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element is part of the meaning of the sentence and, further, it has always been assumed that the resultative or causal element in the meaning is what is responsible for making examples such as (82) unacceptable on the resultative reading.

(82) #John painted the house dirty.

However, there are a number of cases where there is no necessary causal element in the meaning of resultatives:

- (83)a. The crowd cheered the gates open.
 b. Every night the neighbour's dog barks me asleep.
 c. On May 5, 1945, the people of Amsterdam danced the Canadians to Dam Square.
 d. Mary drank John under the table/sick/dizzy.

I shall return to this issue in the next chapter and argue that the resultative/causative component is not semantic, but is fall-out from the meaning of the accomplishment. As we shall see, the structure of an accomplishment involves structuring an activity in terms of the progress of an extended change-of-state event, which culminates when the change-of-state is reached. Constraints on how the activity and change-of-state events are matched make it frequently the case that the change-of-state is caused by the activity, but this is not necessarily the case. We will see that the result aspect of the resultative derives from this causal relation, and when it is absent the result meaning in resultatives is absent too.

Chapter 4

The Structure of Accomplishments

4.1 Incremental Themes and the Notion of "Extent"

4.1.1 Introduction

In the previous two chapters, I argued that there must be (at least) two different aspectual shift operations which derive accomplishments. The first one is triggered by the progressive operator, and derives an accomplishment from a lexical achievement predicate by associating an activity event with a telic point, where the properties of the telic point are given by the achievement. The second shifting operation is triggered by the operation of resultative predication, and derives an accomplishment from a lexical activity predicate by associating a culmination or telic point with the event denoted by the lexical activity. In both cases, although the structural shift operation provided for a compositional interpretation of the structures, it left open questions about when it was contextually appropriate to use the mechanism. In particular, we raised two questions:

- (i) How "far" from the point at which an "achievement event" is scheduled to take place is it appropriate to make an assertion using the progressive. For example, how far from the top of a mountain can Jane be for (1) to be reasonably asserted:
- (1) Jane is reaching the top of the mountain.
- (ii) What constraints are there on the relation between verb and resultative predicate in a resultative construction? Where does the causal implication come from? For example, why is (2a) more acceptable than (2b), and why, if (2b) is acceptable, do we get an implication that the house getting dirty was a result of the painting:
- (2)a. Mary painted the house red.
 b. ??Mary painted the house dirty.

I claimed that in both cases, the answers to these questions could come only from an understanding of what incrementality in accomplishments is, and this chapter is devoted to exploring this issue. Explaining incrementality in accomplishments is tied up with the investigation of another notion – the notion of *culmination*. Culmination is often associated with telicity, as a predicate is usually said to be telic if an event in its denotation has a lexically specified endpoint, and a culmination is naturally identified as such an endpoint, and called the “telic point.” However, I shall show that incrementality and telicity are to be distinguished, and I will leave the discussion of telicity to chapter 5.

This chapter begins by reviewing the claim that an accomplishment is incremental because it has an incremental thematic relation with its theme argument (alternatively, that an event is an accomplishment if and only if it has an incremental relation with its theme), and by exploring the strengths and limitations of Krifka’s account of how incrementality works (Krifka 1986, 1989, 1992, 1998). I go on to discuss some other accounts of incrementality in terms of movement toward a culmination, and I develop a broader account of incrementality which subsumes Krifka’s, and which accounts for the “incremental effects” which we have seen both with progressive achievements and derived resultatives.

4.1.2 “Measuring out” and incrementality

Incremental themes surfaced in linguistic discussion notably in the work of Verkuyl (1972, 1993), Krifka (1986, 1989, 1992, 1998), Tenny (1987, 1994), and Dowty (1991). Linguistic evidence that the direct object plays a role in incrementality comes from the contrast between (3) and (4), noted first by Verkuyl (1972) and Dowty (1979). Accomplishment predicates which normally head telic VPs behave as activity predicates (i.e. head atelic predicates) when the direct object is a bare plural or a mass NP, whereas activity predicates always behave as activity predicates no matter what direct object they have.

- (3)a. Mary built the house #for a year/in a year.
b. Mary built houses for a year/#in a year.

- (4)a. John pushed the cart for an hour/#in an hour.
b. John pushed carts for an hour/#in an hour.

These examples show that the relation between verb and direct object is central in determining what accomplishments are, and, given the centrality of incrementality in characterizing accomplishments, it is plausible to expect that the relation between verb and direct object can be used to explain how the incrementality works. The basic idea common to the works cited above is that the direct object argument of the verbs, such as *eat* and *mow* and *build* in (5), is used up “bit by bit” as the event denoted by the verb progresses.

- (5)a. Mary ate the sandwich.
b. Jane mowed the lawn.
c. Dafna built a house.

One can plot the progress of the event of Mary eating the sandwich by looking at changes in the sandwich, and similarly the progress of the event of Jane mowing the lawn can be plotted by watching changes in the lawn. As Dowty (1991) puts it:

if I tell my son to mow the lawn (right now) and then look at the lawn an hour later, I will be able to conclude something about the “aspect” of the event of his mowing the lawn from the state of the lawn, viz., that the event is either not yet begun, partly done but not finished, or completed, according to whether the grass on the lawn is all tall, partly short or all short. On the other hand I will not necessarily be able to inspect the state of my son and conclude anything at all about his completion of his mowing the lawn. In this event, my son is the Agent and the lawn is the Theme, in fact the Incremental Theme.

Not only the progress of the event, but also the extent of the event can be determined by looking at what happens to the theme. An eating event can go on only as long as there is something to eat, and so the events in the denotation of *eat a sandwich* can continue only as long as there is some sandwich to be eaten. For any particular event in the denotation of *eat a sandwich*, the culmination of that event is determined by the point at which the relevant sandwich is fully eaten. Similarly, the extent of the events in *build a house* are determined by the properties of the particular houses which are participants in the respective events. These accomplishments contrast with verbs such as *run*, which denote activities, but which may easily head telic VPs as in (6b), where the length of the running event is delimited by means of an explicit measure phrase, and (6c), where the event is delimited by a directional or path phrase, but not by an argument.

- (6)a. John ran for an hour.
b. John ran a mile in an hour.
c. John ran to the store in ten minutes.

The contrast between (3) and (4) is the basis for arguing that accomplishments and activities are linguistically distinguishable. Accomplishments may head atelic predicates, and activities may head telic ones, but the telicity of the VPs headed by accomplishments is dependent on the properties of their direct object, whereas the telicity of VPs headed by what we call activities is unaffected by the properties of the direct object.

Krifka (1986, 1989, 1992, 1998) has focused on making precise how the telicity of accomplishment-headed VPs is dependent on the direct object. He argues that the contrasts in (4) and (5) are explained on the basis of two linguistic

notions, incrementality and quantization. The direct object of an accomplishment is the position in which the theme argument is canonically realized. If a verbal predicate is incremental, then there is a homomorphism from the denotation of the theme to the extent of the event in which the theme is a participant. If a VP predicate is quantized, then it is telic, and if it is non-quantized it is atelic. These two notions are related in the following way. If a predicate P is quantized, then no x in the denotation of P has a proper part which is also in the denotation of P (see the definitions given in chapter 1). Nominals, or DPs, are quantized or non-quantized. If a verb is incremental, its relation with its theme is such that the properties of the direct object percolate up to the VP in such a way that the quantized or non-quantized status of the direct object DP determines the quantized or non-quantized status of the VP, and thus its telicity. If the verb is an activity verb (or an achievement verb for that matter) and thus non-incremental, the quantized status of the direct object cannot affect the VP. Krifka's account gives precise semantic content to the notion of "measuring out" or incremental theme, and in his 1998 paper he extends his account of incrementality via thematic roles to paths and other measure functions. In the next section I present his theory in detail.

Note that although Krifka's examples come from direct objects, he claims that it is the thematic relation which is relevant rather than the grammatical relation. Accomplishments, which are normally transitive, have themes in direct object position, but subjects of passives determine the telicity of the VP just as they can be subjects of resultative predicates. Neither an agent nor an experiencer can have an incremental relation with a verb/event. Dowty (1991) suggests that there are some subjects of transitive verbs which have what he calls "proto-patient" properties, and he gives as examples *John slowly entered the freezing water* and *The turtle crossed the finishing line*. However, it is not clear that these are counterexamples to the claim that it is the object of a transitive verb which measures out the extent of the verb. While you can clearly watch the progress of the event by looking at John or the turtle, it is context that determines "how much" of either of them must be affected in order for the sentence to be true, and it thus not the case that the extent of these arguments determines the extent of the event.

4.1.3 Krifka's theory of quantization

Krifka (1992, 1998) argues that predicates can be characterized as cumulative or quantized. He defines cumulativity and quantization as follows:

- (7) If X is **cumulative** then:
 $\exists x \exists y [X(x) \wedge X(y) \wedge \neg x \sqsubset y \wedge \forall x \forall y [X(x) \wedge X(y) \rightarrow X(x \sqcup y)]]$

"If a predicate X is cumulative, and X does not denote a singleton set, then for any two elements in X, their sum is also in X."

- (8) If X is **quantized** then:
 $\forall x \forall y [X(x) \wedge X(y) \rightarrow \neg y \langle x]$

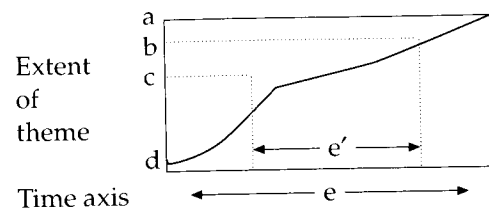
"If X is quantized, then if x and y are in the denotation of X, y cannot be a proper part of x."

Examples of nominal cumulative predicates are *water* or *apples*: if x and y fall under *apples*, then the sum of x and y also falls in the denotation of *apples*. If x and y are non-overlapping and each is in the denotation of (*exactly*) *three apples*, then the sum of x and y cannot also be in the denotation of (*exactly*) *three apples* since there will be at least six apples. Thus (*exactly*) *three apples* is non-cumulative. But (*exactly*) *three apples* is a quantized nominal predicate since, if x falls under (*exactly*) *three apples*, it cannot have a proper part which is also in the denotation of (*exactly*) *three apples*. In contrast, a part of an object in the denotation of the non-quantized predicate *apples* may also be in the denotation of *apples*.

Examples of cumulative event predicates are *run* and *push a cart*; two running events can in the right context form a single event in the denotation of singular *run* and similarly for *push a cart*. However, the sum of two non-overlapping events in the denotation of *build a house* or *eat a sandwich* will not be in the denotation of the singular predicate but only in the denotation of a plural predicate such as *build houses*. On the other hand, *eat (exactly) three apples* and *build a house* are quantized since a part of an event of eating exactly three apples is not itself an event of eating three apples, and a part of an event of building a house is not an event of building a house, but only of building part of one. Atelic predicates are cumulative verbal predicates and telic predicates are quantized verbal predicates. Quantization and cumulativity are then notions which are not specific to the theory of aspectual classes, but are relevant in the classification of nominal predicates as well. In fact, as we pointed out in chapter 1, a single definition of cumulativity cannot separate mass predicates from count predicates in the nominal domain, and atelic count predicates from telic count predicates in the verbal domain, and so the analogy between the structure of the theme argument and the structure of the VP predicate is not as complete as Krifka would wish. We will come back to this in chapter 6. Krifka (1986, 1989, 1992, 1998) shows that if and only if a verb has the appropriate relation with its theme, then the quantized or cumulative status of the theme determines whether the VP is quantized (telic) or non-quantized (atelic). Whether or not the thematic relation has the right properties is what differentiates the two classes of predicates: those we call accomplishments and those we call activities.

The "appropriate thematic relation" is determined in the following way. Thematic roles are functions from events to their participants (Parsons 1990, Landman 2000), and the feature [\pm quantized] percolates from the theme DP to the VP if the function expressed by the thematic role "theme" is a homomorphism from the event to its theme/patient participant. Krifka represents this graphically in (9), taken from Krifka (1992), with a-d as the theme of the event e, and b-c as the theme of the event e':

(9)



Krifka (1998) shows that a thematic role θ is a homomorphism from the event to the object if it has the following properties (under the assumption that each thematic role has a unique value):

- θ shows mapping to subevents:

$$\forall x, y, \forall e [\theta(e, x) \wedge y \sqsubseteq x \wedge \neg y = x \rightarrow \exists e' [e' \sqsubseteq e \wedge \neg e = e' \wedge \theta(e', y)]]$$

"If x is the theme of e and y is a proper part of x , then there is some unique proper part of e which has y as its theme."

- θ shows uniqueness of events:

$$\forall x, y, \forall e [\theta(e, x) \wedge y \sqsubseteq x \rightarrow \exists! e' [e' \sqsubseteq e \wedge \theta(e', y)]]$$

"If x is the theme of e and y is part of x , then there is exactly one event e' which is part of e such that y is the theme of e' ."

- θ shows mapping to sub-objects:

$$\forall x \forall e, e' [\theta(e, x) \wedge e' \sqsubseteq e \wedge \neg e = e' \rightarrow \exists y [y \sqsubseteq x \wedge \neg y = x \wedge \theta(e', y)]]$$

"If x is the theme of e and e' is a proper part of e , then there is some (unique) proper part of x which is the theme of e' ." (Here, note that uniqueness follows from the general properties of θ .)

- θ shows uniqueness of objects:

$$\forall x \forall e, e' [\theta(e, x) \wedge e' \sqsubseteq e \rightarrow \exists! y [y \sqsubseteq x \wedge \theta(e', y)]]$$

"If x is the theme of e and e' is a part of e , then there is exactly one element y , which is part of x , which is the theme of e' ."

Together these properties constitute what he calls "strict incrementality" (in Krifka 1992 this is called "graduality"). Krifka then explains how quantized DPs lead to telic events: incrementality/graduality means that if each subevent of e has a different unique part of x as its theme and each part of x is the theme of a unique part of e , and if each part of x can be the theme of no more than one event, then at some point the object will be used up; this is the culmination point, the point at which the event is over. An event-description is telic if the linguistic expression of the theme of e gives enough information to determine the size of the object which is the theme, and thus the point at which it will be used up. So graduality is a necessary condition for telicity, and graduality plus a quantized theme is sufficient for telicity. In (10a) and (10b), the thematic role "theme" is gradual:

- (10)a. John ate apples last night.
b. John ate three apples last night.

(10a) is non-telic although the thematic role "theme" is gradual, because the direct object cannot be used to identify a telic point; put differently, the description of the event does not include information about when the culmination occurs. (10b), on the other hand, does give such information; the event under discussion is over when the eating of three apples was completed. And because there is such a difference between (10a,b), the verb *eat* is classified as an accomplishment. In contrast, *push* does not have a gradual theme, and thus both (11a) and (11b) are non-telic, independent of the quantized or non-quantized status of the theme argument. So, *push* is classified as an activity:

- (11)a. John pushed carts last night.
b. John pushed three carts last night.

Despite the obvious attractions of the theory, there are a number of problems. Krifka himself brings up several and suggests solutions to them, but the accumulation of questions indicates that the difficulty is more fundamental. There are two issues here: the definition of incrementality, and the relation between telicity and quantization. We will discuss the relation between telicity and quantization in chapter 6, and we will concentrate on incrementality in this chapter. Krifka raises several problems for his theory of incrementality. First, there are VPs such as *peel an apple* where what determines the extent of the event is not the extent of the whole theme of the V (the apple), but only the extent of an aspect of it, namely its outside surface which determines the extent of the peeling event. Second, there are cases where events have parts which do not directly affect a part of the theme: thus in an event of building a house there is the stage at which you put up the scaffolding and the stage at which you take it down again; in neither case is the extent of the house affected by the event at that stage. For both kinds of events, Krifka proposes a modification of the property "mapping to subobjects" which will allow the thematic relation to remain incremental/gradual. A different problem which Krifka (1998) discusses concerns events such as *read "War and Peace"* which can "affect" the same part of the object more than once, since the reader can go back and read, say, chapter 1, many times in the course of reading the book; although *read "War and Peace"* counts as telic, the property "mapping to subevents" does not hold of the thematic relation "theme." Krifka suggests that although an event e of this type may not be incremental in the strict, non-repetitive sense, there is an "idealised" abstract event, which can be defined in terms of e , which is strictly incremental, and in terms of which a general incremental relation can be defined.

Although Krifka shows that it is possible to modify the appropriate definitions to save the homomorphism theory of telicity, I want to discuss three other kinds of problems which indicate that the difficulties are fundamental

and require a reconsideration of the nature of incrementality. First, look at examples like (12a–c), where the identical VP can be interpreted as an activity or an accomplishment predicate:

- (12)a. John wiped glass/polished silver for several hours/*in several hours.
 b. John wiped the table/polished the vase in five minutes.
 c. John wiped the table/polished the vase for five minutes.

(12a) shows that for *wipe* and *polish* a non-quantized direct object forces an atelic reading, but (12b) and (12c) show that a quantized direct object allows but does not force a telic reading. If telicity is determined by the graduality of the theme, then (12b) indicates that the theme of *wipe* and *polish* is gradual, whereas (12c) indicates the contrary. One possibility is to assume that the verb assigns two different theme roles in (12b) and (12c), the first gradual and the second non-gradual. But if this is all there is to it, then whether a theme role is or is not gradual is simply stipulated by the verb: some, like *build*, stipulate yes, others like *push* stipulate no, and others like *wipe* and *polish* leave it open. In order to go beyond stipulation, we need to determine what property of the predicate, or of the event denoted by the predicate, forces graduality of the theme relation, prevents it, or leaves it open. But then again, graduality is a by-product of some other property and not the root of it.

Two other problems which Krifka doesn't bring up indicate that the graduality of the theme relation cannot be the root of incrementality. First, we have verbal predicates which clearly head telic VPs, but in which it makes no sense to see the extent of the event as determined by the extent of the theme. Here are some examples:

- | | | |
|------|------------------------|--|
| (13) | repair the computer | solve the Rubik's cube |
| | spice the soup | close the suitcase |
| | wash the clothes/shirt | close the door |
| | dry the clothes | lock the door |
| | prove the theorem | convince the student of the truth of the |
| | paint the picture | argument |

In each case, the event involves what we would intuitively think of as a process with a telic point or inherent stopping point, but the extent of the theme does not determine when this point is. Repairing a computer, for example, does not usually involve affecting the computer gradually or incrementally, but rather fiddling around with it and trying various things until you hit on the cause of the problem and thus its solution. Washing the clothes or the shirt does not affect the extent of the clothes or the shirt bit by bit: the event is not over when the last part of the last item of clothing or the last part of the shirt is washed. All the clothes are put in the machine or the sink together and washed together, and the event is over when the last stage of the process (washing/rinsing/drying) is over. An event of painting a picture, although it

ends when the picture is done, does not have its size determined by its physical extent: one can paint and paint over the same piece of canvas, either because one is painting something out, or because the painting technique involves the image being painted in a "layered" way. An event of closing the door does not affect the dimensions of the door incrementally: what is incremental is the movement of the door over the path or space which it is necessary to cross to get from being open to being closed. Locking the door involves movement of the lock and not of the door; solving a problem involves following an "abstract" path of thought – but not necessarily incrementally and maybe following lots of dead-ends on the way; convincing someone of something involves affecting them, but there is no obvious way in which their "extent" determines the extent of the event, and so on.

The other problem for a homomorphism theory of telicity is an extension of this, and comes directly from our discussion of resultatives derived from activity verbs in chapter 3. We have seen that in derived resultatives, the direct object is predicted to be the theme, and that its quantized or non-quantized status determines the telicity of the VP. The relevant data from chapter 3, example (64), are repeated in (14):

- (14)a. John sang babies asleep for hours/*in an hour last night.
 b. John sang 3 babies asleep *for hours/in an hour last night.

But in what sense could the "extent" of the themes in (15) dictate the extent, or telic point, of the events involved?

- (15)a. John sang the baby asleep.
 b. The audience booed the player off the stage.
 c. The dog scratched the wound open.

If a baby falls asleep gradually it is not a gradualness which affects her extent incrementally. She does not fall asleep feet first and then legs and then torso; put differently, the size of the baby does not affect the extent of the event of singing her to sleep, though other properties of the individual baby may well affect how long the event lasts – such as how determined she is not to sleep, how tired she is and so on. Similar arguments can be made for (15b). In (15c) the extent of the wound does not affect how long the event took at all. (15c) can be true if the dog scratched and scratched at one part of a big wound so that it opened at that point, irrespective of what happened to the rest of it. The data in (12) indicate that graduality of the thematic role is not in itself sufficient to explain the special relation that accomplishments have with their theme arguments. The data in (13)–(15) indicate that a homomorphism between the extent of the event and the extent of theme argument may not be involved at all. So if the culmination point of an accomplishment is not determined by the extent of the incremental theme, what does determine it? And if the incrementality of the accomplishment is not determined by the way in which

the incremental theme is "used up," then what makes an accomplishment incremental?

One might argue that the problem with Krifka's theory is that the domain of the homomorphism characterizing the accomplishment is too narrow, and that what is involved is a homomorphism from some aspect of the thematic argument to the extent of the event. For example, in *close the suitcase*, the homomorphism would be from the path traversed by the lid of the suitcase to the extent of the event. This is proposed in Filip (1993/1999). But, while Filip is right in claiming that the domain of Krifka's homomorphism is too narrowly defined, widening it is not going to solve all these problems. It is not the case that the extent of some aspect of the theme determines the extent of the event, but rather that the extent of some change happening to the theme determines the extent of the event. And so the question is how to characterize the change and the relation between it and the accomplishment of which it is part. As the examples discussed above show, the relation between the event of change and the accomplishment event may be characterizable by a function, but not by a homomorphism.

We can add another problem to the above data. We argued in chapter 2 that progressive achievements involve constructing an accomplishment verb, which has to be incremental. Yet, in examples like (16), there is no incremental theme which has a gradual relation to the verb:

- (16)a. Our pizza is arriving.
 b. Mary is reaching the top of the mountain.
 c. The plane is landing.

So the answer to the puzzle of incrementality has to explain how derived accomplishments, which do not assign a gradual thematic role, are also incremental.

4.2 A Theory of Accomplishments

4.2.1 What are incremental themes?

In chapter 3 I presented an analysis of resultatives which can be used to argue that the incremental theme of an event e is the argument of the event which is the culmination of e . A resultative predicate which is related to a matrix predicate V gives a property of the culmination of the event introduced by e . I explained the so-called direct object restriction as deriving from a restriction that the resultative must be predicated of the theme of V , which is canonically realized in direct object position. The resultative must be predicated of the theme because the resultative must share an object with the culmination event (because of the TPCONNECT condition), and the culmination event has the theme as its argument, because the theme is the argument which the change of state associated with an accomplishment "happens to." Although agreement

about what a theme is is far from univocal, we can follow Gruber (1976) or Jackendoff (1972) or assume that the theme is approximately related to Dowty's (1991) "proto-patient" role; in all of these cases the theme is the affected argument of the verb. Activities such as those in (17) have themes or proto-patients or affected objects in their direct object position:

- (17)a. Mary hammered the metal bar.
 b. John wiped the table.

If incremental themes are those whose [\pm quantized] status affects the telicity of the VP, then we can see from (18), that the themes in (17a,b) are not incremental, and from (19) that adding a resultative predicate in the VP makes them incremental:

- (18)a. Mary hammered the metal bar for two hours.
 b. John wiped the table for two hours.
 (19)a. Mary hammered the metal bar flat *for two hours/in two hours.
 b. John wiped the table clean *for two hours/in two hours.

So while *hammer* and *wipe* have themes, they do not have incremental themes or culminations; however, in *hammer the metal bar flat* or *wipe the table clean*, the theme is incremental. I argued in chapter 3 that this change comes about because resultative predication forces the addition of the culmination modifier in (20), which denotes a function from activities to accomplishments:

$$(20) \lambda E \lambda e. E(e) \wedge \exists e' [Cul(e)=e' \wedge Arg(e')=Th(e)]$$

Applied to the activity verb *wipe*, whose meaning is given in (21a), the culmination modifier gives the verb meaning in (21b).

- (21)a. $\lambda y \lambda e. WIPE(e) \wedge Ag(e)=x \wedge Th(e)=y$
 b. $\lambda y \lambda e. WIPE(e) \wedge Ag(e)=x \wedge Th(e)=y \wedge \exists e' [Cul(e)=e' \wedge Arg(e')=Th(e)]$

The V' *wipe the table* is ambiguous between the two meanings given in (22); (22a) is the V meaning used in (17b) whereas (22b) is the meaning used in (19b):

- (22)a. $\lambda e. WIPE(e) \wedge Ag(e)=x \wedge Th(e)=THE\ TABLE$
 b. $\lambda e. WIPE(e) \wedge Ag(e)=x \wedge Th(e)=THE\ TABLE \wedge \exists e' [Cul(e)=e' \wedge Arg(e')=Th(e)]$

The culmination modifier assigns a culmination to an event, and selects the theme (or affected argument) of the matrix verb to be the argument of the culmination. When the matrix predicate is an intransitive, the second clause in the culmination modifier, $Arg(e')=Th(e)$, forces the verb meaning to shift from

type $\langle e,t \rangle$ to type $\langle d, \langle e,t \rangle \rangle$, adding an argument to the matrix predicate which is the argument of the culmination event and thus the incremental theme. The shift operation is given in (23), and the result of applying it to *sing* is given in (24):

$$(23) \text{ resultative shift (R-SHIFT):}$$

$$\text{R-SHIFT}(\lambda e.V(e) \wedge \text{Ag}(e)=x)$$

$$= \lambda y \lambda e.V(e) \wedge \text{Ag}(e)=x \wedge \exists e'[\text{Cul}(e)=e' \wedge \text{Arg}(e')=\text{Th}(e)=y]$$

$$(24) \lambda y \lambda e.\text{SING}(e) \wedge \text{Ag}(e)=x \wedge \exists e'[\text{Cul}(e)=e' \wedge \text{Arg}(e')=\text{Th}(e)=y]$$

John sang the baby asleep has the interpretation in (25):

$$(25) \exists e \exists e_1 \exists e_2 (e =^s e_1 \sqcup e_2)$$

$$\wedge \text{SING}(e_1) \wedge \text{Ag}(e_2)=\text{JOHN} \wedge \exists e'[\text{Cul}(e_1)=e' \wedge \text{Arg}(e')=\text{Th}(e_2)=\text{THE BABY}]$$

$$\wedge \text{ASLEEP}(e_2) \wedge \text{Arg}(e_2)=\text{THE BABY}$$

$$\wedge \text{TPCONNECT}(\text{Cul}(e_1), e_2, \text{THE BABY})]$$

Thus in the resultative construction, the activity *sing* has shifted into an accomplishment predicate denoting an event which has a culmination of which THE BABY is the argument. And as we saw above in (14), repeated here, the quantization effects indicate that *the baby* is the incremental theme of the V – or more properly, the VP.

- (14)a. John sang babies asleep for hours/*in an hour last night.
 b. John sang 3 babies asleep *for hours/in an hour last night.

This data convinces us of two things: first, if resultatives give properties of and share arguments with culmination events, then the direct objects of both transitive and intransitive activities in resultative constructions are arguments of culmination events. Secondly, if the quantization effects represented in (14) are an indication of an incremental theme, then culminations have incremental themes. So the answers to the questions of what are incremental themes and what are culminations are intertwined. Now we need to know what it means to say that the singing event had a culmination, and that the the baby, as the argument of the culmination, is the incremental theme of the singing event.

4.2.2 Culminations

If incrementality is to be understood via the role “incremental theme,” and if incremental themes are the arguments of culminations, then to get any further we need to answer the question: what are culminations? There are four possible answers:

1 The culmination of an event *e* is determined by the extent of a bounded object of *e*. A culmination occurs when the bounded object of an event is “used up” in the event

This defines a culmination in terms of an incremental theme; accomplishments are associated with incremental themes, and the culmination of the accomplishment is determined by the extent of the incremental theme. This is, of course, the account proposed by Dowty (1991), Tenny (1987, 1994), and most fully by Krifka (1986, 1989, 1992, 1998). But as we saw in section 4.1.3, there are a large number of accomplishment events which have telic points, and thus culminations, but for which homomorphisms from the extent of the theme argument to the extent of the event argument cannot be defined. So while a definition of culmination in terms of incremental themes will do for a proper subset of accomplishments, this set is not representative of the general case.

2 The culmination of *e* is the result state, or the beginnings of result state, brought into being by the action determined by the matrix verb

This is essentially Dowty’s (1979) account of accomplishments. In chapter 2 he gives the template for accomplishments which we see in (26a); this is translated into an event-argument framework in (26b). This template incorporates two claims: that accomplishments consist of an activity event and a BECOME event, and that these two events are related via a causal relation:

$$(26)a. [\text{ACTIVITY}(P) [\text{CAUSE} [\text{BECOME} (P')]]]$$

$$b. \lambda e. \exists e_1 \exists e_2 [e =^s (e_1 \sqcup e_2) \wedge (\text{ACTIVITY}(P))(e_1) \wedge (\text{BECOME}(P'))(e_2) \wedge \text{CAUSE}(e_1, e_2)]$$

(26) thus incorporates the idea that a crucial part of an accomplishment meaning is that a result state is “brought about.” In lexical accomplishments, the content of this result state is determined by the meaning of the verb.

The two parts of the claim in (26) are not inherently related. While I accept that the structure of an accomplishment is complex, consisting of an activity part and a BECOME event as in (26b), I shall argue that the relationship between them is not causal. There are several reasons for arguing this. Beth Levin has argued (2000) against a causative analysis of lexical accomplishments, pointing out that accomplishments are not necessarily causative, while causatives are not necessarily accomplishments. Thus in *John ate the sandwich* there is something very counterintuitive about suggesting that John caused something to happen to the sandwich by eating it; while on the other hand there are achievement verbs, such as *break*, which head VPs such as *break the vase*, which do seem to contain a causative element. In the latter case, we can think of an event of the vase being broken by John as being caused by some independent event, whereas an event of the sandwich being eaten by John is not causally related to some independent event but is only trivially caused

by the event of John eating the sandwich. Thus while (27a) is meaningful, there is no parallel completion for (27b), but only the trivial completion in (27c):

- (27)a. John broke the vase by dropping it on the floor.
 b. John ate the sandwich.
 c. John ate the sandwich by eating it.

Of course, one can use the *by-* phrase to add a manner component, as in *John ate the sandwich by gulping it down*, but that is not analogous to (27a). The point about (27a) is that all true causals invite the simple question "How did it happen?" And while we can meaningfully respond to *John broke the vase* with the non-trivial question "How did it happen?" or "How did he do it?", the same questions are just bizarre as a response to *John ate the sandwich*. We can understand the issue differently by looking at more formal properties of the "cause" relation. Assume that "cause" is a relation between events e and e' ; then it is usually agreed that we are entitled to assume that if e causes e' , e precedes e' . Then if John broke the vase, or there was an event e' of the vase becoming broken, we can ask what event e caused this, and we can expect e to precede e' , by some time interval no matter how small. If John ate the sandwich, then there was an event of the sandwich becoming eaten, but it is unclear how we can identify an event e which preceded and caused it. Of course, all of John's eating activity in some sense caused the sandwich to disappear inside him, but then the sense in which the activity caused the result state to come into being is only in the sense that the final part of an event is necessarily preceded by, and by some definitions caused by the final state. But in this trivial sense, the result state of an achievement is also caused by the event of change which brings it into existence. So to say that a causal element is an inherent part of accomplishments seems to be either false or trivially true, and if trivially true, then it will be part of the meaning of other non-accomplishment verbs too (see also the discussion in Abusch 1985, 1986).

A second argument against the causal analysis of accomplishments comes from accomplishments derived from activities in resultative predication constructions, such as those in (28):

- (28)a. On May 5, 1945, the people of Amsterdam danced the Canadians to Dam Square.
 b. Reluctant to let him go, the audience clapped the singer off the stage.
 c. At the opening of the new Parliament building, the crowd cheered the huge gates open.
 d. Mary drank John under the table/sick/dizzy.
 e. Every night the neighbour's dog barks me asleep.

In these examples, the activity does not cause the result: in (28a) the people of Amsterdam do not cause the Canadians to get to Dam Square by dancing:

the Canadians were going there anyway. In (28b) the audience did not cause the singer to leave the stage by clapping; on the contrary, they would probably have been happy if their clapping had managed to prevent the singer from leaving the stage. The examples in (28c-e) give similar examples with AP resultative predicates instead of PP predicates. Sometimes, intransitive resultatives do imply a causal relation between the activity and the result, but this is a matter of pragmatics, as the minimal contrast between (28b) and (29), which does have a causal implication, shows:

- (29) The audience hissed/booed/laughed the singer off the stage.

This brings us to the third possible definition of culmination.

3 The culmination of e is an achievement event, or minimal change of state associated with the end point of e

If culminations are not result states, or the beginnings of results states which are *caused* by the activity, we are left with the idea that a culmination is some minimal event which indicates the end of the activity. This fits in with the conceptually attractive idea that activities and achievements are the two basic kinds of non-stative events, and that the complex accomplishment is constructed out of a sum of an activity and an achievement. If we take the "CAUSE" relation out of the representation in (26b), we are left with (30):

- (30) $\lambda e. \exists e_1 \exists e_2 [e = {}^s(e_1 \sqcup e_2) \wedge (\text{ACTIVITY}(P))(e_1) \wedge (\text{BECOME}(P'))(e_2)]$.

Superficially, this looks very plausible. Further, since Dowty (1979) suggests that achievements are to be represented as having a BECOME component (as we saw at the end of chapter 1), it looks at first sight as if (30) represents the third possibility for analysis culminations, namely that the culmination of an event e is an achievement event, or minimal change of state associated with the end point of e . This means that we could analyse accomplishments as consisting of an event which is the sum of an activity e_1 , and an achievement, e_2 . This would be conceptually very pleasing. It would give us three basic event types: a minimal stative eventuality, two event types in which operators affect that basic eventuality, the activity and the achievement, and one complex event type in which an event is constructed through summing the activity and the achievement. This is essentially the intuition which is represented in the templates for the basic lexical classes which I gave at the end of chapter 1: (63a-c) repeated here;

- (31)a. States $\lambda e.P(e)$
 b. Activities $\lambda e.(\text{DO}(P))(e)$
 c. Achievements $\lambda e.(\text{BECOME}(P))(e)$

(30) is a sum of two events of the types determined by (31b) and (31c) respectively.

However, to analyse accomplishments in this way would be a misreading of Dowty's claim that accomplishments contain a BECOME component. It would also be unhelpful in understanding what accomplishments are. First, Dowty is explicit about the fact that the BECOME part of an accomplishment differs from an achievement verb, since the BECOME part of an accomplishment takes place over an extended period of time whereas achievement BECOME events are instantaneous. And if the BECOME event in (30) takes place over an extended period of time, then e_2 in (30) cannot be the telic point or culmination event we are looking for.

Secondly, we could interpret (30) by treating the BECOME event as an achievement, as in (32) but we wouldn't gain anything in understanding.

(32) Accomplishments $\lambda e.\exists e_1.\exists e_2[e=\text{S}(e_1\sqcup e_2) \wedge (\text{DO}(P))(e_1) \wedge \text{Cul}(e)=e_2]$

Analysing an accomplishment as an activity event summed with a minimal change of state or culmination doesn't explain very much unless we say something about the relation between the two eventualities, and (30) and (32) put two events together via conjunction without saying anything about their relation to each other. So we come to the fourth suggestion.

4 The culmination is the final minimal event in an incremental process

Analysing accomplishments as consisting of an activity and an achievement type event as in (32) misses the crucial point: the activity and the culmination must be linked via what we can call an **incremental process** or (in Dowty's terms) a BECOME event. So Dowty's original proposal that accomplishments involve an extended BECOME event is incorporated into the definition of culmination in (33):

(33) The culmination is the final minimal event in an incremental process. It is the event which is the final part of the BECOME event; the upper bound of the BECOME event. The argument of the culmination event is the argument of the BECOME event (i.e. the affected object or theme).

So now we need to explain what an BECOME event, or incremental process, is.

The hypothesis is as follows: intuitively, an accomplishment includes an activity event and an extended change of state which affects the theme, and the extent of the change of state (how long it takes to happen) is what determines when the accomplishment ends. More precisely, an accomplishment consists of an activity event and an extended BECOME process, which is **incremental** in the way I shall make precise below. The culmination of an accomplishment is defined in terms of this BECOME event as **the final minimal event in the incremental process**, the event which is the final part of the BECOME event,

or, in other words, the upper bound of the BECOME event. The culmination event must share an argument with the BECOME event since it is part of it, and so the argument of the culmination event is the argument of the BECOME event. As Dowty and many others have shown, the argument of the BECOME event is the non-agentive entity affected by the main event. We call this the **incremental argument**, or incremental theme, since it denotes the participant in the incremental process.

To make this analysis of accomplishments precise, we need to do two things: the first is to determine what are the identifying characteristics of a BECOME event, and the second is to characterize the (non-causal) relation that holds between the activity event and the incremental event which are summed together in an accomplishment.

4.2.3 Incremental processes and incremental relations

I suggest then that an accomplishment is analysed as consisting of an activity, e , and a BECOME event which is an incremental event which "accompanies" it; we call this accompanying event the **incremental process**, and the culmination of the accomplishment is the final minimal event in this incremental process. I discuss what BECOME events are in more detail in chapter 8; for the moment I assume that a BECOME event is a "BECOME- ϕ " event, and that it is an event e such that at the time immediately preceding the beginning of e , $\neg\phi$ is the case and at the time immediately following the end of e , ϕ is the case.

BECOME events in accomplishments are incremental in the sense that their parts are individuable, that each has a distinguishable upper bound, and that these parts have a natural and inherent order. This order is determined by our real-world knowledge of what the BECOME event under discussion actually entails. BECOME events are naturally conceptualized as ordered by an incremental chain as follows:

(34) **Incremental chain:**

Let e be a BECOME event.

An incremental chain $C(e)$ is a set of parts of e such that:

1. the smallest event in $C(e)$ is the initial bound of e
2. for every e_1, e_2 in $C(e)$ $e_1 \sqsubseteq e_2$ or $e_2 \sqsubseteq e_1$
3. $e \in C(e)$

(35) **Culmination:**

Let $C(e)$ be an incremental chain in e .

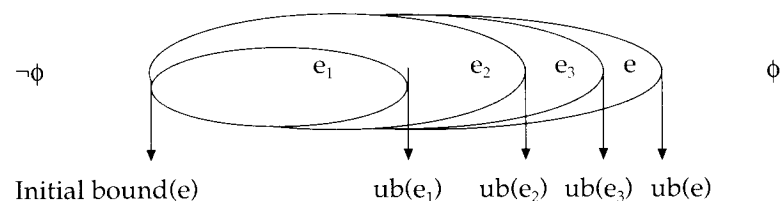
$\text{ub}(C(e)) = \{\text{ub}(e') : e' \in C(e)\}$ (the set of upper bounds)

The **culmination** of e is defined as follows:

$\text{Cul}(e)_{\text{def}} = \text{ub}(e)$

An incremental event can be represented graphically as in (36):

(36) **Incremental event (=BECOME event)**



The function of the incremental BECOME event is to “keep track” of the progress of the activity. This requires imposing a developmental structure, or ordered part structure, on the activity (this includes assigning it a culmination), and we do this by relating it to the developmental structure of the BECOME event via an **incremental relation**:

(37) **Incremental relations**

Let e_1 be an activity, e_2 be a BECOME event, and $C(e_2)$ be an incremental chain defined on e_2 .

$INCR(e_1, e_2, C(e_2))$ (e_1 is incrementally related to e_2 with respect to the chain $C(e_2)$) iff:

there is a contextually available one-one function μ from $C(e_2)$ onto $PART(e_1)$ (the set of parts of e_1) such that:
for every $e \in C(e_2)$: $\tau(e) = \tau(\mu(e))$.

We define the set of culminations of the parts of e_1 as the upper bounds of the event parts of e_1 which are the values of the μ function:

$$Cul_{C(e_2)}(e_1) = \{ \tau(\mu(e)) : e \in C(e_2) \}$$

INCR is used in the meaning of accomplishments as follows (where $\langle x \rangle$ and $\langle y \rangle$ give the content of the activity and BECOME events):

(38) **Accomplishment template**

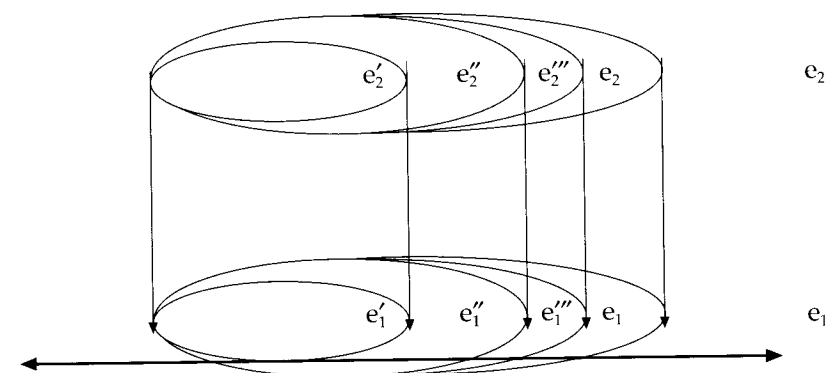
$\lambda y \lambda e. \exists e_1, e_2 [e = {}^s(e_1 \sqcup e_2)$
 $\wedge ACTIVITY_{\langle x \rangle}(e_1) \wedge Ag(e_1) = x \wedge Th(e_1) = y$
 $\wedge BECOME_{\langle y \rangle}(e_2) \wedge Arg(e_2) = Th(e_1)$
 $\wedge INCR(e_1, e_2, C(e_2))]$

Since the accomplishment inherits the properties of the activity, $Cul(e) = Cul(e_1) = Cul(e_2)$. The content of the BECOME event is derived from the structure of the Incremental Relation. The BECOME event is constrained to be (i) a change of state, (ii) which happens to the theme participant in the activity event,

(iii) while the activity event is going on. The only information that there is about the argument of the activity is precisely that it is the argument of the activity, and thus the only content which can be supplied for the content of the BECOME event is that it is a change of state in which the participant “undergoes” the activity event. In other words, the BECOME event associated with *build a house* will be $BECOME-BUILT(e_2) \wedge Arg(e_2) = Th(e_1)$, the BECOME event associated with *read “War and Peace”* will be $BECOME-READ(e_2) \wedge Arg(e_2) = Th(e_1)$, and so on.

An event structure following the template in (38) can be pictorially represented as in (39):

(39) **Accomplishment event structure**



The intuition that this reflects is the following. Activities are inherently non-structured. They are, following Dowty, homogeneous down to contextually determined minimal intervals. In an accomplishment, an incremental structure is imposed on an unstructured activity by relating it to a BECOME event. The activity part of an accomplishment can be a simple activity, which consists of a string of repeated “minimal” activity events, as in *read*, or it can be a process consisting of a string of associated tasks or events, as is the case with *build*, where the activity event consists of the multitude of different kind of activities which compose a building event. Let us look more closely at how *read* works. An event of reading involves a reading activity which consists of a string of appropriately defined “minimal reading activity events,” where a minimal reading event is an event of associating a perceived symbol, be it a word or a morpheme, with a meaning. This activity does not have any internal structure or inherent order. If a child is practising reading she can do it by picking out words at random from a book, and, indeed, lots of children’s “word books” are designed to allow them to practice the activity in just such an unstructured way. It doesn’t matter whether the child reads the words in the book in any order or not; the minimal events of reading of which the activity consists can in principle be strung together in a number of ways, not just in the way they

were in the actual event. We might well describe an event of a child engaged in such an activity as in (40a) and describe the end of such an event as in (40b), both indicating that *read* is being treated as an activity verb.

- (40)a. The child read for an hour.
b. The child stopped reading.

Of course, an activity of reading may involve some kind of order for pragmatic reasons, just in the same way that an activity of running or walking normally involves walking in a linear way. But this is different from an accomplishment eventuality which we identify as having parts which are inherently ordered as part of its description. In contrast to the activity, an accomplishment event of reading a book is one which we identify as having an inherent order which is (normally) determined by the order of the given text. An event described by *read the story of Rapunzel* does not just consist of a number of minimal reading activities; these minimal activities have to be strung together in a particular way in order for the reading activity to be an event of reading the particular story. The order of the parts of the event *read the story of Rapunzel* is determined by what is necessary for there to be an event which is in the denotation of the predicate $\lambda e.BECOME\ READ(e) \wedge Th(e)=THE\ STORY\ OF\ RAPUNZEL$. The words have to be read in a particular order, the beginning has to be read before the middle, and the middle before the end and so forth. The demands of this event are imposed on the reading activity which must perform accompany it. The activity involved in this accomplishment is over when the event determined by the incremental process is over, i.e. when the story of Rapunzel is read. *The story of Rapunzel* is the incremental argument of the accomplishment because it is the argument of the incremental process: as the theme of the activity event and argument of the incremental process event, it is the **incremental theme**. Given the template in (38), the meaning of the accomplishment *read* will be the VP interpretation in (41), and the interpretation of *read the story of Rapunzel* will be as in (43). The direct object is the incremental theme because of the clause $Arg(e_2)=Th(e_1)$:

- (41) $\lambda y \lambda e. \exists e_1, e_2 [e =^s(e_1 \sqcup e_2) \wedge READ(e_1) \wedge Ag(e_1)=x \wedge Th(e_1)=y$
 $\wedge BECOME-READ(e_2) \wedge Arg(e_2)=Th(e_1) \wedge INCR(e_1, e_2, C(e_2))]$

- (42) *read the story of Rapunzel*
 $\lambda e. \exists e_1, e_2 [e =^s(e_1 \sqcup e_2) \wedge READ(e_1) \wedge Ag(e_1)=x \wedge Th(e_1)=THE\ STORY\ OF$
 $RAPUNZEL \wedge BECOME-READ(e_2) \wedge Arg(e_2)=Th(e_1) \wedge INCR(e_1, e_2, C(e_2))]$

The activity use of *read* used in the examples in (40) uses the intransitive activity meaning in (43), which is simply the intransitivized activity "part" of (41):

- (43) *read*
 $\lambda e. \exists y [READ(e) \wedge Ag(e)=x \wedge Th(e)=y]$

The incremental relation INCR uses the contextually determined one-one function μ which maps from the parts of the incremental chain $C(e_2)$ into $PART(e_1)$, the parts of the activity e_1 . Context plays a role here in two ways. First, the incremental chain $C(e_2)$ consists of a set of events which are part of e_2 which are arranged in a partial order. Context plays a role in the choice of which event-parts of e_2 are in the chain $C(e_2)$, in other words which event parts of e_2 are in the domain of μ . If the event is *read a book* then the relevant parts will be different depending on whether the agent is my five-year-old daughter and the book is *A Kiss for Little Bear*, or whether I am the agent and the book is *War and Peace*. In the first place the contextually relevant parts of the incremental event determined by *A Kiss for Little Bear* becoming read may be the event of reading a page of the book, or even a word of it, while in the second, the contextually relevant part events of the event of *War and Peace* becoming read are likely to be much bigger, for example the events of reading at least a chapter.

Secondly, the existence of a relevant μ function depends on there being some contextually available "connection" between the incremental event and the activity which makes it plausible to impose the developmental structure of one upon the other. When the accomplishment is a lexical one such as *read*, the nature of the event itself guarantees a relation between the activity and a BECOME event which leaves little, if anything, for context to determine. Thus, when *read* assigns a theme role as part of its meaning – which is to say, when it involves the object being read as a participant in the eventuality – it also, as part of its meaning, determines that the relevant incremental process is progress through the book or magazine, or whatever. And the culmination of the incremental process, and thus of the whole eventuality, is the point at which the object is read or used up. But, as we will see below, the role of context in establishing a plausible incremental relation is crucial in determining the acceptability of derived, rather than lexical accomplishments, especially those used in resultative constructions. We'll come back to those in depth in section 4.3, but the point is made clearly by contrasting the examples (44a) and (44b):

- (44)a. Mary sang the baby asleep.
b. #Mary ate the baby asleep.

(44a) is considered acceptable by most native speakers because the contextual relation between singing and a baby becoming asleep is easily recognized, and it is thus easy to "measure" or "structure" the progress of a singing activity in terms of an incremental process of a baby falling asleep. In contrast, (44b) is generally considered infelicitous, because such a contextual relation is not available. However, suppose I provide one. Suppose that Mary's child is a very bad sleeper, and Mary, who is thoroughly exhausted, has to sit with the child for hours in the middle of the night to get her to sleep. The only way Mary can manage to keep going is by sitting by the baby's bed with a large

box of cookies, and by eating and eating. Under such circumstances, she might say "I ate the baby asleep again tonight." Now, most of my informants find the sentence much improved.

The above discussion focuses on *read* where the meaning of the accomplishment determines that the activity part is a simple activity consisting of repeated instances of events of a single event type. The same analysis works for *build* where the activity consists of a series of different tasks all associated with and involved in an activity of building. The relation between the activity and the incremental event are the same, with the change of state structuring the set of associated tasks which comprise the building activity.

To sum up then, an **incremental process** is a BECOME event with an inherent internal progression expressed by the fact that it has distinguishable parts which stand in a linear order and which form an **incremental chain**. The **incremental relation** between an activity and an incremental process (with respect to an incremental chain) relates parts of the incremental process to parts of the activity, using the developmental structure of the process to assign a developmental structure, and thus a culmination, to the activity. The **incremental argument** is the argument of the incremental process. What structures the accomplishment event is not (necessarily) the gradualness with which the parts of the theme are affected, but the fact that the process affecting the theme is a gradual process with recognizable stages ordered in a particular way determined by the process. The process may affect the theme gradually, and this is the case with verbs of consumption and creation; but these are special cases of the more general incremental process.

4.2.4 Answering some questions about accomplishments

4.2.4.1 Aspectual ambiguity with wipe and read

The above account explains some of the properties of accomplishments noted in section 4.1. First, it explains the basis of the contrast between verbs such as *wipe* and *polish* which seem to have both an activity and an accomplishment use, as in (12b,c) repeated here:

- (12)b. John wiped the table/polished the vase in five minutes.
c. John wiped the table/polished the vase for five minutes.

The verb *wipe* (and similarly *polish*) is ambiguous between an activity reading, in which it denotes a set of simple activity events as in (45a), and an accomplishment reading, in which it denotes a set of complex accomplishment eventualities each of which consists of an activity eventuality incrementally related to a BECOME event via the INCR relation, as in (45b), giving the two meanings in (46) used in (12b) and (12c) respectively:

- (45)a. $wipe_{\text{ACCOMPLISHMENT}}$:
 $\lambda y \lambda e. \exists e_1 \exists e_2 [e = {}^s(e_1 \sqcup e_2) \wedge \text{ACTIVITY}_{\langle \text{WIPE} \rangle}(e_1) \wedge \text{Ag}(e_1) = x \wedge \text{Th}(e_1) = y$
 $\wedge \text{BECOME}_{\langle \text{WIPED} \rangle}(e_2) \wedge \text{Arg}(e_2) = \text{Th}(e_1)$
 $\wedge \text{INCR}(e_1, e_2, C(e_2))]$
- b. $wipe_{\text{ACTIVITY}}$:
 $\lambda y \lambda e. \text{ACTIVITY}_{\langle \text{WIPE} \rangle}(e) \wedge \text{Ag}(e) = x \wedge \text{Th}(e) = y$
- (46)a. $\exists e \exists e_1 \exists e_2 [e = {}^s(e_1 \sqcup e_2) \wedge \text{WIPE}(e_1) \wedge \text{Ag}(e_1) = \text{JOHN} \wedge \text{Th}(e_1) = \text{THE TABLE}$
 $\wedge \text{BECOME-WIPED}(e_2) \wedge \text{Arg}(e_2) = \text{Th}(e_1)$
 $\wedge \text{INCR}(e_1, e_2, C(e_2))]$
- b. $\exists e [\text{WIPE}(e) \wedge \text{Ag}(e) = \text{JOHN} \wedge \text{Th}(e) = \text{THE TABLE}]$

The relation between activity and accomplishment *wipe* is like the relation between activity and accomplishment *read*, except that in the *wipe* cases both forms are transitive. We noted above that the two cases of *wipe* are apparently distinguishable only by whether the direct object/theme is incremental or not. This derives from difference between the accomplishment and activity meanings. If the theme of the activity is also the argument of the BECOME relation, then it is incremental; if there is no BECOME relation, then the direct object is filled by the patient or theme or affected object, whichever term we choose, but this is not an incremental role. As we predicted, only (45a) can be used in the resultative *wipe the table clean*. We can think of *wipe* as lexically ambiguous, with the activity and accomplishment meanings listed parallel in the lexicon, or we can think of them as related by a lexical redundancy rule deriving the accomplishment reading from the activity via the same aspectual shift operation that is used in the resultative cases which we will discuss in section 4.3 below. The second seems more plausible, since it explains why such a shifting operation is in principle readily available in both cases.

The relation between activity and accomplishment *read* is more complex. There is an intransitive activity verb *read* used in *John read for hours* and I assume, following Fodor and Fodor (1980) and Dowty (1982), that intransitive *read*, *eat* and so on are derived from their transitive counterparts by an operation which removes a syntactic argument slot and existentially quantifies over the corresponding variable. Thus, if transitive *read* denotes a verb like (47a), the corresponding intransitive is in (47b):

- (47)a. $\lambda y \lambda e. \text{READ}(e) \wedge \text{Ag}(e) = x \wedge \text{Th}(e) = y$
b. $\lambda e. \exists y [\text{READ}(e) \wedge \text{Ag}(e) = x \wedge \text{Th}(e) = y]$

But as Mittwoch (1982) points out in her response to Fodor and Fodor, this cannot be all that there is to intransitivization, as the transitive is (usually) an accomplishment whereas the intransitive is an activity. We saw that in contrast to transitive *read*, the intransitive examples in (40) are activities, and Mittwoch shows that minimal pairs such as those in (48) differ in the same

way. Despite the fact that (48a) and (48b) entail each other, the first is an accomplishment whereas the second is an activity. (This is argued extensively in Mittwoch (1982), using the same kind of tests that we have used up till now, so I won't go through them again here.)

- (48)a. John ate something.
b. John ate.

We can see that what is missing from both Fodor and Fodor's and Dowty's account is that the intransitivization operation is necessarily associated with an operation of aspectual shift, in which the activity part of the transitive accomplishment is detached from the whole meaning.

While intransitivization necessarily involves aspectual shift, the converse is not the case, since some cases of transitive *read* and *eat* can have an activity reading. This is shown in (49), which, as an activity, does not entail that we finished reading *Mary Poppins*.

- (49) Before Dafna went to bed, we read *Mary Poppins* for about half an hour.

Note that imperatives of accomplishments have an easy activity reading. There is a clear contrast between (50a) and (50b):

- (50)a. Eat your soup!
b. Eat your soup up!

(50a) is an instruction to get on with a particular activity, namely soup eating, while (50b) is an instruction to finish all the soup in the plate. I assume that these verbs are derived by a shift from the accomplishment to the activity reading, as formalized in (51):

- (51) $\text{SHIFT}_{\text{accomplishment} \rightarrow \text{activity}} (\lambda y \lambda e. \exists e_1, e_2 [e =^s (e_1 \sqcup e_2)$
 $\wedge \text{ACTIVITY}_{\langle x \rangle} (e_1) \wedge \text{Ag}(e_1) = x \wedge \text{Th}(e_1) = y$
 $\wedge \text{BECOME}_{\langle y \rangle} (e_2) \wedge \text{Arg}(e_2) = \text{Th}(e_1)$
 $\wedge \text{INCR}(e_1, e_2, C(e_2))])$
 $= \lambda y \lambda e. [\text{ACTIVITY}_{\langle x \rangle} (e) \wedge \text{Ag}(e) = x \wedge \text{Th}(e) = y]$

However, this shift operation cannot be freely available, since (52a) is more acceptable than (52b):

- (52)a. Dafna read *Mary Poppins* for hours.
b. ??John built a house for hours.

I hypothesize that (52a) is more acceptable than (52b) because the activity part of *read*, as we noted above, consists of the repetition of a single kind of event, whereas the activity part of *build* consists of a series of associated different

events. In general, I hypothesize that it will be easier to derive activities derived from accomplishments when the activity part of the accomplishment is a simple repetition of a single event type, rather than a complex activity. We will come back to these activity readings of accomplishments in chapter 8.

4.2.4.2 The incremental role of the incremental theme

We saw in section 4.1.3 that there are many verbs which have incremental themes but where we cannot define a homomorphism from the extent of the theme to the extent of the event. There were a number of different subcases of this: cases where the notion "extent of the theme" takes only an aspect of the theme into account and not its whole extent such as *peel an apple*; cases where we have a function from the extent of the theme *into* the event but not *onto* it, leaving parts of the event unrelated to parts of the theme, such as *build a house*; cases where the relation between the theme and the event is not a function, as in *read a book*, where one chapter may be read more than once; and cases where there is simply no relation between the extent of the theme and the duration of the event, such as the examples listed in (13) including *close the suitcase*, *lock the door*, *repair the computer*, *wash the clothes*, *paint the picture*. When it comes down to it, the homomorphism account can explain the incrementality of even straightforward events like *eat the sandwich* only by postulating an idealized event in which, say, there are no pauses to drink, no coughing, and so on. The account of incrementality that I have presented shows clearly why all the problems with the homomorphism account do actually occur, and why the homomorphism account can only be used to posit an idealized BECOME event and then only for a limited set of cases. Incrementality is in fact determined by an independent incremental process charting the ordered stages in which some event affecting some participant occurs, and this event may or may not "use up" its participant gradually. The semantic constraint is that the argument of the incremental process must be the theme or affected argument of the lexical verb, so that in a sentence like *John ate the sandwich* the incremental process which determines the extent of the event must be an event which has the sandwich as participant and not John.

The incremental argument of an accomplishment is thus the argument of the incremental process. It is the participant that something happens to, stage by stage. In some kinds of events, such as those listed in (13), the extent of the incremental argument is not affected gradually. All of it is involved in the different stages of the process. In other events, most notably events of consumption like *eat the sandwich* and *drink the beer*, and events of creation like *build the house*, *paint the picture* and *write the letter*, the incremental process does affect the extent of its participant gradually, because this is what an eating event or a writing event naturally involves. But the gradual involvement is not absolute even in these cases, because eating events involve more than just biting, chewing and swallowing, while building events involve much more than putting bricks on top of one another and putting the cement in the right

places – for example, it can involve putting up scaffolding and taking it down, standing in line to get building permits, and so on. So while the extent of the affected theme which is actually affected by the event may grow as the event progresses, as in the case of these verbs of consumption and creation, there is no homomorphism between extent of the affected argument and the extent of the event. There will be cases where the extent of the object is not affected incrementally, but will be affected in a way which produces a zigzag graph. Assume that when I write a letter, I usually tear up a number of attempts before I write something which satisfies me. Then if you see me at any given time with a piece of paper in front of me, you can't tell how far I am in the process. If it is a blank piece of paper, you don't know how many attempts I have so far made, and even if it looks as if the letter is finished, you still don't know whether I am about to tear this draft up and start all over again. And at any given point, even if you know what has happened up till now, you don't know how much longer, or how many more attempts will be necessary before the letter is written. So we naturally get all the problems with defining a homomorphism between extent of the object and duration of the event which Krifka brings up and which we discussed above.

What this account does not explain as yet is the role of the incremental theme in determining telicity. I have identified the telic point of the event as the culmination point of the incremental event, or BECOME event, but I have said nothing about the role that the properties of the incremental argument, or of the incremental DP, plays in fixing that point. As we saw, the homomorphism account gives an explanation for the role of the incremental theme in determining the telicity of the VP, and it should also explain the theory I have presented here I shall show how telicity and incrementality are related in chapter 7.

4.3 Kennedy and Levin: Telicity in Terms of Degree Measurements

Before we go on to look at the interpretation of the aspectual shift operations which I argued for in chapters 2 and 3, I want to compare the analysis given above with recent work on the semantics of accomplishments in Hay, Kennedy and Levin (1999) and especially Kennedy and Levin (2002). Kennedy and Levin argue that the criterion for being an accomplishment verb cannot be the existence of a homomorphism from the extent of the theme argument to the extent of the event. Instead, what characterizes accomplishments is that they have a difference variable as part of their lexical argument structure, and that the extent of an accomplishment event is measured by the extent of the difference. Kennedy and Levin distinguish three kinds of accomplishments: verbs of creation and consumption (where the theme is involved in determining the extent of the event); verbs of motion (where the extent of the event is determined by movement along a path argument); and verbs of change of state (where the extent of the event of change is determined by the degree of change in a

gradable property whose nature is determined by the verb). In each case, the telicity of the event is determined by whether the difference variable is bounded or unbounded. The examples in (51) illustrate the three types:

- (53)a. Mary ate two bowls of rice.
 b. Bill walked to the store.
 c. The tailor lengthened my skirt.

(53a) can be paraphrased as "Mary consumed rice and lessened its quantity by two bowls," and (53b) can be paraphrased as "Bill walked and the difference between where he began and where he finished was the distance which was between him and the store." (53c) doesn't need to be paraphrased to show up its degree meaning because the verb is an explicit "degree" predicate, derived from the degree adjective *long* which is analysed by Kennedy (1999) as denoting a function from individuals to values on a scale. (53c) means something like "the tailor made my skirt longer by a certain degree." Hay, Kennedy and Levin analyse (53c) as expressing the meaning represented in (54a), where *d* is a variable over degrees. (54c) gives the meaning of the parallel sentence in (54b), where the difference variable is explicit:

- (54)a. $\exists e \exists d [\text{INCREASE}(\text{long}(\text{my skirt})) (d) (e) (\text{the tailor})]$
 b. The tailor lengthened my skirt by 5 centimetres,
 c. $\exists e [\text{INCREASE}(\text{long}(\text{my skirt})) (5 \text{ centimetres}) (e) (\text{the tailor})]$

Kennedy and Levin assume that degree achievements such as (54) reveal the basic structure of accomplishments; if (53a,b) have the same fundamental structure, then they can be assigned meanings approximately as in (55). (Note, however, that in (55b) we must ensure that *to the store* is not just a measure phrase but denotes an actual path since (51b) requires an actual path to the store to be walked and not just a distance equal to it.)

- (55)a. $\exists e [\text{CONSUME}(\text{by eating}(\text{rice})) (2 \text{ bowls}) (e) (\text{Mary})]$
 b. $\exists e [\text{MOVE}(\text{by walking}) (\text{the path to the store}) (e) (\text{Bill})]$

Kennedy, Hay, and Levin (1999) and Kennedy and Levin (2002) argue that it is the boundedness of the difference variable which makes the predicate telic or atelic. Kennedy and Levin argue that there is homomorphism from the difference argument to the event, and that if the difference variable is bounded, either explicitly or contextually, then VP is telic and if it is unbounded then it is atelic. Thus we have the contrasts in (56):

- (56)a. The council widened the road three metres in a month/*for a month.
 b. The council widened the road for two months.

(56b) can also be modified by *in a month* because of the possibility of a specific difference variable being supplied contextually.

Thus, while Krifka argues that the extent of an accomplishment event is determined by a homomorphism from the extent of the theme (or internal direct object) to the event, and I argue that the accomplishment is measured by an incremental event related to the activity by an incremental function (but not a homomorphism), Kennedy and Levin introduce a new possibility, which is that all accomplishments are to be analyzed as causing a quantifiable change of state and that the measure lies in the "size" of the change, or the difference between the start state and the end state.

The analysis explains some of the same things as my analysis. A BECOME event by definition introduces a change of state in an argument *x*; I argue that the extent of the BECOME event is the measure, whereas Kennedy and Levin (2002) propose mapping the extent of the change of state affecting *x* onto a degree on a scale, and introduce that degree as an argument of the verb. For example, I analyze *eat* as a verb assigning two arguments, an agent and a theme, and denoting an complex event with two participants, and with two subevents, an activity and a BECOME event, which are incrementally related. Kennedy and Levin, however, analyse *eat* as a non-complex event assigning three thematic roles, an agent, a theme and a difference variable, with the difference variable derived from information contained in the direct object. It would seem that the truth conditions of a sentence *S* under the two analyses should be the same, since the measure of difference in the theme which Kennedy and Levin use is determined by the BECOME event. But there are a number of problems with Kennedy and Levin's account.

First, Kennedy and Levin claim that "quantization/telicity follows completely from the structure of the degree of change argument" (Kennedy and Levin 2002: 2), and thus, like Krifka's, their theory is not just a theory of the structure of accomplishments but is also a theory of telicity. But their claim is not true. When the degree variable is explicitly quantized, a VP like *lengthen the skirt 5 centimetres* is clearly telic. But even in these cases, the direct object plays the same role in determining telicity that other theories claim it does; mass or bare plural direct objects lead to an atelic reading, as in (57):

- (57)a. The tailor lengthened the skirt 5 centimetres in half an hour.
 b. The tailor lengthened skirts 5 centimetres for three months, until the fashion changed.
 c. John pushed the cart full of sand to the end of the street in 5 minutes.
 d. John pushed carts full of sand to the end of the street for hours.
 e. John pushed sand to the end of the street for hours/*in an hour.

Thus it cannot be that the quantized or non-quantized status of the degree of change fully determines the telic or atelic status of the VP. (57) shows that Kennedy and Levin's theory does not make an account of the role of the direct object redundant. This means that their account is not a theory of telicity, but a theory about the meaning of accomplishments which needs to be supplemented by an independent theory of the role played by the direct object in

determining telicity/quantization too. The "degree variable" account thus competes with other theories not as an account of telicity, but as a theory of accomplishment meanings which must interact with a theory of telicity. But if the degree of change does not play the role they claim for it, we must ask whether there is enough evidence to warrant positing an explicit degree variable in the argument structure of verbs of motion and verbs of creation, as in (55).

Looking more closely, we see that the Kennedy and Levin account has essentially the same problem as Krifka's theory. Both take the relation between the event and an argument as the defining property of the accomplishment, rather than looking at the structure of the process or event itself. It is this focus on the internal composition of the event which distinguishes the "BECOME" theory from both of them. The difference is made clear in examples such as (54b), and parallel cases with *shorten* and so on. Suppose my mother-in-law shortens the sleeves of my jacket by five centimetres and it takes her only half an hour. I can say:

- (58) My mother-in-law shortened the sleeves of my jacket 5 centimetres in only half an hour.

(58) asserts that the extent of this event was shorter than half a hour. But the extent of this event is not determined by the degree to which the sleeves become shorter, which actually happens when she takes the scissors and cuts, but by what is involved in making the change: the event is not over when the unpicked sleeves have been shortened, but when the lining has been reset and the sleeves refolded, and restitched into the lining (which is why I was so grateful that she did the job, instead of me). There is a canonical incremental process which determines the extent of a sleeve-shortening event, and the culmination of the particular event described in (58) is determined by the canonical endpoint of that process, not the extent of the difference variable. Shortening sleeves three centimetres or five centimetres is likely to take exactly the same amount of time, unless a change in the difference variable makes the related *process* more complex. And if a smaller difference variable leads to a trickier job, then the extent of the event may be bigger because the extent of the difference variable is smaller. Kennedy and Levin argue that the incremental paradox occurs with examples like (58) because the difference variable is quantized. They also argue that the examples in (59) are telic, because a quantized difference variable is always inferable from context. *My mother-in-law was shortening the sleeves of my jacket* does not entail (59a) and *The tailor was lengthening the trousers* does not entail (59b):

- (59)a. My mother-in-law shortened the sleeves of my jacket.
 b. The tailor lengthened the trousers.

They contrast this with examples where there is no explicitly quantized difference variable, and where one cannot be inferred from context, as in (60). Here,

according to Kennedy and Levin, the imperfective in (60a) entails (60a'), and (60b) entails (60b'):

- (60)a. The sailors were lengthening the rope.
 a'. The sailors lengthened the rope.
 b. The council was widening the road.
 b'. The council widened the road.

However, a closer look at these examples just strengthens the point that what is relevant is the nature of the process involved and not the quantized or non-quantized status of the difference variable. If the entailments in (60) go through, it is not because of the non-quantized degree variable, but because of specific assumptions about the nature of the process involved. (Compare related observations in Abusch (1986) about the status of the verb *change*.) If you assume that all (60a) involves is a gradual letting out of the rope by, say, a repeated "hand-over-hand" movement, then it is true that as soon as the sailors have started the process, they have already somewhat lengthened the rope. But if you assume that lengthening the rope involves, say, unwinding the long length of "loose end" which is coiled around a metal post (as is the case on a barge), then if the sailors are in the process of uncoiling the rope, we might well want to assert *They are lengthening the rope* even though the rope is not yet lengthened at all, in which case (60a) does not entail (60a'), even though there is no quantized direct object available. A similar story can be told for (60b). If the council is digging up the road and demolishing the sidewalk then (60b) is true, but not (60b'), independent of the degree of widening (which may not even be decided on). So what matters here is the nature of the event involved and not the nature of the degree variable. Intuitively, the "hand-over-hand" scenario makes the lengthening event described in (60a) look like an activity: it involves repeated performance of a minimal event, where the number of "repeats" is not specified. And if *lengthen* events have the properties of activities, then the imperfective paradox should not hold. The cases where the imperfective paradox does hold are cases where the event looks more like an accomplishment, consisting of a single instance of an event type which can't be repeated (although it may have some repeatable subparts). We will discuss the question of when an event is repeatable in chapter 8. It is clear that when *lengthen* has an explicit difference argument, the verb behaves as an accomplishment, and is potentially telic. This is because the measure phrase means that an event in the denotation of *lengthen x a metre* cannot be constructed from an indefinitely repeated minimal event. An explicit measure on an event always makes the predicate non-cumulative, and *lengthen x a metre* is non-cumulative and potentially telic just in the same way that *eat x* or *build x* is. In each case, the properties of the direct object determine whether the V heads a telic or atelic VP.

One might argue that verbs in (60) are non-quantized, and that the lack of entailments are because any non-telic event has a "minimal initial event" during which the imperfective paradox holds. As we saw in chapter 1 (and also

shown in Dowty 1979), in the very initial stages of a running event, *John was running* will not entail *John ran*. In the same way, if the examples in (60) just involve the minimal initial event of a widening event or a shortening event, the imperfective paradox should hold. But this doesn't detract from the main point, that the nature of the process determines the semantic properties of the event, including its telic/atelic status and its susceptibility to the imperfective paradox, and not the quantized nature of the difference variable.

A second argument against Kennedy and Levin's theory of accomplishments concerns the analysis that it forces for derived accomplishments. For them, an accomplishment verb must have a difference variable as a lexical argument. I argued in chapter 3 that resultative predication with activity verbs triggers an operation of aspectual shift as part of the process of compositional interpretation, which builds an accomplishment reading out of an activity predicate, preserving the meaning of the activity and embedding it in a more complex accomplishment template. (Even when, as in the case of intransitive activities, a theme argument must be added, this does not require reanalyzing the meaning of the intransitive activity itself.) In the next chapter we will look in detail at how the aspectual shift operation described in chapter 3 can be reformulated in the framework of the analysis of accomplishments presented in this chapter. Kennedy and Levin's theory forces the shifting process to be lexical, since it would have to change meaning and argument structure of the verb to incorporate the INCREASE meaning, and difference variable, rather than using its original meaning in a more complex structure. Thus, in *Mary hammered the metal flat* Kennedy and Levin would have to argue that a lexical rule constructs a new accomplishment *hammer-flat*, which takes an agent, a theme and a difference, and in which the difference is a value on a scale of flatness. The sentence would be interpreted as asserting that there was an event of hammering in which Mary and the metal were participants, and in which Mary caused a change of state in the metal to be measured in a degree of flatness (sufficient to entail that the metal was flat). This in itself is no problem. However, problems arise with examples such as (61), repeated from examples in (28) above:

- (61)a. On May 5, 1945, the people of Amsterdam danced the Canadians to Dam Square.
 b. At the opening of the new Parliament building, the crowd cheered the huge gates open.

A lexical rule would have to derive a verb *dance* with an agent, a theme and a path argument denoted by *to Dam Square*, with the last allowing a difference measure to be understood. By analogy with (56b) it should mean something like:

- (62) $\exists e[\text{MOVE}(\text{by dancing}) (\text{to Dam Square}) (e) (\text{The people of Amsterdam}) (\text{The Canadians})]$

The problem is that it is not clear what this verb would mean, or how DANCE would relate these three participants in the dancing event. According to the semantics which Kennedy and Levin propose for accomplishments, (61a) ought to associate *dance* with a scale which directly measures the dancing event in which the people of Amsterdam and the Canadians were participants, and *to Dam Square* should denote a measure on that scale. But it is extremely difficult to give a plausible lexical meaning for a predicate DANCE of this kind. It is not a dancing activity in which the participants take part, since (61a) doesn't require the Canadians to dance. It is not a causal meaning in which the dancing causes a change of state in the Canadians since, as we have seen, the Dutch did not cause the Canadians to get to Dam Square. It is also not a meaning in which the measure directly measures how much dancing there is, since (61a) doesn't require the dancers to get to Dam Square, only the Canadians. So, it is not clear what lexical rule could determine productively how such a verb could be interpreted. The analysis I have presented avoids this problem by maintaining the original meaning of *dance* embedded in an accomplishment template and thus associated with an independent BECOME event. In this way *the people of Amsterdam* remains the single thematic argument of *dance* and the added argument receives its interpretation via its relation with the independent but associated event.

Chapter 5

The Interpretation of Derived Accomplishments

5.1 Aspectual Shift in Resultatives

5.1.1 Transitive accomplishments

The previous chapter looked at the semantics of lexical accomplishments where the association between activity and incremental process is lexically determined. In this chapter we look at the interpretation of accomplishment predicates derived through type-shifting operations triggered in particular constructions. We begin with the accomplishments derived in resultative constructions.

Accomplishment VPs such as *build a house* and *read "War and Peace,"* are headed by lexical accomplishments, where the meaning of the V stipulates what the activity is and what incremental process is associated with it. We saw that context has an important role to play in the construction of the incremental chains (for example, in the minimal pair *read "War and Peace"* and *read "A Kiss for Little Bear"*). Nonetheless, the basic information about the activity and the incremental process it is structured by are given by the lexical semantics, and there is no choice which incremental activity is chosen to "measure out," or developmentally structure, the activity. It is part of the meaning of *read* that it denotes an event with a theme participant and that its incremental process involves progression through this participant. Context determines how the event is divided into parts to give the domain of the incremental relation, and what activities which are not strictly reading activities may be part of the incremental process (discussing the book with a friend, going to a book-club meeting, etc.), what pauses (in the sense of Landman 1992) are allowed in the incremental process, and so on. Verbs such as *wipe*, which are lexically ambiguous between an activity and an accomplishment reading, are also lexically associated with an incremental process, but the association is optional, captured either through dual lexical entries or through a redundancy rule. As Dowty (1979) says, the BECOME event associated with an event predicate P is the event in which the theme "has P happen to it" or in which the theme is affected by the activity. This means that, while the particulars of the BECOME event depend on the nature of the activity involved (different themes are