed. The plural event is an event in which nine apples are eaten. Both of these examples are indications that eventualities are not upwardly homogenous. However, there is one point at which upward non-homogeneity seems to break down. In the examples given above, the atoms of a sum can be distinguished by the fact that they have different agents and occur at different times. Suppose that there are two non-telic events (where the same predicate applies to a singular and a plural event) which have the same agent and which are temporally contiguous. If the two running events that I refer to are temporally adjacent, then they may be treated as a single event. If Dafna runs in the park and then she runs in the park some more, then whether we count one event of Dafna's running or two seems to depend on whether the two runnings are temporally separated or temporally connected. So it looks as if two events of Dafna's running, if they are temporally contiguous, can be treated as a singular event, with each of the subevents and the sum event falling under the event description 'Dafna run once'. This partial upward homogeneity ('partial' because it depends on the extra condition of temporal contiguity) occurs with atelic predicates. With a telic predicate such as *eat two apples*, if there is one event of eating two apples and then another event of eating two apples, the only way we can label them as a single event is to call them an event of eating four apples.

It turns out to be very difficult to prove that M-states are homogenous, independent of showing that they are noncountable. Since, as we have seen, the pronoun *it* can always make reference to sums of non-individual entities as well as singulars, and since there is no syntactic way of predicating properties of parts of states, we are essentially forced to treat M-states as upwardly homogenous for independent reasons. But there are at least some indications that M-states are different from eventualities in this respect.

First, suggested to me by Fred Landman (p.c.), is the effect of using the expression *It lasted x time*. This expression seems to give the duration of a single eventuality or state. As we said above, pluralities of eventualities may always be combined into a single abstract eventuality, but some contexts make this less plausible. If we find a context in which it is inap-

appropriate to treat a number of eventualities as a sum, but we find that in the same context, a number of M-states are treated as a sum, then we have some evidence that pluralities of non-distinguishable M-states must be treated as single entities. In (90), the adverbial *independently* stresses that there were two events of ‘making’, and thus two events which are caused.

- (90) Independently, Jane and Mary made the child run. It lasted two hours.

In this circumstance, *it* naturally refers to the process of Jane and Mary making the child run, and the second sentence asserts that this process lasted for two hours and not that the combined events of running lasted for two hours. In contrast, in (91) *it* most naturally refers to the state of being angry which was the combined result of both Mary’s and Jane’s actions (although the other reading is also available):

- (91) Independently, Jane and Mary made the child angry. It lasted two hours.

If M-states are upwardly homogenous, then this is explained: the result of each action must have been a state of the child being angry, and the result of both their actions is a single state of the child being angry, which we can assign a duration. As we would predict, (92) patterns like (90) and not like (91):

- (92) Independently, Jane and Mary made the child be angry. It lasted two hours.

Another indication of upward homogeneity is use of the expression *the same*. If I make Dafna happy on Monday morning and on Tuesday morning, I can say (93); there is an intuitive sense that she is in the same state.

- (93) On the Monday and Tuesday, I made Dafna be in the same state.

Of course, there are two occurrences of the state; crucially, it is occurrences that we count, and not states themselves. However, if I make or see her run twice, then I haven’t made or seen the same event occur twice, but rather, I have made or seen two instances or occurrences of the same kind of event. (94a) implies that I was watching a video with a rewind button, and not that I saw two running occurrences. If I want to say that I saw two tokens of the same kind of event, I’ll say (94b):

- (94) a. I saw the same event (Dafna run) twice.
b. I saw the same thing/?event happen twice.

Testing for downward homogeneity, it is impossible to make any distinctions along the M-state/eventuality line and the crucial distinction becomes that of telicity vs. non-telicity. The distinction that downward homogeneity draws is essentially the one captured by Krifka (1992) when he uses the notion of ‘set terminal point’ to distinguish between quantized (telic) and non-quantized (non-telic) predicates. A ‘set terminal point’ is the externally given point which dictates when the eventuality ends. The point at which the two apples disappear indicates the end of an event of eating two apples. A telic predicate like *run* has no set terminal point because the predicate itself gives no information about when the event it denotes ends. A telic predicate like *run a mile* has a set terminal point because it dictates how long the event it applies to lasts, namely until the mile is run. It follows that a subevent of ‘run a mile’ is not also an event of ‘run a mile’, while a subevent of ‘run’ is also an event of running. In this respect, M-states are like any other non-telic predicate. If I make Jane happy, then any subpart of that state is also a state of Jane being happy.

The line between atelic predicates and telic predicates drawn by downward homogeneity is essentially the same division between verbal predicates that Bach (1986) draws; however, he argues that atelic verbal predicates denoting processes should be considered mass terms, while telic verbal predicates have their denotation in the count domain. Bach (1986) was the first, to my knowledge, to propose applying Link’s distinction between mass and count to the verbal domain, and he distinguished between events and processes rather than between eventualities and states. He argued that events are count entities, and that the mass “stuff” of which events are made are processes. This hypothesis is based on contrasts such as those in (95, 96), which show that adverbial expressions for counting events like *three times* contrast in their distribution with ‘mass’ adverbials like *a lot* and with adverbials based on *much*:

- (95) a. John slept a lot/too much last night.
 b. (*) John found a unicorn a lot/too much last night.
 (Bach ex. 2)
- (96) a. John fell asleep three times during the night.
 b. (*) John slept three times last night. (Bach ex. 4)

The analysis that I am proposing here predicts that all eventualities are in principle countable, and that alongside the examples in (95, 96), there must be sentences which indicate that verbally expressed processes also denote countable events. This seems to be correct. In context, (97a) is acceptable, and has different truth conditions from (97b), since if I fell asleep

but was woken after two minutes, this would count as an event of falling asleep, but not, in my experience, as an event of sleeping.

- (97) a. I slept only three times last week.
 b. I fell asleep only three times last week.

Bach claims that examples like this are instances of packaging stuff into count entities, and that temporal boundaries are all that is needed to package processes, while I claim that processes (and states, which Bach doesn't talk about) are inherently countable entities, and that no particular packaging process is going on. The counting of processes is a frequent and unmarked linguistic operation, as (98) shows, as is the modification of processes by adverbials which individuate events, as in (99a), and of course there is no problem with temporally locating processes, as (99b) shows:

- (98) a. Truus has already walked several times since the operation on her hip.
 b. We have danced many times since then.
 c. Jane has been building a house three times since I met her. Once she got as far as putting up the walls, once she only dug some of the foundations, and once she got no further than getting the planning permission.
- (99) a. Every time she walks/dances/runs, she is glad that she had the operation.
 b. She walked yesterday for the first time.

The easy acceptability of these examples contrasts with the impossibility of modifying adjectives with counting expressions, modifiers of temporal location, and the *every time* modifier which we saw in section 3.2, and makes it seem that it is adjectives which do not have their denotation in the domain of individuable events.

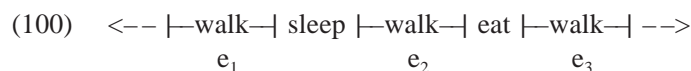
However, if we consider that non-countability and homogeneity are the hallmarks of mass expressions, then, as Fred Landman pointed out (p.c.), there is an apparent conflict here, which Bach's account of eventualities and Krifka's discussion of telicity brings out. Assume that (97–99), together with (48a), repeated here, show that the denotations of even process and state verbs are in the count domain:

- (48) a. I made Mary know the answer three times.

By the criterion of countability, these atelic predicates are clearly count predicates, and non-mass. However, the same predicates are clearly

downward homogenous, and partially upward homogenous (if contiguous constituents are added together), and are thus mass. Landman suggests that this indicates that in the verbal domain, homogeneity and countability are separable. This would constitute a difference between the mass/count distinction in the verbal domain and the nominal domain respectively: in the nominal domain mass predicates are homogenous and non-atomic (= non-countable) and count predicates are atomic and non-homogenous, whereas in the verbal domain true mass predicates are homogenous and non-atomic, but count predicates are divided into one group which is atomic and non-homogenous – the telic predicates – and one which is atomic and homogenous – the atelic predicates. If this distinction is correct, then it would be an interesting distinction between the verbal/adjectival and nominal domains, but it would weaken the claim that the verb/adjective distinction is strongly analogous to the distinction between count and mass nominals. I shall argue in a moment that the strong analogy does not break down, and that the problem of countable but partially homogenous predicates occurs in the nominal domain as well, but first let us raise another question. If there are countable but partly homogenous predicates, then these presumably denote sets of atoms (or sums of atoms). But what is atomicity for a homogenous predicate? The notion of a partly homogenous but atomic predicate requires us to think differently about what atoms might be.

Normally, we think of atoms as being unbreakable, small units. The atoms of the set of individuals ‘dog’ are the individual dogs, none of whose subparts are dogs, and the atoms of the set of events ‘eat three apples’ are the events of eating three apples, none of whose subparts are events of eating three apples. These atoms are the things we count. But when we count events such as events of running or walking or being happy, then intuitively we are counting not the smallest units which have no subparts of the same type, but rather large, temporally bounded units. If I say “Truus has walked three times since her operation,” I am counting three ‘big’ events of walking. Each can be subdivided into smaller events of walking, but each is temporally bounded by a period of time which was not a walking event, as in the diagram in (100):



So the atoms, in this case, are not indivisible units but atomic constructs; they are constructed not in terms of the relation between an event and its parts, but rather in terms of the relation between an event and the events that it may or may not be part of. Landman suggests the definitions in

(101–103), restricting our attention to singular eventualities (where E_s is the domain of singular eventualities, I is the set of intervals, and τ is the function mapping an event onto its running time).

- (101) e is an atom iff E_s iff $\tau(e) \in I$
 $\wedge \neg \exists e' \in E_s: e \sqsubset e' \wedge \tau(e) \sqsubset \tau(e')$

Thus an atomic event, be it telic or atelic, is one which is not a proper part of a bigger event of the same kind. Atelic events are homogenous if they belong to a homogenous event type, where the latter is defined as follows:

- (102) Let $X \subseteq E_s$:
 X is homogenous iff
 (i) if $i = i_1 + i_2 \wedge e \in X \wedge \tau(e) = i$,
 then $\exists e_1, e_2 \in X: e_1, e_2 \sqsubset e \wedge \tau(e_1) = i_1 \wedge \tau(e_2) = i_2$
 (ii) if $i = i_1 + i_2 \wedge e_1, e_2 \in X \wedge \tau(e_1) = i_1 \wedge \tau(e_2) = i_2$,
 then $\exists e \in X: e_1, e_2 \sqsubset e \wedge \tau(e) = i$.

Run denotes a homogenous event type:

- (103) $\forall d \in AT: \{e \in RUN: Ag(e) = d\}$ is homogenous (if defined).

This means that for every event of Mary running holding at interval i , if we can reasonably split i into two subintervals i_1 and i_2 , we find events of Mary running going on at i_1 and i_2 as well. Also, if a process of running goes on at i_1 and i_2 and these are adjacent, then an event of Mary running is going on at $i_1 + i_2$. ('Adjacent' has to be defined in such a way as to allow single events to have pause stages, as defined in Landman (1992).) Thus events are allowed to be atomic and homogenous, with downward homogeneity being complete and upward homogeneity being restricted to essentially contiguous constituents. This would mean that if Jane made Betty run from one to two and Mary made Betty run from two to three, we might consider there to be one extended event of Betty running, but if Jane made Betty run from one to two and Mary made Betty run from five to six, then there would be two events of Betty running. (Presumably there could also be contextual factors which would cause what would normally be considered a single event of running to be analysed as consisting of several atomic events, but I won't go into this here.)

Atoms, on this account, are not inherently indivisible, small units, but the smallest individuable units out of which count structures can be built. Verbal predicates access these units, adjectival ones do not.

Is this any different in the nominal domain? Is it the case that while the mass and count domains are distinguished by two properties in the

nominal domain, namely countability and homogeneity, only the first is relevant in the verbal domain? And are atoms any more ‘real’ and less constructed in the nominal domain?


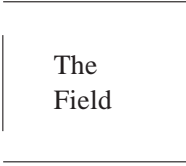
I think that the answer is perhaps slightly surprising: the verbal and nominal domains are parallel even with respect to homogeneity, but it is the verbal domain which gives a truer indication of how homogeneity and atoms work.

First, homogeneity *is* relevant in the verbal domain for distinguishing count eventualities from mass M-states. This is because, despite the apparent homogeneity of atelic events, there is a crucial distinction between the mass and the count domains which makes use of upward homogeneity: events e_1 and e_2 can be part of a singular event e only if e_1 and e_2 are temporally connected in an appropriate way. True upward homogeneity, with mass predicates like ‘water’ and, I would argue, M-states, like the state of Mary being happy, involves putting together chunks of stuff which are not necessarily contiguous, either temporally or spatially. The difference shows itself in the fact that if I put together contiguous events of, say, Dafna running, I will end up with an atomic unit, but if I collect together temporally non-contiguous events of the same kind, I will get a plurality.

Second, the property of downward homogeneity and partial upward homogeneity which we find in the verbal count domain can be found in the nominal count domain too. It is much rarer, although not as rare as some previous discussions of ‘atelic’ count predicates may lead one to think. As noted earlier, Mittwoch (1988) mentions the problem of mathematically defined terms such as *line*, and Krifka (1989) and Zucchi and White (1996) discuss the problem of *sequence*, *twig*, and *quantity of milk*. The issue arises with a larger number of non-mathematical concrete terms; for example, predicates like *wall*, *fence*, *lawn*, and *hedge*, which pass the obvious tests for count predicates: they pluralise, and they occur with count determiners and numeral determiners.

- (104) a. fence/fences, wall/walls, lawn/lawns
 b. two fences, three walls, four lawns
 c. every fence, few walls, each lawn

These predicates are homogenous in exactly the same sense that an event type like ‘Mary run’ is homogenous; they are downward homogenous and upward homogenous with respect to contiguous constituents, although contiguity is determined spatially rather than temporally. Suppose there is a rectangular field and each side borders onto a different farmer’s land. Each farmer builds a fence along the side which borders her land. Now imagine the situations in (105a,b) and compare the assertions in (105c–f):

- (105) a.  b. 
- c. Four farmers have each built a fence.
d. Four fences have been built.
e. There is a fence surrounding The Field.
f. There are four fences surrounding The Field.

We are entitled to describe the situation in (105a) with the assertions in (105c, d), since there were four fence building events, each with a different agent and with a different fence as theme. We can also make the assertion in (105e), but it would be much less appropriate to use (105f) to describe the same situation. By contrast, if the farmers built their fences to look like (105b) we would not say that the field had a fence around it. So we don't have true upward homogeneity, and 'fence' can be distinguished from true mass terms which apply to discontinuous constituents. Note that we do have downward homogeneity. If the farmers take a piece of the fence out and put it around a tree, we can easily say that there is a fence around part of the field and a fence around the tree.

What makes it possible for *fence* to behave in this way is that there is no inherent unit of 'fence' as there is a well-defined unit or entity of 'dog'. Intuitively, a piece of fence is an atom iff there is no other piece of fence of which it is a proper part. If we assume that individuals are assigned a spatial location, or (assuming they are movable) a spatiotemporal location, then we can define homogeneity in the count domain and atomicity for homogeneous count entities of the 'fence' variety parallel to the way we did for count eventualities.

- (106) Assume that L is a set of spatial locations and $\text{Loc}(d)$ is a function from individuals into pairs of locations and intervals, assigning a spatial location to d at i : then d is an atom in D iff
- $$\text{Loc}(d) \in L \times I \wedge \neg \exists d' \in D: d \sqsubset d' \wedge \text{Loc}(d) \sqsubset \text{Loc}(d').$$

Homogeneity will occur whenever the entities involved do not have an inherent structure dictating what a unit of stuff is; the units will be defined contextually by looking for the maximal boundaries which an element has. I have suggested that the boundaries of events are defined temporally, and that the boundaries of noun denotations are defined spatiotemporally;

presumably boundaries of mathematical concepts and abstract nouns will be defined in other terms, but the principle will be the same.

Note that this strengthens the well-known claim that the mass/count distinction is independent of the structure of matter; it is well known that a mass predicate like 'furniture' can apply to stuff made up out of indivisible units, and we now see the converse too: count predicates can apply to entities that do not consist of inherently indivisible units. Atoms are not the 'smallest' elements in any ontological sense, but rather semantic constructs that we use as the basic units in constructing the count domain. Count terms force us to make such a construction. The fact that in the case of dogs and cups and forks the semantic atoms correspond to real units in the world is no doubt to do with the fact that the way the world is broken into units influences the way we construct our count domains – but it only influences it. I suspect that the problem of twigs and sequences, which I have extended to fences, walls and such like, is much more widespread.

There is clearly much more to say about the structure of the mass/count domains and the importance of the property of homogeneity, both in the domain of individuals and in the domain of eventualities. I am not going to say it here. What I am interested in is two crucial points. One is that what I have hypothesised to be a mass/count distinction in the domain of eventualities shows the same kind of semantic properties as does the distinction in the domain of individuals, and essentially the same grammatical properties – taking into account the categorial differences between nouns, verbs, and adjectives. The second is that the crucial semantic property in both the domain of individuals and the domain of eventualities is the property of atomicity. In order to use homogeneity, one must test for upward homogeneity with discontinuous entities, since it is this which is an indication of a mass expression. Downward homogeneity and upward homogeneity between contiguous constituents is not a test for a mass term in either the nominal or the verbal domain.

Finally, note that since mass terms are completely homogeneous both upwardly and downwardly, it is not surprising that those count terms which are partially homogeneous feel more 'mass-like' than those which are not, and we would expect it to be easier to 'grind' such partially homogeneous count entities. The kind of events which Bach categorises as mass are the partially homogeneous ones; the fact that process verbs can be easily modified by modifiers like *a lot* while accomplishments cannot may be because there is a grinding operation which applies easily to the downwardly homogeneous predicates. For at least some speakers (especially of British English) there is a correlation in the nominal domain; it is easier to treat

downwardly homogenous count terms as mass than it is to grind non-homogenous ones. So, if I am painting the walls of a room, (107a) is much more natural than (107b);

- (107) a. Don't worry; there is enough wall for everyone to paint some.
 b. Don't worry; there is enough room for everyone to paint some.

But this is just the tip of the iceberg in a discussion of the properties of downwardly homogenous count terms.

5. HOW A DERIVATION WORKS

Let us go back to *be* and look at how a derivation works. I assume that *be* selects a small clause complement (Stowell 1978) and that the subject of the small clause raises to [Spec, IP], as in (108):

- (108) Mary_i is [t_i clever]

In addition to Stowell's (1978) arguments, we can use conjunction constructions such as (109) to argue for a small clause analysis of *be* complements:

- (109) John [is [rich] and [proud of it]_{AP}]_{VP}

(109) means that John is rich and proud of himself being rich. The question is what is the linguistic antecedent for the pronoun *it*. Intuitively, it is 'the state of him being rich', and not the richness property itself. (109) does not mean 'John is rich and proud of wealth', but that John is proud of the fact that the wealth is his. Assume that the pronoun cannot be dependent on a constituent which contains it and thus must depend on some constituent within the conjunction, and that the only one available is the first conjunct. If the choice of antecedent is the AP *rich*, which is translated as $\lambda x \lambda s. \text{RICH}(s) \wedge \text{Arg}_1(s) = x$, we get the reading we don't want, namely that the antecedent of the pronoun is the 'rich' property itself. If we assume that *be* takes a small clause complement, then (109) has the structure in (110):

- (110) John_i [is [t_i rich]_j and [t_i proud of it]_{AP}]_{VP}

The antecedent of *it* is now the small clause [t_i rich]_j, where *rich* is predicated of a variable which is dependent on John. This gives the reading that we want: John is proud of the state of *x* being rich, where *x* is dependent on John.

Following Vlach (1983) and Parsons (1990), I assume that small clauses where the predicate is headed by a verb denote sets of events. In addition

I assume that small clauses where the predicate is headed by an adjective denote sets of states. Following Rothstein (1983, 1999) I assume that a verb or adjective with all its internal arguments forms a saturated constituent and that automatic predicate abstraction at the XP level gives a function from individuals into sets of events (for VPs) and from individuals into sets of states (for APs).

The derivation for (108) is (111):

$$\begin{aligned}
 (111) \quad & [\text{clever}] && \rightarrow \lambda s. \text{CLEVER}(s) \wedge \text{Arg}_1(s)=x \\
 & [\text{clever}]_{\text{AP}} && \rightarrow \lambda x \lambda s. \text{CLEVER}(s) \wedge \text{Arg}_1(s)=x \\
 & && \text{(Predicate Abstraction)} \\
 & [\text{t clever}]_{\text{SC}} && \rightarrow (\lambda x \lambda s. \text{CLEVER}(s) \wedge \text{Arg}_1(s)=x) (x) \\
 & && = \lambda s. \text{CLEVER}(s) \wedge \text{Arg}_1(s)=x \\
 & [\text{be [t clever]}]_{\text{V}} && \rightarrow \lambda S \lambda e. \exists s \in S: e=l(s) (\lambda s. \text{CLEVER}(s) \\
 & && \wedge \text{Arg}_1(s)=x) \\
 & && = \lambda e. \exists s \in \lambda s. \text{CLEVER}(s) \wedge \text{Arg}_1(s)=x \\
 & && \wedge e=l(s)] \\
 & && = \lambda e. \exists s [\text{CLEVER}(s) \wedge \text{Arg}_1(s)=x \\
 & && \wedge e=l(s)] \\
 & [\text{be [t clever]}]_{\text{VP}} && \rightarrow \lambda x \lambda e. \exists s [\text{CLEVER}(s) \wedge \text{Arg}_1(s)=x \\
 & && \wedge e=l(s)] \text{ (Predicate Abstraction)} \\
 & [\text{is clever}]_{\text{I}} && \rightarrow \lambda x \lambda e. \exists e [\text{CLEVER}(s) \wedge \text{Arg}_1(s)=x \\
 & && \wedge e=l(s) \wedge \text{PRES}(e)] \\
 & [\text{Mary is clever}]_{\text{IP}} && \rightarrow \lambda x \lambda e. \exists s [\text{CLEVER}(s) \wedge \text{Arg}_1(s)=x \\
 & && \wedge e=l(s) \wedge \text{PRES}(e)] (\text{MARY}) \\
 & && = \lambda e. \exists s [\text{CLEVER}(s) \wedge \text{Arg}_1(s)=\text{MARY} \\
 & && \wedge e=l(s) \wedge \text{PRES}(e)] \\
 & && \rightarrow \exists e \exists s [\text{CLEVER}(s) \wedge \text{Arg}_1(s) = \text{MARY} \wedge \\
 & && e=l(s) \wedge \text{PRES}(e)]
 \end{aligned}$$

So the sentence asserts that there is a present event which packages some state of Mary having the clever property.

Here is a summary of the proposal so far:

V (and VP) denote sets of count eventualities.

A (and AP) denote sets of mass states.

Predicate *be* denotes the constant function INST defined as follows: $\text{INST} = \lambda S \lambda e. \exists s \in S: e=l(s)$.

6. SELECTIONAL RESTRICTIONS

We are now in a position to go back to the problems raised in section 1. These can be divided into two groups. One set concerns the semantic selection by matrix verbs, and the second involves the apparent change in meaning caused by the introduction of *be*.

It becomes quite straightforward to express the selectional restrictions that matrix verbs exert on non-tensed complements in semantic terms once we see that small clauses with VP predicates denote different entities from small clauses with AP predicates. As discussed in section 1, I assume following Vlach (1983) and Parsons (1990) that small clauses without inflection denote sets of events, and that, crucially, without inflection existential quantification over the event argument isn't triggered. Thus an IP will denote a proposition, and a bare verbal small clause will denote a set of events. Following the analysis in sections 3–4, small clauses with AP predicates will denote sets of states, and here too there will be no existential quantification over the state argument.

I assume the semantics proposed in Vlach (1983) and extend it to apply to complements denoting sets of states as well as those denoting sets of events:

- (112) $V(x, Y)$ is true if x stands in the V relation with a member of the set (of events or states) Y .

Vlach uses this rule to interpret perception verb complements, such as (113):

- (113) Mary saw John leave.

See denotes a relation between an event, an experiencer (in this case Mary) and a set of events of John leaving. The assertion in (113) is true if Mary stands in the seeing relation with at least one member of the set of events of John leaving; that is, if there is at least one event of John leaving which Mary saw. I assume that this extends naturally to other verbs with small clause complements. *Mary let John leave* will be true if there is at least one member of the set of events denoted by *John leave* which Mary allowed to happen, and so forth.

When the small clause has a bare AP predicate, things will work basically the same way, but with some important caveats. The matrix verb will denote a relation between an individual and a set of states, and parallel truth conditions will hold. So, using (112), (114a,b) will be true if there is a state in the set of states of politeness holding of Jane which Mary has the 'consider' and the 'make' relation with:

- (114) a. Mary considered Jane polite.
b. Mary made Jane polite.

What exactly the relation is with a state depends on the meaning of the matrix verb. One crucial difference between verbs selecting event complements and those selecting state complements is that while the former are extensional with respect to their complements, the latter are not always extensional with respect to their state complements, although I think they sometimes are. Suppose Jane has the politeness property when and only when she is happy. If Mary considers Jane polite, it need not follow that she considers her happy (she might not know of the constraints on Jane's politeness), but I think that if Mary made or kept Jane polite, then it follows that she made or kept Jane happy. I don't have strong intuitions about this, and it would be easier (and maybe more interesting) if it could be argued simply that verbs are extensional with respect to event complements and intensional with respect to state complements. But for the moment, I'll assume that the extensionality/intensionality follows from the properties of the matrix verb and not from the nature of the complement.

If states are fully homogenous, as I argued in the last section that they are, then a set of states will either have one member (the 'biggest' state S which is the sum of its parts) or no members. So you have a 'consider' relation with a set of states $\lambda s. \text{POLITE}(s) \wedge \text{Arg}_1(s) = \text{JANE}$ iff you consider that the set is non-empty, i.e., that Jane has the politeness property. And, roughly, you have a 'make' relation with a set of states if you act in such a way as to guarantee that the relevant set of states isn't empty. Then (114a) is true roughly under the conditions in (115a), and (114b) will be true roughly under the conditions in (115b):

- (115) a. $\llbracket \text{Mary considers } [\lambda s. \text{POLITE}(s) \wedge \text{Arg}_1(s) = \text{JANE}] \rrbracket = 1$ iff
 $\llbracket \text{Mary considers } \exists s [\text{POLITE}(s) \wedge \text{Arg}_1(s) = \text{JANE}] \rrbracket$
 b. $\llbracket \text{Mary made } [\lambda s. \text{POLITE}(s) \wedge \text{Arg}_1(s) = \text{JANE}] \rrbracket = 1$ iff $\exists s [\text{Mary made } s: s \in \lambda s. \text{POLITE}(s) \wedge \text{Arg}_1(s) = \text{JANE}]$

There is no specification as to how big the state is: the truth conditions require only that there be such a state and don't specify any state part or properties of a state part as being particularly relevant; thus, unless the context implies otherwise, the maximal available state will be the witness for (115) being true. In this particular case, this will give an 'individual-level' flavour to the complement. Because of the way in which people tend to have the politeness property, the biggest available state will, out of context, be the one in which Jane has the politeness property in what Condoravdi (1992) calls a 'tendentially stable' way; the effect will be to assume that the state of politeness that has Jane as a participant is stable, and that we are therefore dealing with an individual-level predication. But this is context dependent and may be overridden by many factors, including the context in which the sentence is uttered and the nature of the partici-

pants in the state. (A reviewer suggests “I consider that remark polite” as a stage-level predication; I would rather say that the state of politeness with ‘that remark’ as a participant is not stable because remarks don’t usually have a continuing existence in time and space.)

We can now go back to the problems that we looked at in section 1. First, how can we account for the distribution of small clause complements? As soon as we phrase the selectional restrictions in semantic terms, the problem resolves itself. The constituents we are interested in denote different semantic entities in each case:

- (116) [NP VP] denotes a set of events: $\lambda e.P(e)$
 [NP AP] denotes a set of states: $\lambda s.S(s)$
 [NP I'] denotes a proposition: $\exists e[\alpha]$

The selectional restrictions of the matrix verb have to be stated in semantic terms. ECM verbs may subcategorise for (non-tensed) IPs and/or small clauses, and they can select semantically for propositional complements, for sets of events as complements, or for sets of states as complements. I repeat here the crucial examples that we discussed in section 1, summed up in (117), and give an update of the original table (28) in (118), which sums up the data and the explanation. (Remember that ‘proposition’ is the denotation of a non-tensed IP (or CP) of the form [NP to VP]_{IP}. I ignore *that*-clauses entirely.)

- (117) a. Mary made Jane (be) polite.
 b. Mary let/helped Jane *(be) polite.
 c. Mary considers/found/kept Jane (*be) polite.
 d. Mary considered/found/helped Jane to be polite.
 e. *Mary saw/made/kept/let Jane to be polite.
 f. Mary caused/allowed Jane *(to be) polite.

(118)	[NP AP] _{SC}	[NP VP] _{SC}	[NP to VP] _{IP}
<i>keep</i>	+	–	–
<i>let/see/hear</i>	–	+	–
<i>cause/allow</i>	–	–	+
<i>make</i>	+	+	–
<i>consider/find</i>	+	–	+
—	–	+	+
—	+	+	+
semantic selection	sets of states	sets of events	propositions

What looks like an optional *be* in a complement, as in (117a), shows up in the table as the effect of a V selecting for either a set of states or a set of events. What looks like an obligatory *be* in (117b) is the effect of a matrix V selecting only for a set of events and not a set of states, and what looks like an obligatorily absent *be* in (117c) is the effect of V selecting only a set of states and not a set of events. Some, but not all, verbs which allow a small clause complement allow an untensed IP, and these are the ones which select for a propositional complement. Of course, this leaves open the question of how the meanings of the matrix verbs dictate their selectional restrictions, but I am not going to discuss this here. What we have is a semantic characterisation of the selectional restrictions which provides us with terms in which to ask this question. Note that these selectional restrictions are assumed to be a grammatical property of the verbs; thus a violation of table (118) results in an ungrammatical construction marked by ‘*’, and not just an infelicity.

Now we can look at the question of subtle meaning differences between minimally different complements of ECM verbs. First, we asked with respect to *consider* and the paradigm in (119) why it was that the small clause and the infinitival complement feel as if they do not mean the same.

- (119)a. Mary considers Jane to be polite.
- b. Mary considers Jane polite.
- c.* Mary considers Jane be polite.

(119) reflects the selectional properties given for *consider* in the chart in (118): it selects a proposition and a set of states but not a set of events.

The representations of the meanings of (119a, b) will be roughly as in (120a, b), respectively:

- (120)a. Mary considers $\exists e[\exists s[\text{POLITE}(s) \wedge \text{Arg}_1(s) = \text{JANE} \wedge e = l(s)]]$
- b. Mary considers $[\lambda s.\text{POLITE}(s) \wedge \text{Arg}_1(s) = \text{JANE}]$

As I suggested above, (120b) will be true if Mary considers that the set of states of politeness with Jane as participant is not empty. This is essentially equivalent to asserting that Mary considers that Jane has the ‘polite’ property. (120a) asserts that Mary is in the ‘consider’ relation with the proposition that there is an event which instantiates Jane having the polite property. But this adds the information that Mary considers that there is an individuable and temporally locatable eventuality which is evidence for asserting that Jane has the polite property, which is more than is asserted in (119b, 120b). In (119b) Jane’s having the politeness property is not associated with any instantiating eventuality; rather, as I suggested above, the ‘witness’ state for this sentence will be the maximal available state,

which, out of context, will be a tendentially stable one. The assertion thus ‘feels’ more ‘inherent’ than in (119a), where typing the state to a locatable individuable eventuality gives a less inherent ‘feel.’ But these implications are easily overridden, as we saw in section 1.

7. ASPECTUAL CLASSIFICATION OF *BE* + AP

The third question that we raised in section 1 is why *be* seems to introduce agentive implications in examples like (121b) which are absent from (121a):

- (121) a. Mary made Jane polite/nice to her family.
 b. Mary made Jane *be* polite/nice to her family.

I am going to argue that these agentive implications follow from the way in which a VP of the form *be* + AP gets assigned to an aspectual class. In order to see this, we need first to review some features of the aspectual classification of VPs, and to look at some differences between lexical VPs and *be* + AP with regard to aspectual classification.

It is a well-known semantic fact that verbs, or more properly VPs, can be classified into aspectual classes according to the kind of eventualities they denote. A familiar classification, which I shall use here, is that of Vendler (1967), which was analysed in depth in Dowty (1979). This classification divides eventualities into states, activities, accomplishments, and achievements, where states and activities are atelic, whereas accomplishments and achievements are telic. Stative verbs, such as *know* and *love*, are (downwardly) homogenous, and if they hold over a period of time, they hold at any instant at that time. Activities are typically ‘under the control of’ the subject, although, as noted in section 2, Dowty (1979) points out that there is also a group of non-agentive activities involving physical activity or movement and an “internal change of state that has visible, audible or tactile consequences” (see the discussion of Dowty’s theory of ‘DO’ in section 2). Activities are atelic and hold over an interval *i*, and they hold at sufficiently large subintervals of *i*, where ‘sufficiently large’ is contextually defined. Thus if John ran for an hour, he ran at any sufficiently large subinterval of that hour, but not necessarily at the moment he stopped to cross a road or the instant after he started to run and so on. Achievements are typically punctual and involve a near-instantaneous change of state from a situation where $\neg P$ is true of the subject to a situation in which *P* is true of the subject. This change of state may or may not be under the control of the subject, as in (122):

- (122) a. John arrived at the station.
 b. The letter arrived after three days.

Accomplishments are often thought of as distinguished from the other classes, since they are often treated as complex eventualities while the other VP types are treated as simple eventualities. An event-based interpretation of Dowty's (1979) theory treats accomplishments as consisting of two subeventualities, an activity and a resultant change of state, where the change of state gives the natural stopping point for the activity. While the eventuality in (123a) is an atelic activity, the one in (123b) is a telic accomplishment.

- (123) a. Mary was cooking for hours last night.
 b. Mary cooked pasta for dinner last night.

In (123b) the state brought about by the pasta becoming cooked provides the culmination, or natural stopping point, of the cooking activity.

Formally, I assume event-based schemas for the representation of aspectual properties, based on Dowty (1979), as in (124), with examples in (125). 'DO' is Dowty's activity operator, which introduces both the agentively based activities and the non-agentive physical activities involving internal changes of state as discussed above. 'BECOME' is the operator expressing the punctual change of state involved in achievements and, by hypothesis, in the culmination of accomplishments:

- (124) a. *States*: $\lambda P \lambda e. P(e)$
 b. *Activities*: $\lambda P \lambda e. (DO(P))(e)$
 c. *Achievements*: $\lambda P \lambda e. (BECOME(P))(e)$
 d. *Accomplishments*: $\lambda P \lambda e. \exists e_1 \exists e_2 [e \sqsubseteq e_1 \wedge e_2 \sqsubseteq e \wedge DO(P))(e_1) \wedge (BECOME(P'))(e_2) \wedge Cul(e)=e_2]$
- (125) a. 'love' $\rightarrow \lambda e. LOVE(e)$
 b. 'run' $\rightarrow \lambda e. (DO(RUN))(e)$
 c. 'arrive' $\rightarrow \lambda e. (BECOME(AT A LOCATION))(e)$
 d. 'write the paper' \rightarrow
 $\lambda e. \exists e_1 \exists e_2 [e_1 \sqsubseteq e \wedge e_2 \sqsubseteq e \wedge DO(PAPER-WRITE))(e_1) \wedge (BECOME(THE PAPER WRITTEN))(e_2) \wedge Cul(e)=e_2]$

While it is VPs, or the denotations of VPs, which are assigned to a particular aspectual class, the denotations of verbs also have aspectual properties and can be assigned to a basic aspectual class, although the VP which they head may ultimately be assigned to a different class. The trickiest classification in terms of basic classes is probably that of accomplishments, since, as is well known, they seem to alternate between the

activity or the accomplishment class depending on whether the direct object of the V contributes information about when the end point of the activity is – in Krifka's (1992) terminology, determining whether or not the object is 'quantized'. This is illustrated in (126):

- (126) a. This morning Dafna ate cheerios/apples.
- b. This morning Dafna ate 35 cheerios/three bowls of cheerios/two apples/the apple I gave her.

In (126a) the direct object of *eat*, and thus the VP, is not quantized, and the VP denotes an activity; in (126b) the direct object, and thus the VP, is quantized, and the VP denotes a accomplishment. However, rather than say that a verb like *eat* is ambiguous between an activity and an accomplishment, I think it is more proper to see this sensitivity to the quantized status of the direct object as a characterising property of accomplishments, and to contrast (126) with transitive activity verbs such as *push* which are not aspectually sensitive to the quantized status of the direct object. Thus both the examples in (127) are activities, and *push* is squarely in the activity class:

- (127) a. The child pushed an apple around.
- b. The child pushed apples around.

Although verbal predicates do get assigned to a basic class, aspectual shifting may be forced by interaction with modifiers and other operators. For example, directional PPs may have a 'quantizing' effect, as (128) shows.

- (128) a. The children are running in the park.
- b. The children are running to the swings.

In (128a) *run in the park* denotes a set of activity eventualities, but in (128b) the directional PP provides a natural end to the running activity and the VP is understood as denoting a set of accomplishments. Modifiers may cause aspect shift between other classes too, as illustrated in (129), from Zucchi (1998). The predicate *resemble her mother* is inherently a state. It is a downwardly homogenous predicate, and it is inappropriate in a pseudo-cleft construction with *do*, like (129a), and in the progressive, such as (129b), but, as Zucchi (1998) shows, in conjunction with the operator *more and more* it can occur in the progressive, as in (129c).

- (129) a.* What Mary did was resemble her mother.
- b.* Mary is resembling her mother.
- c. Mary is resembling her mother more and more every day.

Resemble is naturally stative, while the progressive operator cannot apply to stative predicates but only to activities or accomplishments. But, Zucchi argues, the progressive operator can force *resemble NP more and more* to be reanalysed as a non-agentive process or activity, and thus to become an appropriate complement of the progressive operator. (See Zucchi (1998) and Moens and Steedman (1988) for discussion.) Other linguistic elements may also cause aspectual shift; for example, plural NPs may interact with achievements to get an iterative activity reading for *spot trains* and *notice pictures*, but I won't go into this further here. What we see in general is that verbs can be assigned to a basic aspectual class, with interaction with modifiers and other operators causing a shift between the class of the V and the class of the VP. Some of these modifiers, such as the directional PP in (128b), are probably best analysed as functions from sets of eventualities of one class into sets of eventualities of another class, and others, such as the progressive operator in (129c), seem to trigger an aspectual shift analogous to type shifting; the exact analysis of each is not important for our purposes.

The point that I want to make is that with expressions of the form *be + AP* the situation is much freer, so much so that I want to suggest that these expressions are not inherently assigned to a particular aspectual class. 'Lexical' Vs of the kind discussed above are assigned to a particular class and can be reanalysed as belonging to a different class in the context of an appropriate operator. But *be + AP* seems to move quite freely between at least two classes, often between three classes, and sometimes (arguably) between all four, depending on contextual factors; the relevant contextual factor may be the semantic effect of a particular linguistic operator in whose scope the V occurs, but it may also be purely pragmatic, based on the discourse. The evidence for this is that sentences with $[be + AP]_{VP}$ can easily be analysed as stative, activity, or achievement (we'll come back to accomplishments below). First, they are often ambiguous between different aspectual readings, as in (130); (130a) is ambiguous between a stative and an activity reading, and (130b) between a stative and an achievement reading, asserting either that Jane was in the awake state at three o'clock (stative reading) or that there was a punctual change of state in which Jane moved from being not awake to being awake, and that this took place at three o'clock.

- (130) a. I met Mary and John yesterday. Mary was pleasant and John was obnoxious. (stative or activity)
 b. Jane rested for half an hour. At three o'clock she was awake just as she had said she would be. (stative or achievement)

Second, aspectual classifications which are provoked by modifiers give a much more natural reading with *be* + AP than with shifted or coerced lexical verbs. Thus, *be obnoxious* easily has an achievement reading in (131a), which we don't get if we use a typical verbal state or activity in the same construction, as in (131b,c):

- (131) a. It took Mary only three minutes to be obnoxious to her brother.
 b. ? It took me ten years to own a house.
 c. ? It took Bill half an hour to run.

Context also pushes *be* + AP into a particular aspectual class much more easily than it can shift a verb. So although *suddenly* can provoke an achievement-like reading for *know the answer*, as in (132a), it is difficult, if not impossible, to get an activity-like reading for the same VP, as in (132b). In contrast, *be tall*, which most naturally has only a stative reading, can be given achievement and activity readings as in (132c,d), even without *suddenly* in (132c) (although the adverb serves to rule out the stative reading).

- (132) a. When Alice ate the mushroom, she ?(suddenly) knew the answer.
 b. * Since she ate the mushroom, she has been knowing the answer all the time.
 c. When Alice ate from the right side of the mushroom, she was (suddenly) tall, and when she ate from the left side she was short again.
 d. Since she put on those high heels, she has been strutting around being tall.

Not all aspectual classes are available for all lexical choices of AP – for example, *be ready* does not have a natural activity reading. I assume that which aspectual classes are readily available for a particular *be* + AP is dependent on the meaning of the adjective, but I don't have anything to say at the moment about how this might work. The point that I want to make is that there is a real contrast between how these 'derived' *be* + AP verbs work aspectually and how lexical verbs work. What I'd like to suggest is that *be* itself is not assigned to a particular lexical aspectual class, and that the result of applying *be* to an AP is not determined with respect to aspectual class; rather, it can fit into any aspectual class if it is pragmatically appropriate, taking into consideration the meaning of the adjective and the context in which *be* + AP occurs. More precisely, we can think of the schemas in (124) as being possible forms that an eventuality can take. We know from the fact that verbal predicates can shift from one aspectual

class to the other that these schemas are not just formulae abstracted from existing lexical predicates and representing what members of groups of predicates have in common, but also independent schemas representing forms that verbal predicate meanings can be shifted or coerced into. It is reasonable to assume that they are available also for the ‘aspectually unclassified’ meanings of *be* + AP to shift into. We can think of the schemas in (124), repeated here, as functions, any of which can apply to the meaning of *be* + AP freely according to the needs of the context (although so far we have not seen any examples of accomplishments).

- (124) a. *States*: $\lambda P \lambda e. P(e)$
 b. *Activities*: $\lambda P \lambda e. (DO(P))(e)$
 c. *Achievements*: $\lambda P \lambda e. (BECOME(P))(e)$
 d. *Accomplishments*: $\lambda P \lambda e. \exists e_1 \exists e_2 [e_1 \sqsubseteq e \wedge e_2 \sqsubseteq e \wedge DO(P))(e_1) \wedge (BECOME(P'))(e_2) \wedge Cul(e)=e_2]$

The effect of applying (124a–c) to *be obnoxious* will give the results in (133):

- (133) **be obnoxious**: $\lambda e. \exists s [OBNOXIOUS(s) \wedge Arg(s)=x \wedge e=l(s)]$
 a. *State*:
 $\lambda P \lambda e. P(e) (\lambda e. \exists s [OBNOXIOUS(s) \wedge Arg(s)=x \wedge e=l(s)])$
 $= \lambda e. \exists s [OBNOXIOUS(s) \wedge Arg(s)=x \wedge e=l(s)]$
 b. *Activity*:
 $\lambda P \lambda e. (DO(P))(e) (\lambda e. \exists s [OBNOXIOUS(s) \wedge Arg(s)=x \wedge e=l(s)])$
 $= \lambda e. (DO(\exists s [OBNOXIOUS(s) \wedge Arg(s)=x \wedge e=l(s)]))$
 c. *Achievement*:
 $\lambda P \lambda e. (BECOME(P))(e) (\lambda e. \exists s [OBNOXIOUS(s) \wedge Arg(s)=x \wedge e=l(s)])$
 $= \lambda e. (BECOME(\exists s [OBNOXIOUS(s) \wedge Arg(s)=x \wedge e=l(s)]))(e)$

I suggest, then, that an instance of *be* + AP is not inherently marked as belonging to a particular aspectual class, and that it can shift into any of the aspectual classes under contextual pressure. Because it is not aspectually classified, shifting into a particular class does not mean shifting out of another class, and thus the contextual pressure can be much, much weaker than that required for aspect shift with lexical verbs. Further, since the stative function is the identity function, as (133a) shows, the stative reading will be the unmarked or default class for all *be* + AP meanings. Activities and/or achievement forms are available depending on the meaning of the AP. The one missing reading, of course, is the accomplishment reading. If we look at what the representation of *be obnoxious* as an accomplishment would be, we can see why accomplishment *be* + AP is problematic:

(134) **be obnoxious:***Accomplishment:*

$$\begin{aligned}
& \lambda P \lambda e. \exists e_1 \exists e_2 [e_1 \sqsubseteq e \wedge e_2 \sqsubseteq e \wedge \text{DO}(P))(e_1) \wedge \\
& \quad (\text{BECOME}(P'))(e_2) \wedge \text{Cul}(e)=e_2] (\lambda e. \exists s [\text{OBNOXIOUS}(s) \\
& \quad \wedge \text{Arg}(s)=x \wedge e=l(s)] \\
& = \lambda e. \exists e_1 \exists e_2 [e_1 \sqsubseteq e \wedge e_2 \sqsubseteq e \wedge \text{DO}(\exists s (\text{OBNOXIOUS}(s) \wedge \\
& \quad \text{Arg}(s)=x \wedge e=l(s))))(e_1) \wedge (\text{BECOME}(\exists s [\text{OBNOXIOUS}(s) \\
& \quad \wedge \text{Arg}(s)=x \wedge e=l(s)]'))(e_2) \wedge \text{Cul}(e)=e_2]
\end{aligned}$$

The problem is that (134) requires there to be an activity of the obnoxiousness performed by the subject, which culminates in a change of state in which the subject changes from non-obnoxious to obnoxious. This is *prima facie* contradictory, since it requires the subject at the point immediately prior to the culmination of the accomplishment to be lacking the property which s/he has had during the activity stage. The only way in which an accomplishment of this kind could not be self-contradictory would be if one could engage in an activity of kind P without directly displaying property P until the culmination. I think that *be obnoxious* does in fact have an accomplishment reading of this type, although it is very unusual in doing so. The scenario which would allow this reading would be the one in (135):

- (135) John has an obnoxious habit of drawing people into conversations by first being charming and then, as their defenses drop, by becoming more and more unpleasant and trapping them into embarrassing and uncomfortable situations. At a party, I see John collar some unsuspecting person and put into action stage one of his habit, the charming and gracious stage. I register what is going on, perhaps because he is never charming except in this context or maybe because he has some tic whenever he practices this game.

I can later report on what was happening at this stage with the progressive and I can say: “John was being obnoxious last night.” But, if because of some unforeseen circumstance, such as his being interrupted by an earthquake or a fire alarm or some helpful friend, he never gets to the stage of being explicitly unpleasant, “John was obnoxious last night” will not be true, and the victim may never even realise what was going on. This means that we have an instance of the imperfective paradox, in which “John was being obnoxious last night” does not entail “John was obnoxious last night,” and this is a good indication of an accomplishment reading.

Note that this of course depends on the use of the progressive. If John was interrupted in time, then (136) is infelicitous:

- (136) Last night I watched/saw John be obnoxious, though he was interrupted before he got to the stage of being really unpleasant.

So, the general picture is that instances of *be*+AP are not firmly anchored in a particular aspectual class, but move relatively freely between different aspectual classes. There are constraints, apparently dependent on the meaning of the adjective, and as a result adjectives do not allow the *be*+AP in which they occur to surface in all aspectual classes; but in comparison with lexical Vs, adjectives do not seem to have a single inherent aspectual characterisation.

The kind of underdeterminedness that we see here parallels the underdeterminedness that Bach (1986) noticed in the output of the packaging operation in the nominal domain: “If we start with a count meaning and derive the non-count meaning, there seems to be a regular and predictable meaning . . . going in the other direction, the connection seems to be much less systematic. A beer may be a serving of beer or a kind of beer” (p. 11). The packaging operation gives three units of beer, and the context determines what the units are. Something similar seems to be going on here. As the verbal equivalent of the packaging operation, *be*+AP gives a set of eventualities which instantiate a set of states, but it does not give any information about the aspectual properties those eventualities have. The aspectual properties of *be*+AP depend on how we choose to analyse the eventuality; and how we choose to analyse it depends on the interaction of the meaning of the adjective with contextual factors.

8. AGENTIVITY EFFECTS WITH *BE* IN SMALL CLAUSES

I argued above that for reasons of fine-grainedness, the two examples in (137) are truth-conditionally equivalent: if we can assert that there is a state of Jane’s having the politeness property, then there is an eventuality instantiating it and vice versa.

- (137) a. Mary made Jane polite.
b. Mary made Jane be polite.

In the light of the discussion in the previous section, this statement is too strong. If there is a state of Jane’s being polite, it will follow that there is at least one eventuality instantiating it. However, if the eventuality is assigned to an aspectual class other than that of stative eventualities, then there will be additional information in (137b) not present in (137a). With

this, and with some basic Gricean maxims, we can get the meaning differences that we discussed in section 1.

I assume two Gricean pragmatic maxims: (i) the maxim of *quantity*: the injunction not to say more than is required; (ii) the maxim of *manner*: the injunction to avoid obscurity and to say things briefly, simply, and not in an unnecessarily complex way.

The first maxim, the maxim of quantity, tells us that if an eventuality must be assigned to an aspectual class, then all things being equal, it must be assigned to the simplest class with the least additional information. This means that in (138), the maxim of quantity will force us to treat the eventuality as a stative eventuality, which is identical with the output of the packaging function:

(138) Jane is polite.

And indeed, “out of the blue” (138) will be taken as asserting that there is an eventuality instantiating Jane having the polite property, and no more. We shift the eventuality to a different aspectual class only if there is some good reason, given either by lexical material or context, to do so, as, for example, in (139):

- (139) a. Jane was polite to a lot of people last night.
b. Dafna tried hard to be polite to all the visitors.

The maxim of manner, which enjoins us to be straightforward and not unnecessarily complex in our communications, tells us that if (137a,b) are truth-conditionally equivalent, then there has to be some good reason to introduce a set of eventualities in (137b) rather than just making use of the set of states already available in (137a). We then have an apparent conflict between these two instructions. The maxim of quantity tells us that we should assign the set of eventualities denoted by *Jane be polite* to the class of stative eventualities. However, the set of stative eventualities denoted by *Jane be polite* are so minimally different from the set of states denoted by *Jane polite* that we shouldn't use the packaging function at all. This situation doesn't arise in (138) because English requires the sentence to have a tense, and tense can be attached only to predicates of eventualities. Thus the maxim of manner can't rule out the introduction of stative eventualities, since the conditions on tense require an eventuality argument and make the use of bare states unavailable.

If we look more closely, we see that the two maxims work together to get us exactly the subtle meaning differences that we in fact encounter. In (137b), Mary stands in the ‘make’ relation to a set of eventualities which instantiate the set of states of Jane being polite. This set must be assigned

to an aspectual class. The maxim of quantity tells us to assign it to the set of stative eventualities. The maxim of manner tells us not to use a set of stative eventualities unless there is good reason to do so. Assume the maxim of manner wins out; the result will be that small clause complements will not be interpreted as denoting sets of stative eventualities unless this is justified. (We will come back to what might justify it in a moment.) This means that in order to satisfy manner and quantity, the sets of eventualities in these complements must be assigned to one of the other three classes. Suppose that the denotation of *be*+AP is interpreted as denoting a set of activities (or, much less likely, accomplishments). This would involve a change of perspective which justifies introducing the eventuality argument. But, as we saw in the discussion of Dowty's analysis of activities, the operator DO implies (though it does not entail) that its animate subjects are in some sense agents of or in control of the activity. As Dowty showed, the strength of the control is determined pragmatically by the nature of the activity. We would expect to find just these agentivity or control implications where *be*+AP is assigned to the activity or accomplishment class in small clause complements where the subject is animate.

If the denotation of *be*+AP is assigned to the class of achievements, the relation between an animate subject argument and the event may, but need not, be agentive. Some predicates allow, but do not force, an agentive reading, as in (140a,b), but in other cases an agentive reading is basically out, as in (140c,d).

- (140) a. Dafna proudly reached the top of the flight of stairs alone.
 b. Dafna reached the top of the stairs in her father's arms.
 c. She realised that she had to be careful.
 d. She arrived home fast asleep.

In the non-agentive cases, an animate subject is typically an active and sentient participant in the event, unless this is explicitly ruled out, as in (140d). We get the same effect in achievement uses of small clause *be*+AP.

- (141) a. I made her be awake for the visit.
 b. We made the children be ready before us.
 c. They made the dog be quiet by giving it a tranquilizer.

This makes several correct predictions:

1. If the subject of an activity, accomplishment, or achievement eventuality denoted by *be*+AP does not naturally have an agentive relation to the eventuality, then there are no agentive implications. This explains our examples such as (141) above and (142):

- (142) a. They made the pigeons be obnoxious by teasing them with food.
 b. They can make the river be very noisy by opening the dam.

2. Stative eventualities are possible in bare infinitive small clauses if the addition of the event argument is justified. This occurs when the introduction of an eventuality argument is necessary to allow adverbial modification, temporal locating of the eventuality, and so on.

- (143) a. They made her be afraid of dogs when she meets them.
 b. They made/had the children be ready/awake at three.
 c. They had/made the music be particularly noisy last night.

3. If a matrix verb allows only a set of events as a complement and not a set of states, then it will be much easier to get a stative eventuality as a small clause, since there can be no ‘competition’ from the bare state reading. Thus (144b) is somewhat better than (144a), since the interaction between the eventuality argument and the modifying *when*-clause justifies using the stative eventuality, but (144c) is much better than (144a). Since *let* does not allow for a set of bare states, justification of the eventuality argument by introducing a modifier isn’t necessary. (Note that in (144b) *when they arrived* modifies *be untidy* and not the matrix verb.)

- (144) a. ?She made the room be untidy.
 b. She made the room be untidy when they arrived.
 c. She let the room be untidy.

Notice that in many of these cases (except (141, 143, 144b)) the aspectual shift to an activity or an achievement is not provoked by the need to allow a compositional rule to operate, but is the result of less local contextual factors and pragmatic constraints.

9. AGENTIVITY EFFECTS WITH *BE* IN THE PROGRESSIVE

The facts to be accounted for here are as follows:

1. When predicative *be* occurs in the progressive, there are very strong implications of agentivity which can, but need not, be present in simple tensed sentences. This shows in the contrast between (145a), where, without an appropriate context, the subject is not assigned an agentive relation to the eventuality, and (145b), in which the subject is preferentially a causing agent with respect to the eventuality in which she displays the polite property.

- (145) a. Dafna is polite.
 b. Dafna is being polite (to our guests).

These agentivity restrictions are so strong that they appear to rule out progressives where the subject is not capable of being agentive, as in Partee's contrasts, repeated here as (146):

- (146) a. John is being noisy.
 b.#The river is being noisy.

As we saw above, the subject of *be*+AP in a small clause doesn't have to be animate. The contrast between (147a) and (147b) is sharp.

- (147) a. She made the room be tidy when they arrived.
 b.#The room was being tidy when she arrived.

2. Independent of whether the subject can be an agent, there are restrictions on what predicates can occur with progressive *be*. These restrictions do not occur with matrix sentences or small clauses.

- (148) a. The children are awake/ready.
 b. I made the children be ready/awake.
 c.#The children are being ready/awake.

Be+AP combinations which are odd in small clauses are completely unacceptable in progressives. This is particularly clear where the subject is inanimate. The generalisation seems to be that if *be*+AP doesn't naturally have an activity (or accomplishment) reading, it doesn't occur in the progressive. The unacceptable examples in (147) and (148) are bad precisely because it is not possible to interpret the verbal *be*+AP as denoting an activity or accomplishment. The agentivity effects that occur so strongly in (147b) do so because *be polite* must be interpreted as an activity and, as we have seen above, it is the activity operator DO which introduces the implication that the subject has an agentive relation to the predicate. In order to give a precise statement of how this works, I shall explore how *be*+AP interact within the account of the progressive given in Landman (1992). I'm going to use Landman's theory because it is intensional, and because (unlike Dowty's 1979 account) it makes explicit use of a Davidsonian eventuality variable, treating the progressive operator as introducing a relation between two sets of eventualities.

Landman treats the progressive operator as a VP operator relating a set of events to the set of events denoted by the lexical VP, as in (149):

- (149) BEING(VP) $\rightarrow \lambda e.\text{Prog}(e, \lambda e'.\text{VP}(e') \wedge \text{Ag}(e') = x)$

The central problem for any theory of the progressive is how to treat the imperfective paradox. Clearly the truth value of a sentence like (150) is dependent in some way on events of building a tower (out of lego).

(150) Dafna is building a tower out of lego.

The question is what this dependence is. If Dafna gets interrupted in her tower building, then while (150) is true, there will never be an actual event of the type denoted by *build a tower* to justify using the predicate in (150).

Landman's theory crucially introduces the notion of event stages. An event *e* is a stage of an event *e'* if it grows or develops into *e'*. Thus the relation 'stage-of' is a much closer relation than the more familiar 'part-of' relation. My frying onions and my listening to the radio may both be part of the event of my making fried rice, but only the first is a stage of it. Landman argues that the progressive introduces a relation between two events if one is a stage of the other. A sentence like (150) asserts that there is an event going on which is a stage of a 'build a tower' event. The problem of the imperfective paradox arises with accomplishments because the progressive is an intensional operator. We are allowed to assert that an event such as the one which we are talking about in (150) is a stage of an event of tower building even if the event in which the tower is built doesn't occur in this actual world. What we assert in a progressive sentence like (150) is that there is an event going on which, on the basis of evidence internal to the event itself, we judge very likely to turn into an event of the type denoted by *build a tower*. If Dafna is left alone for long enough and she is sufficiently concentrated, then the event which warrants the assertion in (150) will turn into an event of the type denoted by *build a tower* in the actual world. If Dafna gets interrupted in her tower-building by external circumstances – she is suddenly hungry and stops to eat, or another kid knocks the tower down, or someone tells her to put the lego away – then the event *e* warranting the assertion in (150) won't be a stage of an actual event of the build-a-tower type. But, Landman claims, there is an event of building a tower in a near enough world of which we can say that *e* is a stage.

In order to explain the intuition that an event *e* in this world can be a stage of an event *e'* in another world, and also to give content to the notion 'near enough world' in this context, Landman develops the notion of a 'continuation branch' of an event. Landman's idea is that when checking the truth value of a sentence like (150), we take the event stage that warrants the assertion and follow this event stage through its development. If it turns into an event of the right kind in this world (in our case an event of building a tower), then the sentence is true. If the event is interrupted before this happens, we jump to the closest world which is identical to this one, but where the event was not interrupted, and follow through its development there. If there is another interruption, we jump to the next closest world

and carry on following through the development of the event. Sooner or later, either we find that the original event stage does turn into an event of the desired type, in which case the sentence is true, or we decide that we are too far from the original world and the sentence is deemed false. The line which traces the development of the event through the worlds is called its continuation branch.

Landman's rule for interpreting (149) is given in (151):

- (151) $\llbracket \text{PROG}(e, \text{VP}) \rrbracket_{w,g} = 1$, iff $\exists f \exists v: \langle f, v \rangle \in \text{CON}(g(e), w)$ and $\llbracket \text{VP} \rrbracket_{v,g}(f) = 1$ where $\text{CON}(g(e), w)$ is the continuation branch of $g(e)$ in w .

So, x is *VPing* is true iff there is an event going on which gives every indication that, in the absence of interruptions, it will turn out to be a stage of an event of type VP.

Landman's paper discusses explicitly only how activities and accomplishments work in the progressive. Activities have stages, and accomplishments must as well, since they have an activity part and a culmination. What then about stative verbs and achievements? And how does this question relate to our problem of trying to explain the agentivity implications in *being* + AP and the restrictions on what AP can occur there?

It is clear that Landman's theory predicts correctly that the progressive operator should not apply to stative verbs. The progressive denotes a relation between two sets of events where the first must be a set of event *stages*. States are by definition downwardly homogenous, and since a state which holds at interval i holds at every subinterval of i , no stages can be distinguished. So, it is inherently contradictory to analyse states as having stages, and the progressive operator just cannot apply to a stative VP. Since it denotes a relation 'be a stage of', there will be type mismatch if PROG applies to verbs which do not have stages.

This means that we can explain the contrast in (145) above, repeated here:

- (152) a. Dafna is polite.
b. Dafna is being polite.

As we argued in the previous section, the maxim of quantity, forbidding excess or unnecessary information, will leave the eventuality in (152a) in a form equivalent to a stative, unless there is good contextual reason not to. In the absence of such contextual justification, there will be no agentive implications. But, if (152b) is to be felicitous, the progressive operator must have as its complement a set of non-stative eventualities – in fact, for reasons that we'll see below, a set of activities or accomplishments. Thus, *be polite*

will be assigned to one of these classes. But this will mean that *be polite* is analysed as the complement of a DO operator, and thus, if the subject is animate, it will be assigned an agentive relation to the eventuality.

This predicts that non-animate, non-agentive subjects of *being* + AP should be OK as long as it is acceptable to interpret the eventuality as an activity, in Dowty's second sense of a physical activity or movement, involving an "internal change of state that has visible, audible or tactile consequences" (Dowty 1979, p. 165). The relevant examples from above are repeated here in (153):

- (153) a.# The river is being noisy. (= 146b)
 b.# The room was being tidy when she arrived. (= 147b)

These examples are infelicitous to the degree to which the predicates *be noisy* and *be tidy* (*when she arrived*) cannot be interpreted as activities (and even less as accomplishments) as the progressive requires. To the degree to which the predicates can be interpreted as activities under Dowty's second definition of activity, the sentences improve. It is possible to find a context in which (153a) is acceptable, since we can think of the river as being noisy as a result of an activity of internal movement; (153a) improves in the context given in (154), since this indicates that the river's being noisy is to be considered as a stage of an activity, in this other sense.

- (154) The river is being very noisy this evening; it must be breaking through the dam.

Since it is impossible (as far as I can see) to find any way in which *tidy* can have an activity reading with an inanimate subject, shifting to the activity reading of *be tidy* will be impossible, and the progressive will have an inappropriate complement and will be infelicitous. Of course, with an animate subject the progressive is fine.

The fact that the progressive operator cannot apply to statives is a semantic fact, and the examples in (153) are thus semantically uninterpretable if *be* + AP is assigned to the class of stative eventualities. (They are marked infelicitous, rather than ungrammatical, because they could in principle have an activity reading – it's just that the activity reading isn't very plausible.) In the small clause examples discussed in the previous section, the constraint against having stative eventualities in small clause constructions was pragmatic, and if it could be shown that the maxim of manner was not violated, they were quite acceptable. This explains why the felicity violations in (153) are much stronger than in the corresponding small clause examples in (155):

- (155) a. They made the river be very noisy by opening the dam.
 b. She made the room be untidy ?(when they arrived).

An obvious question is whether an achievement reading of *be* + AP is acceptable as complement to the progressive, and this brings us back to the second fact that we need to explain, namely the fact that expressions like *be ready* and *be awake* do not have progressive readings at all, as (156) shows:

- (156) a.# The children are being ready/awake. (= 148c)
 b.# She is being afraid.

The adjectives in these examples are those which do not naturally have an activity reading, and where the non-stative reading of *be* + AP is naturally an achievement one. But, as with (153a), if these examples are to have any reading at all, the predicates have to be assigned to the activity class. The reading we then get is the usually inappropriate one that the children are ostentatiously displaying awake or ready behaviour; this reading is odd because we don't associate behaviour or activity with these predicates, except in ironic sentences like (157).

- (157) Dafna has been ready to go to kindergarten for some time.
 She has found her shoes and her bag and she has gone to stand by the door, where she is very ostentatiously being ready.

What we don't get from "Dafna is being ready" is an achievement reading.

If we could believe the often-repeated generalisation that achievements don't occur in the progressive, then we would not expect to get an achievement reading for (156). And it would make sense. Landman's paper doesn't talk about the progressive and achievements, but on the plausible assumption that achievements, being punctual, do not have stages, we would expect that achievements do not occur in the progressive any more than stages do. Classic examples like (158) seem to bear this out, since they have only a 'slow motion' reading where we assign stages to a slowed-down version of the eventuality introduced by *notice*. (I believe this observation is due to Sandro Zucchi.)

- (158) John is noticing that Mary has cut her hair.

However, it is not possible to maintain the claim. Achievements do occur, with a non-slow motion reading, in the progressive:

- (159) a. Dafna is reaching the top of the ladder.
 b. The kids are arriving at the station.

(159a) is reasonably interpreted as asserting that there is some preparatory eventuality going on which, if not interrupted, will turn into an eventuality in which Dafna reaches the top of the ladder, and (159b) has an analogous paraphrase.

If this is the case, then why isn't there an acceptable progressive reading for *Dafna is being ready*? Neither the 'preparatory' activity nor the 'slow motion' reading are available. We can't interpret *Dafna is being ready* as asserting that there is an eventuality which, if not interrupted, will turn into an eventuality in which Dafna becomes ready. If we could, then (160a, 161a) would have readings parallel to the sentences with "true" verbal predicates in (160b, 161b). And the slow motion reading is not possible either. (160a, 161a) can only have the odd 'pseudo-activity' reading, which we saw illustrated in (157).

- (160) a.# Dafna is being ready.
b. Dafna is getting ready.

- (161) a.# She is being awake.
b. She is waking up.

Since we know that the progressive triggers aspect shift (see (129) above), that it applies to achievements, and that very little is required to trigger shift of *be* + AP into an achievement, then why is the progressive not acceptable with the achievement use of *be* + AP here?

Rothstein (1998) proposes that what makes it possible for verbal achievements to occur in the progressive is also a type shifting process. In a sentence like (162), the progressive operator cannot normally apply to the VP, since it requires the eventuality denoted by the VP to have stages, while achievement VPs like *arrive at the bakery* denote punctual events which do not have stages.

- (162) Dafna is arriving at the bakery.

I argue in that paper that, in a number of ways, progressive achievements are different from progressive accomplishments, and we do not want simply to shift the achievement into a corresponding accomplishment form. What we want is for the progressive to associate with an achievement a set of event stages which will plausibly develop into the achievement event, without actually being part of that event. I propose that when the progressive operator applies to a punctual VP, it triggers the type shifting process given in (163), which raises the denotation of the VP into the structure of an accomplishment whose culmination is given by the lexical VP.

$$\begin{aligned}
 (163) \quad \text{SHIFT (VP}_{\text{punctual}}): \lambda e.(\text{BECOME(P)}) (e) \rightarrow \\
 \lambda e. \exists e_1 \exists e_2 [e_1 \sqsubseteq e \wedge e_2 \sqsubseteq e \wedge \text{DO}(\alpha)(e_1) \\
 \wedge (\text{BECOME(P)})(e_2) \wedge \text{Cul}(e) = e_2]
 \end{aligned}$$

If this type shifting operation applies to the VP in (162), then (162) asserts that there is an event e_1 which is a stage of an event e which has an arrive-at-the-bakery event e_2 as its culmination, without being part of the arrive-at-the-bakery event. The output of (163) is an ‘abstract accomplishment’ which does not correspond to any lexical item. I suggest that what is going on with the examples in (156, 160a, 161a) is that the normal aspectual shift rule cannot apply. Suppose that (163), being a rule of aspectual shift, applies only to lexical predicates. In order for *be*+AP to be the input to this rule, it would already have had to shift into the achievement class, and (163) would have to apply to an already shifted predicate. This is ruled out. The ‘slow motion’ reading is not available for similar reasons. I assume that the slow motion reading of *Dafna is noticing the new picture* is derived by slowing down the change of state so much that it can be assigned stages and treated as an accomplishment. In these cases, an achievement is genuinely being treated as an accomplishment. But here too, the shift must be from a lexical achievement to an accomplishment and not from an achievement which is itself the result of aspectual shifting.

10. A NOTE ON OTHER *BE*’S

1. *Progressive Be*. An obvious question is whether we can assimilate progressive *be* to the copular *be* we have been examining above, especially because of the much discussed idea that the progressive is a stativizer. The simple answer is No. Progressive *be* takes a VP as a complement and a VP denotes a set of eventualities, while copular *be* takes a set of M-states as a complement. They must thus be of different types:

- (164) a. copular *be*: $\langle\langle s, t \rangle, \langle e, t \rangle\rangle$
 b. progressive *be*: $\langle\langle e, t \rangle, \langle e, t \rangle\rangle$

This difference in type reflects the very different semantic functions that they perform. Copular *be* takes sets of unlocated states into sets of eventualities of an unspecified aspectual class which locate or instantiate the states; progressive *be* takes sets of eventualities into the sets of activity stages out of which they are (partially) composed.

2. *Be of Identity*. I assume that predicative *be* operates in identity sentences as well, and I essentially adapt Partee’s (1986) proposal to explain how this works. *Be* induces a lifting operation on a non-predicate com-

plement, so that intuitively, an identity sentence such as (165a) has the reading in (165b):

- (165) a. My teacher is Mary.
 b. My teacher has the property of being in the state of being Mary.

The lifting operation is given in (166), and the derivation for (164a) is in (167):

- (166) a. $\text{LIFT}(\text{Mary}) = \lambda s. \uparrow \text{MARY}(s) \wedge \text{Arg}_1(s) = x$
 b. $\uparrow(d)(s)$ is the relation that holds between s and x if $x = d$ and s is a state of being x .
- (167) $\llbracket \text{My teacher is Mary} \rrbracket$
 $= [\text{IS MARY (MY TEACHER)}]$
 $= (\lambda x \lambda e. \exists s [\uparrow \text{MARY}(s) \wedge \text{Arg}_1(s) = x \ \& \ e = l(s) \wedge \text{PRES}(e)]$
 $\quad (\text{MY TEACHER})$
 $= \lambda e. \exists s [\uparrow \text{MARY}(s) \wedge \text{Arg}_1(s) = \text{MY TEACHER} \wedge e = l(s)$
 $\quad \wedge \text{PRES}(e)]$
 $\rightarrow \exists e \exists s [\uparrow \text{MARY}(s) \wedge \text{Arg}_1(s) = \text{MY TEACHER} \wedge e = l(s)$
 $\quad \wedge \text{PRES}(e)]$

In other words, there is a present eventuality which packages the state of my teacher being Mary.

11. A NOTE ON HEBREW ADJECTIVES AND POSSIBLE CROSSLINGUISTIC VARIATION

In Hebrew matrix small clauses, a non-inflected adjectival main predicate can be temporally modified, as in (168):

- (168) a. ha-ben Seli xole ha-yom/axSav
 the son my sick today/now.
 'My son is sick today/now.'
- b. rina gevoha haerev (ki hi al akevim gvohim)
 Rina tall tonight (because she on high heels)
 'Rina is tall this evening because she is wearing high heels.'
 (Greenberg 1994)
- c. dani xaxam ha-boker (ki hu haya etzel
 Dani clever this morning (because he was with
 ha-maxSefa etmol)
 the witch yesterday
 'Dani is clever this morning because he visited the witch
 yesterday.'

There are several possible reasons for this difference. One could always introduce a null inflection which introduces an event argument, but I argue in Rothstein (1999) that there is no serious syntactic evidence that there is such a syntactic node. Another possibility is that adjectives in Hebrew have an event argument. This may well be the case, since Hebrew adjectives pass other eventuality tests. As predicates of matrix small clauses they can be modified in the 'every time' construction, as in (169), and in colloquial Hebrew they can be modified by adverbs of temporal location, as in (170):

- (169) dani me'od nexmad kol pa'am Se-dafna ba'a.
 Dani very nice every time that Dafna comes
 'Dani is very nice every time that Dafna comes.'
- (170) dani texef Sikor axSav, ki hu lokeax trufot.
 Dani immediately drunk now because he takes medicines
 'Dani gets immediately drunk now, because he is taking medicine.'

The idea that adjectives in Hebrew are verb-like is the more intuitively plausible because of the well-known observation that 'present tense' verbal forms in Hebrew have adjectival properties – in particular, they are inflected only for number and gender, with typically adjectival morphological markings. This leads to the feeling that the verb-adjective distinction in Hebrew is less a contrast and more a continuum. Be that as it may, the data raises the possibility of crosslinguistic variation in syntactic-semantic categorial mappings. Chierchia (1997) has suggested that NPs may be of different types in different languages; specifically, he suggests that Italian NPs (as opposed to DPs) are of type $\langle d, t \rangle$ and denote predicates, while English NPs are of type d and denote individuals, and he derives from this differences in reference to kinds in the two languages. If there is crosslinguistic categorial variation of this kind, then whether adjectives denote states or eventualities may well be a parameter along which differences can occur.

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Department of English
Bar-Ilan University
52-900 Ramat Gan
Israel
E-mail: rothss@mail.biu.ac.il