

What are Incremental Themes?

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Abstract

In this paper I examine the approach to incremental themes developed in Krifka 1992,1998, Dowty 1991 and others, which argues that the extent of a telic event is determined by the extent of its incrementally affected theme. This approach identifies the defining property of an accomplishment event as being the fact that the theme relation is a homomorphism from parts of the event to parts of the (incremental) theme. I show that there are a large number of accomplishments, both lexical and derived via resultative predication, which cannot be characterised in this way. I then show that it is more insightful to characterise accomplishments in terms of their internally complex structure: an accomplishment event consists of a non-incremental activity event and an incrementally structured 'BECOME' event, which are related by a contextually available one-one function in such a way that the incremental structure of the latter is imposed on the activity.

1 The Question of Incremental Themes

In this paper, I want to address the question of incremental themes, to discuss what they are and what role they play in determining the aspectual class of the VP in which they occur. Incremental themes surfaced in linguistics discussion notably in work of Tenny 1987, 1994, Dowty 1991, and most importantly in the work of Krifka 1989, 1992, and 1998. The basic idea is that some arguments of verbs, such as the direct object argument of the verbs eat and mow in (1) are used up 'bit by bit' as the event denoted by the verb progresses.

- (1) a. Mary ate the sandwich.
b. Jane mowed the lawn

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." Formally, Krifka has argued, there is a homomorphism from the parts of an incremental theme to the parts of the event of which it the theme.

Incremental themes are argued to be relevant in the literature in two domains; in the theory of thematic roles and the theory of aspect. Dowty 1991 argues that being an incremental theme is a property typically associated with patient arguments. Thus it is one of the properties on his 'cluster' list for contributing properties for the role of proto-patient. But a far more central role has been claimed for it in the determining the aspectual properties of

VPs. Verkuyl 1972 and Dowty 1979 both noticed that accomplishment predicates behave as telic or non-telic depending on the properties of the direct object. The contrast between the examples in (2) and those in (3) show that while activity predicates always behave as activity predicates no matter what direct object they have, accomplishment predicates behave as activities when the direct object is a bare plural or a mass NP.

- (2) a. John pushed the cart for an hour/#in an hour.
b. John pushed carts for an hour/#in an hour.
- (3) a. Mary built the house #for a year/in a year.
b. Mary built houses for a year/#in a year.

Krifka argues that the fact that the theme is incremental and that there is a homomorphism from the denotation of the theme to the event means that the 'quantized' properties of the direct object percolate up to the VP of which it is part and allow the quantized or non-quantized status of the VP to be determined by the direct object. When the direct object denotes quantity of a determined or determinable size and there is such a homomorphism, the telic point of the whole event is identifiable, and the event behaves like an accomplishment. But when the size of the denotation of the direct object is undeterminable because the NP expression is mass or a bare plural, no telic point is identifiable for the event, despite the homomorphism, and the event has the characteristics of a non-telic activity. Tenny's notion of the direct object 'measuring out' the event captures essentially the same idea.

In this paper, I want to examine more closely the role of incremental themes in determining the aspectual properties of the event. I will start by examining some problems which Krifka 1992, 1998 himself brings up. I shall show that the problem extends to lexical accomplishments such as *repair the computer*. Then, drawing on my 2000a analysis of resultative constructions, I will argue that derived resultatives such as *sing the baby asleep* and *clap the players off the stage*, as in (4), provide further evidence that the themes of events cannot always be incremental in the way that Krifka suggests.

- (4) a. John sang the baby asleep
b. The audience clapped the players off the stage.

In the final part of the paper I shall argue that the determining property of accomplishments is not the homomorphism between theme and event that Krifka describes (although it is sufficient to characterise an event predicate as an accomplishment). Instead, the crucial property is that an accomplishment is associated with an activity event and a gradual change of state, or BECOME event, the culmination of which determines the telic point of the accomplishment.

2 Activities vs. accomplishments

I assume (for the moment) that activities and accomplishments have the internal structures in (5):

- (5) **activities:** $\lambda e. (\text{ACTIVITY}(P))(e)$
accomplishments: $\lambda e. \exists e_1 \exists e_2 [e = e_1 \sqcup e_2 \wedge (\text{ACTIVITY}(P))(e_1) \wedge \text{cul}(e) = e_2]$

The culmination (cul), or telic point is the point at which the event is completed, the point at which there is enough of the event for the predicate to apply correctly to it. It is usually agreed (see discussion in Dowty 1979) that the arguments of e_1 are the arguments normally associated with the verb: the argument of the culmination event e_2 is the theme or patient of the verb. Thus, in (6) the endpoint of the event is determined by what happens to the house, namely it gets built, and not by what happens to the agent of the action, Mary:

(6) Mary built the house.

An obvious question is whether verbs should properly be assigned to aspectual classes, or whether the classification should apply to Verb Phrases. Following Dowty 1979, who argues that VPs where the modifier is *in x time* are accomplishments and VPs where the modifier is *for x time* are activities, the examples in (7) and (8) make it look as if the answer should be VPs. (cf. Dowty 1979, Krifka 1992, 1998, Tenny 1987, 1994 and others):

- (7) a. John walked for an hour.
 b. #John walked in an hour.
 c. #John walked a mile for an hour.
 b. John walked a mile in an hour.
- (8) a. #John built a house for a month
 b. John built a house in a month.
 c. #John built houses in a month.
 d. John built houses for a month.

The data in (7a/b) show that *walk* is an activity verb, but (7c/d) show that *walk* can head a VP which is an accomplishment. Conversely in (8a/b) we see that *build a house* is naturally an accomplishment, while the same verb *build* can head an activity VP when the direct object is a bare plural. However, the data in (9) contrast with (8):

- (9) a. John pushed a cart for an hour.
 b. #John pushed a cart in an hour.
 c. John pushed carts for an hour.
 d. #John pushed carts in an hour.

While *build* apparently allows the properties of the direct object to determine whether it heads an accomplishment or an activity VP, (9) shows that *push* heads an activity VP independent of the properties of its direct object. So, we can in principle distinguish between those verbs which allow the grammatical properties of the patient/theme argument to determine their

telicity (accomplishments) and those which don't (activities). The question then is what is the basis of that distinction.

3 Krifka's theory of quantization

Krifka 1992, 1998 argues that predicates can be characterised as cumulative or quantized

(10) cumulative predicates:

$\forall X [\text{CUM}(X) \leftrightarrow \exists x \exists y X(x) \wedge X(y) \wedge \neg x=y] \wedge \forall x \forall y [X(x) \wedge X(y) \rightarrow X(x \sqcup y)]]$
 "If a predicate X is cumulative, then if X applies to x and y it will also apply (non-trivially) to the sum of x and y."

Examples of cumulative predicates are *water* or *apples*: if x and y fall under *apples*, then the sum of x and y also fall in the denotation of *apples*.

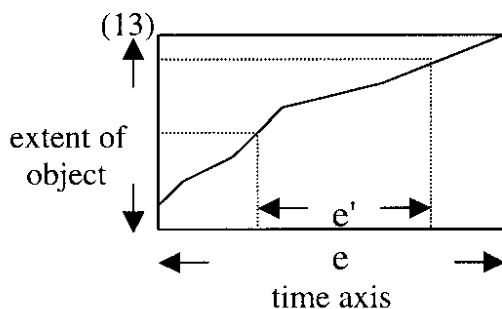
(11) quantized predicates

$\forall X [\text{QUA}(X) \leftrightarrow \forall x \forall y [X(x) \wedge X(y) \rightarrow \neg y < x]]]$
 "If X is quantized, then if x and y fall under X, y cannot be a proper part of x."

An example of a quantized predicate is *three apples*: if x falls under *three apples* it cannot have a proper part which is also *three apples*. Krifka 1992, 1998 argues that if a verb has the appropriate relation with its theme, then the quantized/non-quantized status of the theme determines whether the VP is quantized (telic) or non-quantized (atelic), as illustrated in (12):

- (12) a. John ate apples for an hour.
 b. #John ate apples in an hour.
 c. #John ate 3 apples for an hour.
 d. John ate 3 apples in an hour.

The 'appropriate relation' is determined by the relevant thematic role. Thematic roles are functions from events to their participants, (Parsons 1990, Landman 2000), and the feature [\pm quantized] percolates from the theme NP to the VP if the function expressed by the thematic role 'theme' is a homomorphism from the event to its theme/patient participant, as represented in (13), taken from Krifka 1992.



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) (Krifka 1998):

- mapping to subevents:

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

"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".

- mapping to subobjects:

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

"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 .)

Together these properties constitute what Krifka 1992 calls 'graduality', and Krifka 1998 calls incrementality. Krifka thus explains how quantized DPs lead to telic events: 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 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. Thus in (14a) and (14b), the thematic role 'theme' is gradual. But (14a) is non-telic although the thematic role 'theme' is gradual or incremental 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. (14b), 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 (14a/b), the verb *eat* is considered to belong to the class which denotes accomplishment events. In contrast, *push* does not have a gradual theme, and thus both (14c) and (14d) are non-telic independent of the quantized or non-quantized status of the theme argument. So, *push* denotes an activity event:

- (14) a. John ate apples last night.
 b. John ate three apples last night.
 c. John pushed carts last night.
 d. John pushed three carts last night.

4 Problems with Krifka's approach

Krifka brings up a number of problems for his theory of quantization, and suggests solutions to them. He shows that 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. There are also 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 point at which you take it down again; in neither case is the extent of the house affected by the event at that stage. A more serious problem which Krifka 1998 discusses are events like *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. Here, the suggestion is that although an event e of this kind may not be incremental in the

strict, non-repetitive sense, there is an 'idealised' event which can be defined in terms of *e* which is strictly incremental.

Here, though, I want to mention three other problems which are a problem for the homomorphism theory of telicity. The first problem concerns minimal pairs such as (15):

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

If telicity is determined by the graduality of the theme, then we assume from (15a) that *wipe* and *polish* assign gradual themes. But in (15b) we see that exactly the same VP can also be treated as non-telic. Unless we assume that the verb assigns two different thematic roles in each example in (15), one gradual and the other not, we need to ask why in the one case the quantized direct object determines a culmination point and in the other it doesn't.

The second problem are examples which are clearly telic, but in which intuitively it makes no sense to see the shape of the event as defined by the 'extent' of the direct object incrementally. Here are some examples:

- | | |
|--------------------------|--------------------|
| (16) repair the computer | teach the child |
| spice the soup | close the suitcase |
| wash the clothes/shirt | close the door |
| solve the rubik's cube | lock the door |
| prove the theorem | dry the clothes. |

Repairing a computer, for example, frequently does not involve affecting the computer 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 together and washed together when the last stage of the process (washing rinsing spin-drying) is over. Similarly an event of closing the door does not affect the door incrementally: what is incremental is movement of the door over the path or space which it is necessary to cross to get from being open to being closed.

The third problem for a homomorphism theory of telicity is an extension of the second problem and concerns transitive and intransitive derived resultatives. In what sense could the 'extent' of the direct objects in (17) dictate the 'extent' of the event?

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

If a baby falls asleep gradually it is not a gradualness which affects its extent incrementally. It 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 it to sleep. Similar arguments can be made for (17b). In (17c) the extent of the wound does not affect how long the event took at all. (17c) 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. Note crucially that the direct objects here behave as themes with respect to quantization:

- (18) a. John sang the baby asleep in ten minutes/#for ten minutes.
 b. John sang babies asleep #in half an hour/for hours last night.

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?

5 A Closer look at Resultatives

The kinds of examples we are interested in this section are given in (19):

- (19) a. Mary painted the house red.
 b. John wiped the table clean.
 c. Mary hammered the metal flat.
 d. John sang the child_j asleep_j.

A resultative predicate expresses a property which is true of the culmination of the matrix event. So a plausible paraphrase of (19a) is "Mary painted the house, and at the culmination of the painting event the house was red."

I give a detailed analysis of these constructions in Rothstein 2000a, and here I will explain the major points which are relevant for our discussion of incremental themes. Resultative predication, like depictive predication, sums the eventuality denoted by the matrix verb with the eventuality denoted by the secondary predicate. The condition on the summing, which gets the interpretation that we want, is that the culmination of the matrix event is PART-OF the eventuality expressed by the secondary predicate, where 'PART-OF' is defined as in (20):

- (20) PART-OF(e_1, e_2, y) iff (i) $\tau(e_1) \sqsubseteq \tau(e_2)$ (i.e. e_1 is temporally contained in e_2); and
 (ii) e_1 and e_2 share a thematic argument, y

'PART-OF' is not the standard part-of relation, defined in terms of the sum operation, forming a partial order, but is a non-transitive relation which identifies one atomic eventuality as inherently connected to, or part of, another eventuality. Its analogy in the domain of individuals is the part-of relation which holds between John and his hand, which is non-transitive, but which allows John and his hand to be treated as atoms of equal weight for summing in conjunctions such as (21):

- (21) Holistic doctor to John: "I can't just treat your hand. I have to treat both your hand and you."

The formal operations and derivations are given in (22)-(24). (I follow Rothstein 2000b in treating meanings of verbs as expressions in which the subject variable is free and abstracted over by an operation of predicate formation at the VP level. Transitive verbs denote expressions of type $\langle d, \langle e, t \rangle \rangle$ (where d is the type of individuals and e the type of events), and are of the form $\lambda y \lambda e. V(e) \wedge \theta_1(e)=x \wedge \theta_2(e)=y$, while intransitive verbs denote expressions of type $\langle e, t \rangle$, of the form $\lambda e. V(e) \wedge \theta_1(e)=x$.

- (22) Summing operation for resultative secondary predication

$$\text{RSUM}[\alpha, \beta] = \lambda y \lambda e. \exists e_1 \exists e_2 [e = (e_1 \sqcup e_2) \wedge \alpha(e_1, y) \wedge \beta(e_2, y) \\ \wedge \text{PART-OF}(\text{cul}(e_1), e_2, y)]$$

$$\begin{aligned}
(23) \text{ [paint red]}_{VP} &\rightarrow \\
&\text{RSUM}[\lambda y \lambda e. \text{PAINT}(e) \wedge \text{Ag}(e)=x \wedge \text{Th}(e)=y, \lambda x \lambda e. \text{RED}(e) \wedge \text{Arg}(e)=x] \\
= &\lambda y \lambda e. \exists e_1 \exists e_2 [e=(e_1 \sqcup e_2) \wedge \text{PAINT}(e_1) \wedge \text{Ag}(e_1)=x \wedge \text{Th}(e_1)=y \\
&\quad \wedge \text{RED}(e_2) \wedge \text{Arg}(e_2)=y \\
&\quad \wedge \text{PART-OF}(\text{cul}(e_1), e_2, y)]
\end{aligned}$$

$$\begin{aligned}
(24) \text{ [Mary paint the house red]}_{IP} &\rightarrow \\
&\exists e \exists e_1 \exists e_2 [e=(e_1 \sqcup e_2) \wedge \text{PAINT}(e_1) \wedge \text{Ag}(e_1)=\text{MARY} \wedge \text{Th}(e_1)=\text{THE HOUSE} \\
&\quad \wedge \text{RED}(e_2) \wedge \text{Arg}(e_2)=\text{THE HOUSE} \\
&\quad \wedge \text{PART-OF}(\text{cul}(e_1), e_2, \text{THE HOUSE})]
\end{aligned}$$

The PART-OF condition guarantees that that $\text{cul}(e_1)$ and the resultative predicate must share an argument. I assume (essentially following Dowty 1979 and others, such as Tenny 1987) that the argument of the culmination event is the theme, or the affected entity). By the PART-OF condition, the theme must also be the argument of the resultative. (Thus the so-called 'direct object restriction', which states that the resultative must be predicated of a direct object, turns out to be a condition that resultatives must be predicated of themes, and this itself is explained in terms of the PART-OF condition.)

Given that the resultative predication rule requires the event introduced by the matrix verb to have a culmination, the question is how resultative predicates can occur with activity verbs, either the transitive kind, as in (19b/c), or the intransitive kind, as in (19d).

I assume that a single rule of resultative interpretation applies whether the matrix verb is an activity or accomplishment, and thus in (19b-d) the result predicate adds information about the culmination of the event determined by the matrix verb.

I assume that there is a culmination modifier of type $\langle\langle e, t \rangle, \langle e, t \rangle\rangle$, which can be added to activities, and which specifies that the argument of $\text{cul}(e)$ is the incremental theme of e :

$$(25) \lambda E. E(e) \wedge \exists e' [\text{cul}(e)=e' \wedge \text{Arg}(e')=\text{Th}(e)],$$

This modifier denotes a function from activities to accomplishments: in other words applying the function in (25) to an activity yields an accomplishment predicate. When applied to the verb *wipe*, in (26a), the culmination modifier gives the verb meaning in (26b).

$$\begin{aligned}
(26) \text{ a. } &\lambda y \lambda e. \text{WIPE}(e) \wedge \text{Ag}(e)=x \wedge \text{Th}(e)=y \\
&\text{ b. } \lambda y \lambda e. \text{WIPE}(e) \wedge \text{Ag}(e)=x \wedge \text{Th}(e)=y \wedge \exists e' [\text{cul}(e)=e' \wedge \text{Arg}(e')=\text{Th}(e)]
\end{aligned}$$

This presence of this culmination modifier is what distinguishes between activity and accomplishment readings of *wipe the table/polish the vase* in (15), repeated here:

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

The V' *wipe the table* is ambiguous between (27a/b), with (27b) being used in (15a) and (27a) being the interpretation of the activity V' in (15b). As we would predict, only (27b) can be used in the resultative, and we assume that the presence of the resultative forces the interpretation in (26b/27b) to be used:

- (27) a. $\lambda e. \text{WIPE}(e) \wedge \text{Ag}(e)=x \wedge \text{Th}(e)=\text{THE TABLE}$
 b. $\lambda e. \text{WIPE}(e) \wedge \text{Ag}(e)=x \wedge \text{Th}(e)=\text{THE TABLE} \wedge \exists e'[\text{cul}(e)=e' \wedge \text{Arg}(e')=\text{Th}(e)]$
 c. #John wiped the table clean for ten minutes.
 d. John wiped the table clean in ten minutes.

(27b) is paraphrased as: "There was an event of John wiping the table and the culmination of that event was PART-OF the event of the table being clean, and the culmination of the event was within ten minutes." Again, the theme of the matrix verb is the argument of the culmination relation, and of the resultative. Adding the culmination modifier is thus equivalent to type shifting the verb from one aspectual class, the class of activities, to another, the class of accomplishments.

With intransitive resultatives, as in (19d), not only must the verb be shifted from one aspectual class to another, but its (argument) type must be shifted so that the matrix verb has the right number of arguments to sum with resultatives: I assume the following:

- the resultative triggers the addition of the culmination modifier.
- the culmination modifier, which requires its argument to be the theme of the matrix verb, triggers the type shifting operation on the intransitive matrix verb in (28), and the interpretation of (19d) is as in (29):

(28) resultative shift (R-SHIFT):

$$\text{R-SHIFT}(\lambda e. V(e) \wedge \text{Ag}(e)=x) = \lambda y \lambda e. V(e) \wedge \text{Ag}(e)=x \wedge \exists e'[\text{cul}(e_1)=e' \wedge \text{Arg}(e')=y]$$

(29) John sang the baby asleep.

$$\begin{aligned} & \exists e \exists e_1 \exists e_2 [e=(e_1 \sqcup e_2) \\ & \wedge \text{SING}(e_1) \wedge \text{Ag}(e)=\text{JOHN} \wedge \exists e'[\text{cul}(e_1)=e' \wedge \text{Arg}(e')=\text{THE BABY}] \\ & \wedge \text{ASLEEP}(e_2) \wedge \text{Arg}(e)=\text{THE BABY} \\ & \wedge \text{PART-OF}(\text{cul}(e_1), e_2, \text{THE BABY})] \end{aligned}$$

"There was an event which was the sum of a singing event and an event of the baby being asleep, and the culmination of the singing event was PART-OF the event of the baby being asleep".

PART-of($\text{cul}(e_1), e_2, y$) forces $\text{cul}(e_1)$ and e_2 to share an argument; thus the culmination of the singing event must have THE BABY as its argument. But, if THE BABY is the argument of $\text{cul}(e_1)$, then by definition, it must be the theme of e_1 . It is a peculiar kind of theme argument, since its relation with V is not defined by a standard participant role - by which I mean that the in (19d/29) the verb *sing* cannot be said to assign a theta-role to the direct object, as we can see from the ungrammaticality of (30):

(30) *John sang the baby.

The peculiarity of the argument shows up in the contrasts in (31), noted originally in Rothstein 1992:

- (31) a. Which table did you ask whether John wiped t clean?
 b. ??Which baby did you ask whether John sang t asleep?

Chomsky 1986 argues that wh- extractions may violate subadjacency if they are from a position directly theta-marked by a head. What we see in (31a) is that extraction from a transitive resultative construction which violates subadjacency is acceptable, whereas extraction from the parallel position in an intransitive resultative construction is not good. This contrast is

explained (in Chomsky's theory) on the assumption that the trace in (31a) is in a position directly theta-marked by transitive *wipe*, while in (31b) the trace is not thematically marked by the intransitive V *sing*. Nonetheless, and this is the crucial point which makes the discussion in this section relevant, these non-theta-marked nominals are predicted by our theory to be themes of the verb, and they behave as such. Thus the NP *the baby* behaves as the incremental theme in the following crucial sense: the quantized or non-quantized status of this argument determines whether the VP is telic or non-telic, as shown in (32):

- (32)a. John sang the babies asleep in half hour /#for half an hour last night.
 b. John sang babies asleep #in half hour/for half an hour last night.

Furthermore, our theory of resultatives applied to (19d), and as expressed in (29), involves assigning a culmination to a singing event and requires us to analyse *the baby* as the argument of this culmination, and thus the incremental theme of the complex derived accomplishment. The point is that in this resultative construction the activity *sing* has shifted into an accomplishment which has a culmination of which *the baby* is the argument. What sort of accomplishment is it? What does it mean to say that the singing event had a culmination? And, most important for us here, what does it mean to say that the baby, as the argument of the culmination, must be the incremental theme of the singing event?

6 Back to Incremental Themes

What might incremental themes be? If, as I have been suggesting, they are the arguments of culminations, then in order to give an answer we need first to answer the question what are culminations? There are three obvious possible answers that I know of:

- the culmination of an event *e* is **determined by the extent of a bounded object of *e***. A culmination occurs when the object occurs when the object is 'used up' in the event.
- 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.
- the culmination of *e* is an achievement event, or minimal change of state associated with the end point of *e*.

We have already argued in section 4 that the first approach to culminations cannot be correct. What about the other two approaches? Both are implicitly involved in Dowty's 1979 account of accomplishments: this gives the template for accomplishments in (33a), translated into an event-argument framework as in (33b), which incorporates the twofold claim that accomplishments consists of an activity event and a BECOME event and that they are related via a causal relation:

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

The two parts of the claim are not inherently related: it is plausible - and in fact correct - to argue that the structure of an accomplishment is complex, consisting of an activity part and a BECOME event as in (33b), but that the relationship between them is not causal.

The fact that the relation between the activity and the culmination is not causal and that the culmination is not the result of the activity can be seen very clearly from accomplishments derived by resultative predication as in (34):

- (34) 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 (34a) the people of Amsterdam do not cause the Canadians to get to Dam Square by dancing: the Canadians were going there anyway. In (34b) 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 (34c-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 (34b) and (35), which does have a causal implication, shows:

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

But, if culminations are not result states 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 (33b), we are left with (36):

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

Since Dowty 1979 suggests that achievements are to be represented as having a BECOME component, it looks at first sight as if (36) represents exactly what we want, namely that an accomplishment consists of an activity e_1 , and an achievement, e_2 . However, this would be a misreading of Dowty's claim that accomplishments contain a BECOME component, since Dowty is explicit about the fact that the BECOME part of an accomplishment takes place over an extended period of time, while achievement BECOME events are near-instantaneous. And if the BECOME event in (36) takes place over an extended period of time, then e_2 in (36) cannot be the telic point, or culmination event we are looking for.

What I want to suggest is that Dowty's original suggestion that accomplishments involved an extended BECOME event, which I have represented in (36), is indeed the crucial part of the definition of accomplishments. Although it is possible to analyse accomplishments as consisting of an activity and an achievement, representing their meaning as I did in the template in (5b) so as to make reference only to the activity and the achievement (or culmination) subevents is to miss the crucial point about how an accomplishment works.

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. On this account, since the culmination event is part of the BECOME event, it must share an argument with it; thus the argument of the culmination event is the argument of the BECOME event, which, as Dowty argues, is the affected object or theme. In order 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 characterise the (non-causal) relation that holds between the activity event and the incremental event which are summed together in an accomplishment.

7 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.

BECOME events 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 conceptualised as ordered by an incremental chain as follows:

(37) 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. $e \in C(e)$

(38) Culmination

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

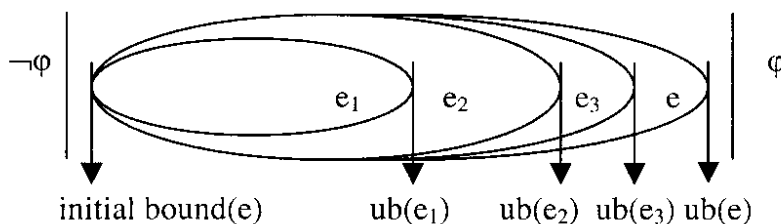
$ub(C(e)) = \{ub(e') : e' \in C(e)\}$ (the set of upper bounds)

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

$cul(e)_{def} = ub(e)$

An incremental event can be represented graphically as in (39):

(39) 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**:

(40) 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 $C(e_2)$ into $PART(e_1)$ (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:

$$cul_{C(e_2)}(e_1) = ub(\{\mu(e) : e \in C(e_2)\})$$

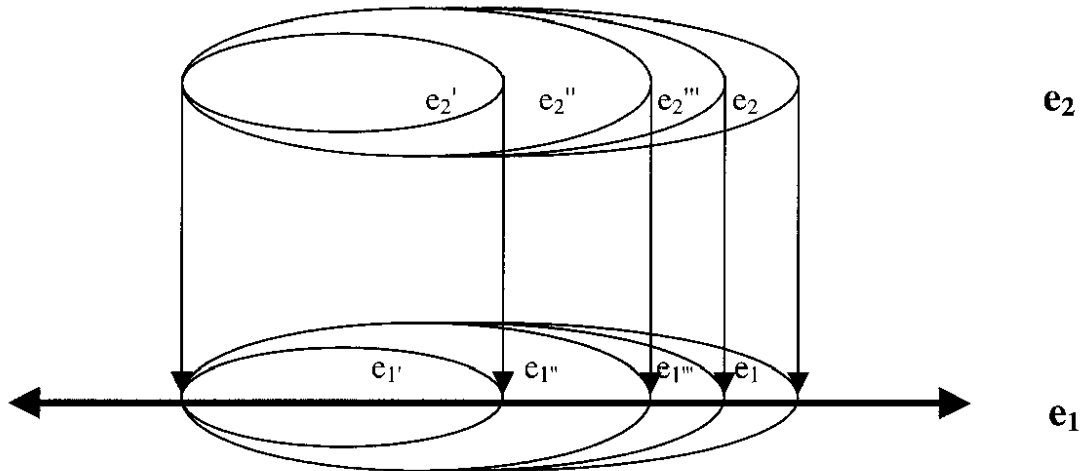
$INCR$ is used in the meaning of accomplishments as follows (where $\langle x \rangle$ and $\langle y \rangle$ give the content of the activity and BECOME events:

(41) Accomplishment template:

$$\begin{aligned} &\lambda y \lambda e, \exists e_1, e_2 [e = e_1 \sqcup e_2 \\ &\wedge \text{ACTIVITY}_{\langle x \rangle}(e_1) \wedge \text{Ag}(e_1) = x \wedge \text{Th}(e_1) = y \\ &\wedge \text{BECOME}_{\langle y \rangle}(e_2) \wedge \text{Arg}(e_2) = \text{Th}(e_1) \\ &\wedge \text{INCR}(e_1, e_2, C(e_2))] \end{aligned}$$

Since the accomplishment inherits the properties of the activity, $cul(e) = cul(e_1) = cul(e_2)$. An event structure following the template in (41) can be pictorially represented as in (42):

(42) Accomplishment event structure:



The intuition that this reflects is the following. Activities are inherently non-structured. They are, following Dowty, homogenous down to minimal intervals. Thus an minimal interval of an activity of walking is a minimal walking event, say taking a step, and an activity of walking is a string of minimal walking events without (relevant) breaks. This is the reason that any part of an activity event of walking which is at least as long as a minimal interval, is also an event of walking. A similar account of the activity of reading can be given, with 'minimal reading activity event' defined appropriately as, say an event of associating a perceived symbol, be it a word or a morpheme, with a meaning. Neither of these activities has an internal structure or inherent order. To give an example, 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 (43a) and describe the end of such an event as in (43b), both indicating that *read* is being treated as an activity verb.

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

An accomplishment event of reading is one which we identify as having an inherent order. An event described by *read the story of Snow White* 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 Snow White* is determined by what is necessary for there to be an event which is in the denotation of the predicate $\lambda e.BECOME\ READ(e) \wedge Th(e)=the\ story\ of\ Snow\ White$. The words have to be read in 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 perforce 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 Snow White is read. *The story of Snow White* 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**.

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 four year old and the book is *Big Egg*, 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 *Big Egg* 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: at least the events of reading a chapter. Second, 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 whole point is that 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. But, the role of context in establishing a plausible incremental relation is crucial in determining the acceptability of the derived accomplishments used in resultative constructions, whose formal properties we will look at in the next section. Thus compare (44a) and (44b):

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

(44a) is easily considered acceptable by most native speakers, because the contextual relation between singing and a baby becoming asleep is easily recognised. (44b) is generally

considered infelicitous because such a contextual relation is not available. But, 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 candies and cookies, and by eating and eating. Under such circumstances, she might say "I ate the baby asleep again tonight". And most informants then find the sentence much improved.

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 have an inherent 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. We can see then that 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 which affects the theme is a gradual process with recognisable stages ordered in a particular way is determined by the process. The process may affect the theme gradually: this is the case in particular with verbs of consumption and creation; but these are special cases of the more general incremental process.

8 Abstract accomplishments

With lexical accomplishments such as *build a house* and *read Snow White* the activity is obligatorily associated with an inherently related incremental process; in other words there is no choice which incremental activity is chosen to 'measure out' or developmentally structure the activity. I assume that verbs such as *wipe*, which can head VPs such as *wipe the table* which have an activity and an accomplishment reading, are lexically associated with an incremental process, but that the association is optional. However, in addition to the lexical accomplishments, where the association is lexical, the English resultative rule can also trigger a type-shifting operation which shifts activities into an accomplishment reading, and derives what I call 'abstract' or 'derived' accomplishments. These are of course the constructions which we discussed in section 5. In these cases, exemplified by *hammer the metal flat* and *sing the baby asleep*, an activity is associated with an incremental process which itself is identified by the property that its culmination has. Thus *hammer the metal flat* associates an activity of hammering the metal with an incremental process defined by the fact that its culmination is PART-OF the event of the metal being flat. Thus the string of minimal hammering-the-metal events of which the activity consists is ordered by the degree to which the metal being hammered is flat, with the upper bound of the event being the point at which the metal has the flat property. ACCOMPLISHMENT SHIFT applied to a transitive activity as in (45):

- (45) **accomplishment shift (for transitive activities):**

$$\text{SHIFT}(\lambda y \lambda e. \text{ACTIVITY}_{\langle X \rangle}(e) \wedge \text{AG}(e)=x \wedge \text{Th}(e)=y) =$$

$$\lambda y \lambda e. \exists e_1, e_2 [e = e_1 \sqcup e_2 \wedge \text{ACTIVITY}_{\langle X \rangle}(e_1) \wedge \text{Ag}(e_1) = x \wedge \text{Th}(e_1) = y$$

$$\wedge \text{BECOME}_{\langle Y \rangle}(e_2) \wedge \text{Arg}(e_2) = y$$

$$\wedge \text{INCR}(e_1, e_2, C(e_2))$$

The interpretation for *Mary hammered the metal flat* is as in (46):

(46) Mary hammered the metal flat.

a. the short form (as in section 5 above):

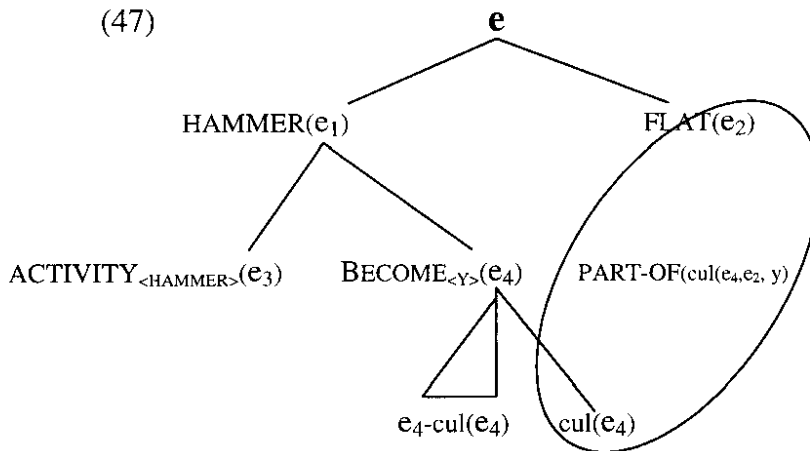
$$\exists e, e_1, e_2 [e = e_1 \sqcup e_2 \wedge \text{HAMMER}(e_1) \wedge \text{Ag}(e_1) = \text{MARY} \wedge \text{Th}(e_2) = \text{THE METAL} \\ \wedge \text{FLAT}(e_2) \wedge \text{Arg}(e_2) = \text{THE METAL}] \\ \wedge \text{PART-OF}(\text{cul}(e_1), e_2, \text{THE METAL})]$$

"There was an event which was the sum of a hammering event with Mary as agent and the metal as theme, and an event of the metal being flat, and the culmination of the hammering event was PART-OF the event of the metal being flat."

b. the long form: $\exists e, e_1, e_2, e_3, e_4 [e = e_1 \sqcup e_2 \wedge e_1 = e_3 \sqcup e_4$

$$\wedge \text{ACTIVITY}_{\langle \text{HAMMER} \rangle}(e_3) \wedge \text{Ag}(e_3) = \text{MARY} \wedge \text{Th}(e_3) = \text{THE METAL} \\ \wedge \text{BECOME}_{\langle Y \rangle}(e_4) \wedge \text{Arg}(e_4) = \text{THE METAL} \\ \wedge \text{INCR}(e_3, e_4, C(e_4)) \\ \wedge \text{FLAT}(e_2) \wedge \text{Arg}(e_2) = \text{THE METAL} \\ \wedge \text{PART-OF}(\text{cul}(e_1), e_2, \text{THE METAL})]$$

The structure is given in (47):



Accomplishment shift for intransitive activities, such as is used in *sing the baby asleep*, must add an argument to the intransitive activity, as in (48):

(48) **accomplishment shift (for intransitive activities):**

$$\text{SHIFT}(\lambda e. \text{ACTIVITY}_{\langle X \rangle}(e) \wedge \text{AG}(e) = x) = \\ \lambda y \lambda e. \exists e_1, e_2 [e = e_1 \sqcup e_2 \wedge \text{ACTIVITY}_{\langle X \rangle}(e_1) \wedge \text{Ag}(e_1) = x \\ \wedge \text{BECOME}_{\langle Y \rangle}(e_2) \wedge \text{Arg}(e_2) = y \wedge \text{Arg}(e_2) = \text{Th}(e_1) \\ \wedge \text{INCR}(e_1, e_2, C(e_2))]$$

The interpretation for *John sang the baby asleep* is as in (49):

(49) John sang the baby asleep.

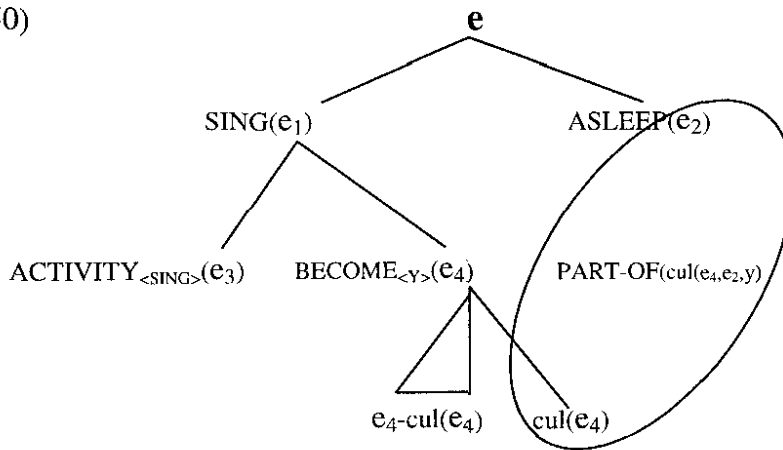
a. the short form:

$$\begin{aligned} \exists e, e_1, e_2 [e = e_1 \sqcup e_2 \wedge \text{SING}(e_1) \wedge \text{Ag}(e_1) = \text{JOHN} \\ \wedge \text{ASLEEP}(e_2) \wedge \text{Arg}(e_2) = \text{THE BABY} \\ \wedge \text{PART-OF}(\text{cul}(e_1), e_2,)] \end{aligned}$$

b. the long form: $\exists e, e_1, e_2, e_3, e_4 [e = e_1 \sqcup e_2 \wedge e_1 = e_3 \sqcup e_4$

$$\begin{aligned} \wedge \text{ACTIVITY}_{\langle \text{SING} \rangle}(e_3) \wedge \text{Ag}(e_3) = \text{JOHN} \\ \wedge \text{BECOME}_{\langle \text{Y} \rangle}(e_4) \wedge \text{Arg}(e_4) = \text{THE BABY} \wedge \text{Arg}(e_4) = \text{Th}(e_3) \\ \wedge \text{INCR}(e_3, e_4, C(e_4)) \\ \wedge \text{ASLEEP}(e_2) \wedge \text{Arg}(e_2) = \text{THE BABY} \\ \wedge \text{PART-OF}(\text{cul}(e_1), e_2, \text{THE BABY})] \end{aligned}$$

(50)



9 Quantization and Telicity

The account of accomplishments that I have been giving makes the claim that there is a lexical difference between simple transitive activities like *push* and transitive accomplishments like *read* or *build*; the simple activities have an interpretation of the form $\lambda e. \text{ACTIVITY}_{\langle x \rangle}(e)$ while accomplishments have complex structures of the form in (41). If so, then we would expect *build* to have the same interpretation in both (51a) and (51b).

(51) a. Mary built a house in a month.

b. Mary built houses for a month.

But, as we have seen, the VP in (51a) behaves as a telic predicate and the VP in (51b) behaves as non-telic predicate. As we saw in section 3, Krifka assumes that the quantized or non-quantized status of the direct object is responsible for this. He argues that the crucial property of verbs like *build* is that the thematic relation **theme** is a homomorphism from event to the extent of the theme argument, structured in such a way that if we know the size or extent of the value of **theme**, we will know when the endpoint of the event occurs. The account I have presented here argues that telic points are not determined by the extent of objects, but by the 'natural' course of an incremental process associated with the verb. Nonetheless, the data in (51) show that the status of the direct object does directly affect the telic status of the VP, and the question is why.

The question is far too big to discuss in this paper, and I shall just sketch an outline to an answer. I assume that the defining property of being an accomplishment is being

associated with the template in (41), and that the example in (51b) as well as (51a) involves an incremental predicate. "John was building houses last week" does not entail "John built houses last week", which is a clear indication that the VP is indeed an accomplishment. However, the infelicity of (52) does indicate that the bare plural object is associated with an atelic reading:

(52) #John built houses in a month.

I suggest that what makes (52) atelic is that the plurality of the direct object means that the event is an event which must be associated with a plurality of BECOME events, whose number is unspecified. The end point of the accomplishment is determined by when the endpoint of all these BECOME events is reached, but there is no evidence as to how many of them there are nor as to whether they are running cocurrently or sequentially. The location of the endpoint is then unidentifiable. A plural like (53) is telic because we know exactly how many BECOME events there are, and thus when they are over (at least on an 'exactly three') reading.

(53) John built three houses.

Similarly (54) is telic, although its direct object is cumulative, because there need be only one BECOME event associated with the activity:

(54) John ate some sandwiches in a very few minutes, and then left.

Note further, that (55a) shows that resultatives can occur with atelic predicates. Since we have argued that resultatives can occur only with incremental events, atelic resultatives should be impossible if atelicity meant non-incrementality. But (55a) is grammatical precisely because the resultative expresses a property of the culmination of each individual BECOME event, and the atelicity of the sentence derives from the plurality. This is shown very clearly in (55b), where the individual event *wipe a table clean* is asserted to take place in less than five minutes, and is thus telic, but the plural event which is the sum of an unspecified number of these individual events is atelic:

- (55) a. John wiped tables clean for three months.
b. John wiped tables clean in two minutes for three months this summer.

Clearly, this is only the beginning of a discussion of the effects of quantized and cumulative direct objects on the telic/atelic status of VPs; in particular I have not even begun to discuss the cumulative/non-quantizing effect of mass nouns in direct object position. But I hope the discussion in this section is enough to show that the theory of incrementality and accomplishments which I have been developing is compatible with, and in fact requires, an explanation of the quantizing effect of direct object nominals.

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