'Aspectual Classes and Aspectual Composition'

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1. Introduction

In this paper, I would like to discuss in some detail the so-called Vendler-classes which play an important role in the linguistic and philosophical literature these days. Vendler breathed new life into an old Aristotelian tripartition of situational types by proposing a quadripartition: States, Activities, Accomplishments, and Achievements.

Basically, this temporal classification is ontological, because it concerns situational categories that are part of the world as we perceive and cognize it, but Vendler offered linguistic criteria to distinguish the four categories from one another. This made his work of interest to linguists and they were offered a linguistic counterpart: State terms, Activity terms, Accomplishment terms and Achievement terms. More specifically, Vendler's proposal seems to incorporate the claim that the category of verbs of any natural language can be split up into these four categories. Among linguists accepting this division, the idea seems to be that, even though the specific linguistic criteria may vary across different languages, every language can produce congenial criteria so as to give the Vendler-quadripartition a solid grounding.

Kenny (1963) independently proposed a tripartition. Both he and Vendler go back to Aristotle for their inspiration, so they have two of his classes: States and Activities. However, Vendler's Accomplishments and Achievements are not distinguished by Kenny. He puts them together as so-called Performances. Part of the discussion in the present paper concerns the question whether or not Vendler's refinement is necessary, if justified at all. In this sense, Kenny is closer to Aristotle. People sometimes speak about the (Aristotle)-Vendler-Kenny classification.

What did Vendler actually propose? Did he make an ontological or a linguistic classification? Or did he do both? The question is of some importance because it is a rather striking feature of his analysis that he kept the quadripartition at the lexical level. He used the term 'term' to denote verbs, even though he seemed to be aware of the fact that his categories are complex in the sense that e.g. the direct object appears to co-determine whether or not a transitive verb belongs to one of the four categories. His inclination to stay at the lexical level enforces the idea

that what he really did was to propose ontological categories: if knowledge of the world and knowledge of a language tie up intimately at some place, they do that at the lexical level not so much as the structural level (cf. Putnam, 1978; Dowty, 1979; Partee 1980).

Vendler's classification, however, turned out to bear on the linguistic theory of aspect. Some of his criteria were well known in the literature on the opposition between the imperfective and perfective aspect in Slavonic languages. The implication that each of his lexical classes can be used in the theory of aspect, would actually constitute a setback. It runs afoul of the growing evidence that aspect is essentially a non-lexical property of sentence structure, both in Slavonic and non-Slavonic languages.

As indicated in Verkuyl (1972, p. 42), the insight that the direct object can at least affect some sort of basic temporal meaning of a verb was already present in the linguistic literature on aspect in the 1920's, though in nuce; cf. e.g. Poutsma (1926), Jacobsohn (1933). Taking up the idea that the nature of the objects can influence the basic aspect of a verb, I argued that the opposition between imperfective and perfective aspect is not a matter settled at the verbal level. I proposed that aspect be 'taken away' from the verb and be assigned to higher levels of sentential structure: first of all, to the VP because this node dominates the verb and the objects, and subsequently, to the S, because the nature of the subject appears to be a determinant of aspect as well.

So the basic idea is that the verb needs to be specified as to its having a specific *meaning element* engaged in the composition of aspect, but that this feature cannot be identified with aspect itself, because aspect is to be considered a complex sentential property. This line of argumentation explains why I did not incorporate Vendler's classification in my analysis of aspect. Vendler kept his classes at the lexical level, whereas I wanted to get rid of the opposition between imperfective and perfective aspect as lexical properties.

The idea of aspectual composition has been widely accepted nowadays. Yet, Vendler-classes are still very popular: many linguists use the quadripartition as part of their theory of aspect. In my view, these two things cannot be married as they are incompatible: if aspect formation is a process at a structural level it is hard to see how a lexical division can be maintained. Actually, closer analysis of recent contributions to aspectual theory reveals (a) that people say explicitly that they like Vendler's proposal, and (b) that they do not use his classes if they express linguistically relevant generalizations.

In this paper, I would like to give such an analysis. I will argue for a

more proper use of classificatory devices than seems to be available in the literature discussed in the sections that follow. I shall also indicate how my own analysis in Verkuyl (1972) and in more recent work, relates to the Vendler-classes.

   This paper is organized as follows. After having surveyed in Section 2, the diverse types of classification of Vendler-classes that I have found in the literature, I shall examine the criteria used by Vendler to establish his quadripartition, in Section 3. My examination of his proposal will lead to the conclusion that Vendler mixed up some of his criteria: he did not distinguish very well between criteria based on (some sort of) agentivity and criteria based on purely temporal properties of situations such as boundedness, uniqueness, etc. In the Sections 4 and 5, several proposals are discussed paying tribute to Vendler (and/or Kenny). My purpose is to examine what they did with the Vendler-(Kenny) classes and how they use them (rather freely). In Section 6 I will discuss my own 'constructive' approach and show that it is not classes that play a role in the explanation of aspectual phenomena but rather some semantic factors from which the classes are constructed, thus (again) leaving behind a Verb-classification as of no use to aspectual theory.

2. Types of classification

There seem to be four major types of classification in the literature. They are represented in the diagrams of Table I. Vendler seems to have


Table I.

constructed his classes out of two binary oppositions, say provisionally +A vs. -A, and +B vs. -B. Later on, I shall show that his proposal was more fuzzy than suggested by the matrix in Table IA, but yet IA seems to be a correct interpretation to begin with. The other diagrams represent different types of classification discussed in this paper. In transferring the feature indications rather than the names of the classes from IA to IB-ID, I want to show that the use of the *name* of a Vendler-class does not warrant the conclusion that the *concept* related to this name is a Vendler-concept. The relationship between concepts is of crucial importance to their interpretation. For example, in IB the two occurrences of [-A] are not directly related, as they are in IA, and the same applies to [-B]. Hence, even though some authors proposing a classification of type IB, claim that their categories are similar to the ones proposed by Vendler, one can be sure that they are not.

In my view, the interpretation of theoretical terms of others requires that one's own position be made clear. Therefore, I shall put my cards on the table here. My aspectual theory requires a non-lexical classification of situational types as in Table II. This classification, which belongs to type D in Table I, was inherent to Verkuyl (1972), where the 'double sided' nature of processes was essential to my aspectual analysis: they go with States as far as durative aspect is concerned, but they form an essential part of terminative events. In fact, my ordering was more like ID itself, because following linguistic tradition, I accepted a 'momentaneous' aspect at the time, and hence (non-lexical) momentaneous events. At the present I no longer believe that they are an aspectual class on their own, as I shall make clear below.

I did not bother very much about a typology of situations at the time, because in my proposal classes as such do not play a role. I still hold this position so it is only for easy reference that I follow Mourelatos (1978) in using the terms 'State' (-A, -B), 'Process' (+A, -B), and 'Event' (+A, +B). As can be easily seen by comparing B with D in Table I, there is a crucial difference in the way Processes and Events relate to each other in (Mourelatos') IB and in Table II, as I shall explain in more detail later on.

An essential feature of the proposal in Table II is that one of the

Table II.
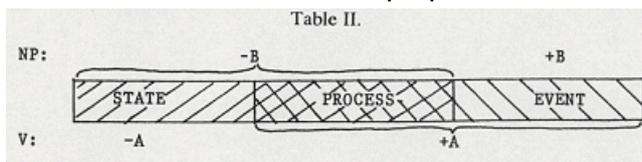
parameters, provisionally just A, is tied up with the Verb whereas the other parameter B is associated with the NP in a way that will also be made clear later on. I shall argue that the aspectual differences in:

She(+B) hated(-A) that sonata(+B)   durative/imperfective

She(+B) hated(-A) sonatas(-B)   durative/imperfective

She(+B) played(+A) that sonata(+B)   terminative/perfective

She(+B) played(+A) sonatas(-B)   durative/imperfective

can be explained in terms of the two parameters A and B that constitute the tripartition; only if there are plus-values may terminativity arise. An explanatory perspective along this line is absent in most of the divisions in Table I that I know of. I will evaluate proposals negatively if there is no linguistic embedding of the aspectual parameters in sentential structure.

In the following section, I shall examine Vendler's proposal in some detail presuming the background of Table II as the source of my criticism. To avoid any misunderstanding, even though my discussion of Vendler's paper is very critical, it does not take away much from my longstanding admiration for this essay.

3. Vendler's matrix

3.1. Introduction

Vendler used the following so-called time schemata to characterize his verb classes:

(1)
STATE: *A loved somebody from t_1 to t_2* means that *any* i n s t a n t between t_1 and t_2 *A* loved that person.

ACTIVITY: *A was running at time t* means that time instant *t* is on *a* time s t r e t c h throughout which *A* was running.

ACCOMPLISHMENT: *A was drawing a circle at t* means that *t* is on *the* time s t r e t c h in which *A* drew that circle.

ACHIEVEMENT: *A won a race between t_1 and t_2* means that *the* time i n s t a n t at which *A* won the race is between t_1 and t_2.

I have cited Vendler's own wording, adding enlarged spacing in the terms pertaining to temporal units (instant, stretch) to indicate one of the two crucial parameters involved, the other being the one italicized by Vendler himself, viz. the (in)definiteness of the temporal unit involved, expressed by *any, a* and *the* in (1).

With Galton (1984) and Hoeksema (1984), I share the opinion that

Table III

	-Process ('Instant')	+Process ('Stretch')
-Definite ('any', 'a')	State	Activity
+Definite ('the')	Achievement	Accomplishment

Vendler's division must be analysed as a partition in which the four classes are intended to be on an equal footing. Many authors ignore this aspect of Vendler's division. Essentially, (1) induces a matrix: States and Activities share the property of pertaining to non-unique, indefinite temporal entities, States and Achievements pertain to instants, so they cannot be seen as *processes going on* in time, Activities and Accomplishments are conceived of as *processes going on* at time stretches, and finally Achievements and Accomplishments involve unique, definite temporal units.

Anticipating my discussion of the criteria pertaining to the opposition Stretch vs. Instant, I have italicized the phrase 'processes going on' because it is crucial to the interpretation of the opposition 'Stretch vs Instant': processes going on in time require there to be stretches to 'go on in'. In view of this, the division based upon (1) will be constructed as in Table III. Vendler presented criteria to tell the four classes apart. In Section 3.2, I shall discuss criteria pertaining to its vertical division, which I have dubbed the Continuous Tense Criteria (CTC). In Section 3.3, the horizontal division will be examined under the heading of Definiteness Criteria (DC). Finally, in Section 3.4 Vendler's plea for an Achievement class sui generis will be examined.

3.2. Continuous Tense Criteria

These criteria involve the opposition between continuous and non-continuous tense. The most important one is ProgF: Accomplishment verbs and Activity verbs can have a Progressive Form, whereas State verbs and Achievement verbs cannot have it. This is illustrated by the following data:

(2)
   (a) *I am knowing, she is loving him, he is possessing the house he is ruling the country (State).
   (b) He was running, she is swinning, they are pushing the cart (Activity).

(c) She is running a mile, he is drawing a circle, he was eating a sandwich (Accomplishment).

   (d) *She was recognizing him, he was teaching the top, she was winning (Achievement).

The judgments are Vendler's. I have starred (2a) and (2d) to indicate that they are meant to exclude the Progressive Form. ProgF seems to be based on the opposition [±Process] in Table III, which in its plus-value [+Process] pertains to processes going on in time. As Vendler put it: '… running, writing and the like are processes going on in time, that is, roughly, that they consist of successive phases following one another in time' (p. 99).

   ProgF has not been accepted as a solid criterion by a great many authors, who noted that sentences like (3) and (4) are acceptable, (e.g. Leech 1971, pp. 14-27; Comrie 1976, 37 f.; Vlach 1981, 279 ff.):

(3)
   (a) I am living in Amherst.
   (b) The dead man is hanging there to deter the population.
   (c) Mr. Smith is standing by the Nile.
   (d) You are looking well.
   (e) He is being ill.

(4)
   (a) She is winning this game.
   (b) He is dying.
   (c) She was reaching the top.
   (d) Look at the screen, the Challenger is exploding now.
   (e) Manufacturers were beginning to find it more difficult to meet the dates.

Putting aside the observational inadequacy of ProgF, however, one can easily see that it does not do what it is assumed to do. This becomes clear from the choice of examples like (2), which shows that ProgF is factually based on another criterion, namely the opposition between expressing or not some specific sort of agentivity which is absent in (2a) and (2d), showing up in (2b) and (2c) though. But examples like (5) are non-agentive; (5c)-(5e) cannot even be taken as quasi-agentive:

(5)
   (a) The weather is developing a strange pattern.
   (b) Colgate is starting to score some coups of its own.
   (c) Imports are increasing in price as a reflection of the weakening dollar.
   (d) Two years ago these operations were not making any money.
   (e) We are at a point here where small things are mattering.

The problem appears to be that ProgF is used to cover two quite different semantic factors. It is said to pertain to successive phasal progress in time, but it is also tied up with the concept of agentivity. Thus, it is strongly suggested that these two factors are identical, which they are not; or that they are very closely related, which they are not either. Consider the following matrix:

	+Agentive	**-Agentive**
+Process	He is running	Prices are increasing
-Process	He is ignoring me	Small things are mattering

Here it is shown (a) that the concept of agentivity is not essentially tied up with the use of the Progressive Form, and (b) that the use of the Progressive Form is not essentially tied up with the criterion of Progress in time, though it is more closely related to temporality. Emmon Bach (pers. comm.) pointed out that in stories the Progressive Form can pertain to States in such a way that the objects which are in a given state are temporarily experienced by the narrator (cf. also Galton, 1984; Dowty, 1979). Thus, a sentence like *The village was lying in the valley* seems to report a state of a village as seen by the narrator who is telling the story as if he just had entered the valley. The use of the Progressive Form tends to actualize its emphemeral nature: the state is reported from the point of view of the narrator. It would be natural to say that the lying-state of the village is presented here as temporarily present: in terms of Verkuyl (1972, 63 ff.; 1976), what is going on is an actualization, a temporal realization of an abstract stative object.

Let us now have a look at the negative side of ProgF: States and Achievements. Undoubtedly, the important role of agentivity in the analysis of temporal phenomena in the work of both Vendler and Kenny is due to Ryle (1949), who also led them back to Aristotle. In this perspective, it is clear why Vendler put States and Achievements in one category: to distinguish Achievements from Accomplishments, he argues that the former have State-like properties. However, do States and Achievements form a natural class?

It can be observed that *She is loving him* is rejected on a different ground than *She is recognizing him*. In the latter case one could say, following Vendler's description of Achievements for the moment, that there is some temporal unit but there is no room within the bounds of a point, because there are no bounds: points are atomic. In the case of States, some sort of universal quantification over a certain time stretch is

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assumed. Galton makes the same point from a slightly different angle by pointing out that Vendler's 'state-verbs lack continuous tenses because their meaning is already necessarily continuous in nature, so a continuous tense would be superfluous; while achievement-verbs lack continuous tenses because their meanings, involving as they do the idea of punctuality, are incompatible with continuity' (1984, pp. 71). I shall return to this point in Section 3.3.

Vendler introduces other CTC to strengthen his case, but as formulated most of these turn out to be tests for agentivity. A clear example is the so-called *Do*-criterion applied to the difference between *Do you know that she is ill*? (Answer: *Yes, I do*), and *Do you run*? where *Yes, I do* expresses an intention. Clearly, this criterion cannot be used in no-animate cases like (5). Yet, the *Do*-criterion is given an important place in the exposition of CTC (p. 99). Dowty (1979) does not have it.

Connected with the use of *Do*, there is a criterion which I shall call AgMod, as it boils down to Agentive modification by adverbials. This is shown by the examples in (6).

(6)
    (a) *John deliberately knew the answer (State).
    (b) John deliberately pushed the cart (Activity).
    (c) John deliberately painted a circle (Accomplishment).
    (d) *John deliberately found a penny (Achievement).

This seems to work quite well, as in the case of adverbials like *attentively, studiously, carefully*, etc., but now consider (7):

(7)
    (a) The sun had (*deliberately) evaporated four gallons.
    (b) The lightbeam (*deliberately) passed the house.
    (c) The mummy was (*deliberately) dried out by the drought.
    (d) The washer (*deliberately) ejected these dishes.

Even though *deliberately* is incompatible with the sentences in (7), I think that Vendler would have to put *evaporate, pass, dry out*, and *eject* in the category of Accomplishments. For example, it is appropriate to ask *How long did it take the mummy to dry out*? whereas it is somewhat queer to ask *For how long did the mummy dry out*? (I shall discuss that criterion below). Dowty (1979) would have no problem either in accepting these verbs as non-agentive Accomplishments. So again, it seems as if one of the CTC, AgMod, has to do with voluntary agency rather than with continuous tense. This is exactly the reason why Mourelatos (1978) introduced the term *Developments* in order to comprise both (agentive) Accomplishments and non-agentive cases like (7).

The same objection applies to verbs like *stop* and *start* which are said

by Vendler (but not by Dowty) to take only Activities and Accomplishments as shown in (8):

(8)
    (a) *She stopped/started loving him.
    (b) She stopped/started running.
    (c) She stopped/started drawing a circle.
    (d) *She stopped/started recognizing him.

Again one could say that some sort of (voluntary) agency seems to be involved in (8b) and (8c) rather than a process taking time: it is rather odd to say *The mummy stopped drying out*, even though *dry out* is not a State or an Achievement term. Consider also (9):

(9)
    (a) Stop being a fool, being naughty, being a workalcoholic.
    (b) ?Stop being ill, being eight feet long, being loved.
    (c) He is being afool, naughty, a work-alcoholic.
    (d) He is being ill, eight feet long, loved.

where both (9a) and (9b) without the verb *stop* pertain to states of affairs or habits or dispositions. *Stop being ill* is somewhat strange given the current insights in the causes of illness: one does not have control over illness. The meaning of *love* seems to express that the one who loves as well as the one being loved have no agentive control: it seems to happen, just like recognizing some object.

Strictly speaking, *Stop/Start* cannot be a criterion, because there is no Progressive Form in the sentences of (8). This is no hair-splitting. If one allows for the *-ing*-forms in (8), one should be able to explain why phrases like *Knowing that he was ill …, Recognizing her sister …*, are perfectly acceptable.

Summarizing, one can say that Vendler seems to be guided by at least one of the following principles, where CTC stands for ProgF, for *Do*, for AgMod, and for *Stop/Start*:

(10)
    If a Verb is positive w.r.t. CTC, then it belongs to the set of Activity verbs or Accomplishment verbs.
    (11)
    If a verb belongs to the set of Activity or Accomplishment verbs, then it is positive w.r.t. CTC.

Of course, Vendler is only committed to (10), as the antecedent of (10) refers to linguistic criteria. But it would be very nice for him if both (10) and (11) held. This is not the case, in two directions. Firstly, (10) does not hold, which becomes clear as soon as we take its contraposition: many State verbs and Achievement verbs allow for the Progressive Form, as

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shown by (4) and (9c). Even if a verb is negative with respect to CTC, it can be a (non-agentive) Accomplishment verb, as shown in e.g. (5a).

Secondly, it has become clear that (11) does not hold either. This too can be shown by contraposition: there are verbs thrown out by CTC which are Activities or Accomplishment by any other account, because they take time, as shown by (5) and (7).

Vendler's *Progressive Form* criterion turns out to be a criterion actually focussed on some unclear concept of agentivity. Vendler seems to follow here the linguistic tradition which coined the term *Aktionsarten* for the phenomena at issue: the ways actions are conceived of. This term itself suggests that agentivity plays an important role. However, important for what? Human actions are extremely important for philosophers. But are they linguistically? And if they are, do they concern aspect? The answer should be negative, I think. It is a rather bad but understandable habit of linguists to mainly choose sentences pertaining to animate beings such as John and Mary, or Jack and Jill at the expense of non-animacy. However, the concept of agentivity may overlap greatly with the concept of processes going on in time, because most of the time we speak about human actions. But this does not mean at all that these concepts can be equated.

3.3. Definiteness Criteria

Returning to Table III, I would like to review Vendler's arguments for a horizontal division on the basis of the Definiteness features. The characterizations in (1) should set Accomplishments and Achievements apart from Activities and States, but Vendler restricted himself mainly to the opposition between Accomplishments and Activities. The few words that he spent on the difference between Achievements and States complicate the picture considerably, as I shall point out in this section.

Vendler characterized the differences between Activities and Accomplishments by two different sorts of linguistic criteria: (a) those based on cooccurrence; (b) those based on entailment. I shall treat them in separate subsections.

3.3.1. FIT-criteria.

The first sort of criteria concern certain restrictions on co-occurrence of verbs with certain adverbials or verbs. I shall refer to these criteria with the letter F for *For*-adverbials, I for *In*-adverbials and T for the verb *take*, as exemplified by (12):

(12)
   (a) He ran for half an hour. F
   (b) #He ran a mile for half an hour.

(13)
    (a) *He ran in half an hour. I
    (b) He ran a mile in half an hour.

(14)
    (a) *It took him half an hour to run. T
    (b) It took him half an hour to draw the circle.

The peculiar feature of sentences like (12b) is not only that a single event reading is blocked, but that in many cases an interpretation is invoked in which repetition of the event or a peculiar sort of stretching the event, in this case 'He ran a mile', is forced upon us (cf. Verkuyl 1987, Footnote 4). From now on, I shall indicate this reading with the symbol #. One of the basic problems of aspectual theory is how to explain the blocking of the singular event reading and the tendency to assign a repetitive reading.

   As shown in Verkuyl (1972), the F-criterion can be considered the most important one in connection with the study of aspect. As a litmus-test for perfective aspect, it has had a long history in the literature. It also has a reasonably clear interpretation: the duration expressed by the adverbial is incompatible with the concept of a unique definite event that is discernible by its bounds.

   An agentless variant of F not discussed by Vendler but giving nice results, is what I call the *Conjunction*-criterion C in (15):

(15)
    (a) The VAX printed a paper on Saturday and on Sunday.
    (b) The VAX ran on Saturday and on Sunday.
    (c) The postman delivered a parcel on Saturday and on Sunday.

In (15a) one can be sure that there were two printings, one on Saturday, the other one on Sunday. In (15b), the VAX may have been running twice having stopped to work at night, but it may also have been working constantly throughout the weekend. In (15c), I have given an example of what Vendler would call an Achievement: as in (15a) there were two deliveries. Vendler's Accomplishments and Achievements form a natural class with respect to C.

   The I-criterion seems to have the same range as F, though again I as presented by Vendler is tied up to the concept of agentivity: tasks are carried out by some agent in x many time units. Thus, Vendler says that *He did it in twenty seconds* is the appropriate answer to *How long did it take him to draw the circle*? But it is quite possible to apply I to non-agentive cases.

   Many linguists consider I to be equivalent to F. I doubt it. Note, for example, that (13a) can have the meaning 'it took him (less than) half an hour before he started to run'. The same interpretation can be given to

(14a). The notion of 'inchoativity' is absent in F. The problem is that *in* can mean 'within, i.e., counting the time units from the begin to the end of an interval' and 'on/at, i.e. locating a unit in a larger unit'. Thus, I rely more on F and C than on I.

   The T-criterion is dubious if compared with F and C. Its form, *It took X y time to …*, requires that the values of *X* be terms expressing some sort of agency. At least that is how T works: it excludes Achievements, as Vendler says explicitly on page 104. It is therefore important to see that it is T that seems to have prevented Vendler from staying in the right aspectual track. If he would only have used FI and not T, then he would have been forced to recognize that both Achievements and Accomplishments meet FI as shown by (12), (13), (16) and (17). Now he ignores this relation, thus suppressing an important part of aspectual theory.

(16)
   (a) *He won the race for half an hour.
   (b) *The bomb exploded for half an hour.
   (c) *She was born for half an hour.
   (d) *He reached the top for half an hour.

(17)
   (a) He won the rice in half an hour.
   (b) The bomb exploded in half an hour.
   (c) She was born in half an hour.
   (d) He reached the top in half an hour.

Dowty (1979, p. 58) also accepts (17) as well-formed. So again Vendler seems to have mixed up criteria pertaining to agentivity with criteria pertaining to the properties of temporal entities, such as the possibility of discerning intervals as temporal units that can be counted. But more importantly, Vendler did not acknowledge that Accomplishments and Achievements form a natural class indeed, as they are supposed to be by the definiteness expressed in (1).

   Turning now to the difference between States and Achievements, one can observe that Vendler introduced a new opposition. He says:

(18)

> … verbs like *knowing* and *recognizing* do not indicate processes going on in time, yet they may be predicated of a subject for a given time with truth or falsity. Now some of these verbs can be predicated only for single moments of time (strictly speaking), while others can be predicated for shorter or longer periods of time. One reaches the hilltop, wins the race, spots or recognizes something, and so on at a definite moment. On the other hand, one can know or believe some-

thing, love or dominate somebody, for a short or long period. (p. 102)

This opposition does not coincide with the opposition between [+Process] vs. [-Process] underlying the vertical division in Table III.

Table IIIa.

	Process	Definite	Momentary
State	-	-	-
Activity	+	-	-
Accomplishment	+	+	-
Achievement	-	+	+

This cannot be, since the latter concerns (non-)continuous tense. What (18) seems to add to Table III is given in Table IIIa. The first two columns in Table IIIa give the same information as expressed by Table III. They have 'an air of completeness': all four classes are distinguished from one another. Yet, Vendler wants to distinguish States from Achievements by a redundant opposition based on *length.* Note that [+Process] implies [-Momentary].

   Clearly, the redundancy of Momentary shows up in an overlap with Definite, as can be shown by considering the criterion used to defend [-Momentary] for States as given by Vendler:

(19)
   (a) For how long did you love her? For three years.
   (b) How long did you believe in the stork. Till I was seven.

These are exactly the criteria given to separate Activities from Accomplishments: they are variants of F. Vendler misleadingly suggests that all verbs expressing [-Momentary] meet (19), but this is not so, because Accomplishments fail the test: #*For how long did you draw the circle*? is unwellformed on Vendler's own account. Thus, the cases in (19) should be headed under [-Definite].

   I have paid some attention to the superfluous imperfection and imperfect superfluity in Table IIIa since it explains why some authors fit in Table IB: they adopted more or less the three parameters, though using different values, as I shall point out below.

3.3.2. Entailments.

Vendler used some important criteria based on entailment relations. He seems to return here to the well-known Aristotelian division discussed in Book IX of *Metaphysics* between verbs expressing incomplete movement (process, energeia) and completed movement (actuality, kinesis), cf. Kenny (1963), Taylor (1977),

Mourelatos (1978), Galton (1984). Vendler says:

(20)

> If it is true that someone is running or pushing a cart now, then even if he stops in the next moment it will be still true that he did run or did push a cart. On the other hand, even if it is true that someone is drawing a circle or is running a mile now, if he stops in the next moment it may not be true that he did draw a circle or did run a mile. In other words, if someone stops running a mile, he did not run a mile; if one stops drawing a circle, he did not draw a circle. But the man who stops running did run and he who stops pushing the card did push it (p. 100).

Dowty (1979, p. 57) noticed that if one replaced the verb *stop* by an appropriate tense, Vendler could be said to have given in (20) two criteria at once, given in Dowty's formulation as (21a) and (21b).

(21)
  (a) *Homogeneity*
  If V is an activity verb, then *x V-ed for y time* entails that at any time *x V-ed* was true. If V is an accomplishment verb, then *x V-ed for y time* does not entail that *x V-ed* was true during any time within *y* at all.
  (b) *Imperfective*
  If V is an activity verb, then *x is* (*now*) *V-ing* entails that *x has V-ed*. If V is an accomplishment verb, then *x is* (*now*) *V-ing* entails that *x has not* (*yet*) *V-ed*.

The intent of both criteria is clear: if you 'get into' the interval during which an activity takes place, *Homogeneity*, as I will call it, says that you can be sure to find the same sort of action at any part of the interval. Criterion (21b) has also been proposed by Kenny to separate Activities from Performances. I refer to it as *Imperfective*, because it has played an important role in the discussion of the so-called Imperfective Paradox: if you are drawing a circle, you have not drawn a circle, whereas if you are walking now, you have walked.
  As to (21a), it seems to me that it correctly renders what Vendler tries to express in the second part of (20). Yet, it must be rephrased because one cannot base entailment on sentences like #*He drew a circle for an hour*. This sentence is not wellformed in the single event reading and it is this reading that is relevant to (20). But apart from that, what about sentences like (22)?

(22)
  (a) For hours Judith ate sandwiches.
  (b) For some time she browsed in that book.

  (c) Judith was eating sandwiches.
    (d) She was browsing through that book.
    (e) She stopped waltzing.

By all criteria, *to eat sandwiches* in (22a) must be taken as an Activity term (one can do it for hours, one cannot do it in an hour, one can stop it, etc. etc.). But it is clear that at the first sandwich, (21a) does not apply at all. And in order for someone to browse through a book she must at least have turned more than one page. And Dowty's (22e) raises a problem if she stopped after one or two steps. Dowty (1979, p. 171) is aware of this problem (one has to do at least three steps before one can waltz), but he does not return to (21a) in order to repair it. Note also that the same problem arises with respect to (21b).

    As to (21b), Parsons (1985) following Bach (1979) raises some doubts, though he says that the intuition behind it seems to be correct. His point is that if one says *Katinka is knitting a sweater* she might have knitted another sweater than the one she is knitting, but the criterion is said to hold good if one can exclude other sweaters (cf. Verkuyl 1972, pp. 85-97; Dowty in prep.).

    Though these sorts of objections are certainly relevant, I would like to restrict myself here to observing that (20) and its close approximations (21a) and (21b) have been formulated with the help of active sentences. At least, both criteria must be rephrased to accommodate sentences like (23)-(25).

(23)
    (a) #John got dressed for hours.
    (b) #The wall was pulled down for hours.
    (c) # Mookie got hit for half an hour.
    (d) #John was released the whole afternoon.

(24)
    (a) John got dressed in a minute.
    (b) The wall was pulled down in five minutes.
    (c) Mookie got hit in ten minutes.
    (d) John was released in two hours.

(25)
    (a) John got dressed on Monday and on Tuesday.
    (b) The wall was pulled down on Monday and on Tuesday.
    (c) Mookie got hit on Monday and on Tuesday.
    (d) John was released on Monday and on Tuesday.

That is, all these sentences can be said to contain Accomplishment or Achievement terms according to the criteria FIC, two of which are proposed both by Vendler and by Dowty. However, one cannot apply

Homogeneity and *Imperfective* to (23)-(25). So again, it seems to be the case that a specific linguistic criterion is associated with an unclear amalgamation of different factors such as agentivity and more purely temporal aspects. Of course, one could say that (23)-(25) can be 'transformed' in such a way that their active counterpart can be captured by (21), but that is virtually impossible in the *a*- and *c*-cases. My conclusion is that neither (21a) nor (21b) is a reliable criterion, and certainly not in their less clear formulation (20).

3.4. On the Punctual Nature of Achievements

To set Achievements apart from the other three classes, Vendler used a criterion which I shall call *Present Perfect Now* (*PPN*). Vendler observed that in the case of pure Achievement terms 'the present tense is almost exclusively used as historic present or as indicating immediate future' (1967, p. 103). Thus *Now he wins the match* is not used to report an actual finding but rather to predict that he is going to win; instead one has to use *Now he has won the match* or *At this moment he has won the match* to report the actual winning.

   However nice at first sight, this criterion is not very convincing: one broadcast of a game will do to convince oneself that reporters very often use the simple present in Achievement situations (catch the ball, hit the ground, score, etc.). In a game, the loser can give up saying *You win* rather than *You have won*. In the linguistic literature, facts like these are well registered, and take away much of the force of Vendler's contention. But I would like to counter Vendler not on the basis of observational adequacy. So let us agree with him, for the sake of the argument, that the present perfect is more appropriate than the present in pairs like (26):

(26)
   (a) ?She wins (now).
   (b) She has won (now).

But then the question arises: what about the pairs in (27)?

(27)
   (a) ?She hates him up till now.
   (b) She has hated him up till now.
   (c) ?She walks already for an hour now.
   (d) She has walked already for an hour.

These are cases in which the Present Perfect reports an actual hate (State) or walk (Activity) more appropriately than the Simple Present. The phenomenon that the Present Perfect pertains more appropriately to

the present situation than the Present itself, is not restricted to Vendler's Achievement terms only. A possible answer to my objection here is that the sentences in (27) contain adverbials which are absent in (26), but note that (27b) and (27d) report on an actual state and activity, respectively, both taking place at the moment of speech as in (26b).

In addition to these objections, I would like to discuss here a counterargument against PPN based on modern technology, because it shows that some intriguing problems of lexical semantics are involved in Vendler's analysis. Compare (28a) with (28b).

(28)
   (a) Now John types/has typed the letter p.
   (b) Now John types/has typed that (business) letter.

To type *x* means that *x* is made visible by print or on the screen of a word processor, say. I can safely assume that Vendler, applying PPN, would characterize *type the letter p* as an Achievement, whereas *type that letter* in (28b) would be taken as an Accomplishment, just like *write a letter*. Vendler says:

(29)

     When I say it took me an hour to write a letter (which is an accomplishment), I imply that the writing of the letter went on during that hour. This is not the case with achievements. Even if one says that it took him three hours to reach the summit, one does not mean that the 'reaching' of the summit went on during those hours (p. 104).

According to (29), if one says that it took him five minutes to type the letter p, one does not mean that the 'typing' of the letter went on during those minutes, whereas if one says that it took him five minutes to type that (business) letter, one could very well mean that the 'typing' of the letter went on during those five minutes. Note also that another one of Vendler's criteria applies to (28a) and not to (28b): *At what time did you type the letter p*? *At noon sharp* as against *At what time did you type that* (business) *letter*? **At noon sharp*. According to Vendler the difference between these pairs would have to be taken as an indication that *type the letter p* is an Achievement therm. Applying PPN, if we give a report about John's actual typing of the p in a split second, we could use the Present Perfect, probably even better than the Simple Present. This does not hold for (28b) if John is typing a letter that Sue gave to him to type and mail.

However, in modern technology the reverse argument is also possible in two respects: (a) the typing of the letter p on the screen of a word processor can take a while due to some *Please Wait* command so that it

takes time before the p has become visible and has been typed out; (b) the typing of a business letter may take just a moment: if it is standard, it can be produced by hitting one single key. If things are going that quickly it would mean that both *type a letter p* and *type a (business) letter* are members of one and the same category and that they manifest themselves as either Achievement terms or Accomplishment terms dependent on something which has nothing to do with language itself. One can easily imagine situations in which writing and typing a letter is a very heterogeneous process of assembling all sorts of information stored in a data base. In that case, writing or typing a letter would have a structure like reaching the top of a mountain or winning a race: only at a certain point the letter can be said to be written or produced. But sentences like (28) can also pertain to the old-fashioned typewriting. On Vendler's account each of them would be ambiguous: he would have to put *type,* and *write* in both two of his classes.

Perhaps it is worthwhile (and necessary) to apply the same argument to the well-known Vendler-example *draw a circle*, because this example has received a great deal of attention. I would say that one can draw a circle without actually drawing its parts with a pencil. If one has a sophisticated computer there are keys to touch in order to reach a result. One does not even have to see an incomplete circle on the screen. By hitting the last key in a series of tasks on the keyboard, the circle can be produced at once, which would make it analogous to *reach the top*, or *win the race*. On the other hand, by introducing logical names one can easily draw a circle by hitting one key only. In one of the recent ads for computers one can see someone drawing a circle in this way. PPN would certainly apply positively if we have to report about what is happening on the screen in these split seconds. I think it might be mistaken to restrict the meaning of *draw a circle* to the way we learn about drawing circles with the help of a pencil or with the help of compasses (which can be turned around very quickly). After all, all sorts of new techniques can be introduced changing the sort of muscular actions involved but leaving intact the concept of drawing, which might turn out to be focussed on the product rather than on the use of arms or pencils to bring the drawing about. I am afraid that Vendler's use of the example *draw a circle* concerns the 1950's stereotype of the verb *draw* rather than its real range of possibilities. We do not assign new meanings to words like *type, draw, write*, etc., if we use them in connection with new technological techniques, unless there is too much of a tension between the old technique and the new one, as in the case of *write* and *type*(*writing*), some decades ago. We do not use the phrase *draw a circle* figuratively if we produce a circle on the screen with

the help of a cursor or an instruction on the Apple mouse. The meaning of verbs like *draw, write*, etc. is rather such that new techniques can be captured by them, indicating that it was accidental up till now that *draw a circle* pertains only to events taking more than one moment. The length of the event in question does not seem to be of importance at all if an event is conceived of as taking time.

In Verkuyl (1972), I distinguished between two sorts of perfective aspect: terminative aspect (Accomplishment) and momentaneous aspect (Achievement), following linguists like Streitberg (1889) and Poutsma (1926). However, in later work I became convinced that the momentaneous and terminative aspects should be combined. My change of mind is based on considerations that are being discussed here: there are no decisive criteria for Achievementhood.

To summarize, I think that the validity of Vendler's criterion, which I dubbed *Present Perfect Now*, is damaged by observational problems - there are a great many cases where the Simple Present can be used to report actual winnings and findings. But it also suffers more serious setbacks due to the fact that from the point of view of language the *length* of (a time unit involved in) an event does not qualify as a meaning element that distinguishes certain verbs from others. Thus there is no reason to distinguish *to walk a mile* from *to walk a yard* linguistically on the ground that a mile consists of feet, whereas a foot does not consist of miles, or on the ground that one can walk a foot in a split moment. One need not introduce giants (who can walk a mile in a second) and dwarfs (who - I am told - need time to walk a foot) to compress miles to points and extend feet to long distances. My typewriting example shows that it is not necessary to step into the world of fiction to make this point. In other words, the opposition between a point and interval as far as length of temporal units is concerned, is not identical to the opposition between an instant and a stretch from the point of view of one unit taking time as against a set of units taking time.

Given these considerations I would conclude that there is no ground for distinguishing Achievement terms from Accomplishment terms.

3.5. Conclusion

Reconsidering the nice quadripartition in Table III one would have wished that Vendler had been using formulations that had precisely cut the set of verbs on the basis of two binary oppositions. By adding a new sort of parameter based on length, he created redundancy problems, as shown in Table IIIa. From the point of view of aspectual analysis,

Vendler's use of the criterion T, deprived him of the possibility of really contributing to aspectual theory: he did not recognize that his Achievements should take time in order to receive the proper aspect. Again the notion of length seems to play a negative role here: Vendler deprived Achievements of length by compressing moments into points to widen the gap with Accomplishments. In doing this he mixed up two parameters. Whereas Vendler's one-sidedness with respect to agentivity can be repaired by adding non-agentive counterparts (as in Mourelatos (1978) and Dowty (1979)), the double-sidedness with regard to the Process-parameter cannot be repaired without changing the essential features of his classification.

4. Partial orderings

In this section, I shall discuss some proposals that have been made since Vendler's paper appeared. I shall first pay attention in Section 4.1, to some proposals introducing a partial ordering of the classes and then proceed to discuss in Section 4.2, the classification made by Dowty, which I would analyse as a partial ordering, though it can be argued that it is intermediate between a partial ordering and a matrix.[1]

4.1. Taylor (1977), Mourelatos (1978)

Actually, Kenny (1963) was the first one who ordered his classes partially. He made a split between verbs having non-continuous tense (States) and verbs having continuous tense (Activities and Performances). Somewhat anachronistically, one could say that Vendler partitioned the Performances and put the resulting class of Achievements in the category having non-continuous tense rather than making a simple differentiation in the set of Performances. In this sense, Kenny is much more faithful to Aristotle's division in Metaphysics IX 1048, pp. 18-35, who distinguishes States from 'Processes' and then subdivides these into 'Movements' and 'Actualities' (ed. Ross).

   Both Taylor and Mourelatos accept this partial ordering. Let us first introduce Taylor's tripartition in (30). I will give the definitions in a general quasi-formal dress to avoid explanation of Taylor's specific (Davidsonian) formalism:

(30)
   (a) *State:* if t is a period and φ is true at t is equivalent to saying that for all moments t' of t, φ is true at t';
   (b) *Energeia*: if φ is true at t, then t is a period and there is an

open-fronted interval *t'* to which *t* belongs at which *φ* is also true and for every subperiod *t''* of *t* *φ* is true.

    (c) *Kinesis*: if *φ* is true at *t*, then *t* is a period and there is no subperiod *t'* of *t* such that *φ* is true at *t'*.

The label 'E(nergeia)-verbs' is used to pertain to Activity verbs, whereas 'K(inesis)-verbs' pertain to Kenny's Performances. Both (30b) and (30c) begin with 'if *φ* is true at *t*, then *t* is a period'; together with the fact that the truth of *φ* is determined with respect to subperiods of *t*, this puts them in one category.

    However, Taylor sets out to modify (30) by subdividing the set of E-verbs into homogeneous E-verbs such as *fall, move, ponder, blush*, etc. and heterogeneous E-verb such as *walk, talk, chuckle, giggle*, etc. The former meet (30b), but the latter have to meet postulate (30b') in view of which (30c) is changed into (30c'):

(30)

    (b') if *φ* is true at *t*, then *t* is a period and there is a maximal period *p* (*t* is a subset of *p*) such that *φ* is true at *p* and there are minimal subperiods of *p* where *φ* is true and for all subperiods *p'* of *p* *φ is true* means that there is at least a minimal subperiod *p''* of *p'* at which *φ* is true

(30)

    (c') if *φ* is true at *t*, then *t* is a period and there is a maximal period *p* (*t* is a subset of *p*) such that *φ* is true at *p* and there are minimal subperiods of *p* where *φ* is true and for all minimal subperiods *p'* of *p*, there are (larger) proper subperiods *p''* of *p*, such that *φ* is not true at *p''*.

The definitions (30) do not require much explanation but perhaps the notion of 'minimal period' does: if *φ* is true for a minimal period *p*, there is no proper subperiod *p'* of *p* at which *φ* is true.

    The differentiation of the E-verbs into two subsets appears to me to involve more than just a subdivision as shown in Table IV. In his original analysis, Taylor offers a partial ordering along the line of Aristotle and Kenny. Thus, his modifications seem to lead to the same division, just adding a local subdivision shown in Table IVb: on this view E-verbs are


Table IV.
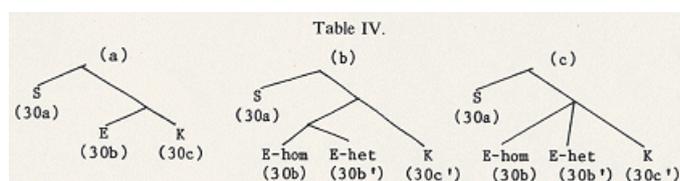
homogeneous and E-heterogeneity is just a form of homogeneity. E would be [-Heterogeneous] and K[+Heterogeneous]. However, there is another interpretation: by casting (30b') and (30c') in the same mould, Taylor can be argued to propose an ordering like Table IVc. In view of the analysis proposed in Verkuyl (1978) where homogeneity was treated as a gradual concept, I would like to interpret Taylor in this way, but I am not sure about it.

Which are exactly the parameters used by Taylor? As far as I can see, Taylor focussed on the opposition 'Interval vs. Moment': K- and E-predicates are true at intervals rather than at moments. That is, taking time is interpreted by him in terms of truth assigned to intervals rather than to progress in time, to moving along the time axis, to dynamicity or whatever metaphor can be used. In this sense, Taylor is part of a tradition invoked by Bennett & Partee (1972).

The second parameter is also part of this tradition. It applies only to non-States. The opposition involved concerns the question whether or not the truth of a predicate with respect to the whole interval carries over to parts of it. Of course, Vendler's Definiteness parameter is related to this opposition, but only secondary. In Taylor (1977), Mourelatos (1978), Ter Meulen (1983, 1984) the 'Homogeneity'-parameter is given a more dominant place than in Vendler, who stressed the necessity of having 'a set terminal point' (1967, p. 100), so that the time stretch can be located on the time axis. As I pointed out in Verkuyl (1978), homogeneity can indeed be accounted for as a secondary lexical parameter as part of the thematic analysis of verbs expressing change. But as such I see no room for it at the structural level, certainly not as a primary aspectual parameter. It is accidental that in the literature the philosophers have been focussed on homogeneity? It seems to me that homogeneity should be treated as an ontological category, that is, primarily at the lexical level.

As said, Mourelatos (1978) also focusses on the matter of homogeneity, though he relates this concept more straightforwardly to the distinction between Mass and Count. Essentially, Mourelatos does three things: (a) he merges Vendler and Kenny into one division of situational types; (b) he proposes a classification applying both to agentive and non-agentive cases: and (c) he coined very useful terms for situational types corresponding with sentences. His proposal is captured by Table V. The merger of Vendler and Kenny is more Kennyan than Vendlerian: the Kenny-tree of the form given in Table IVa is simply extended with Accomplishments and Achievements as subclasses of the performances. However, Mourelatos rightly undid Vendler's analysis from its agentive

H.J. Verkuyl, *'Aspectual Classes and Aspectual Composition'*
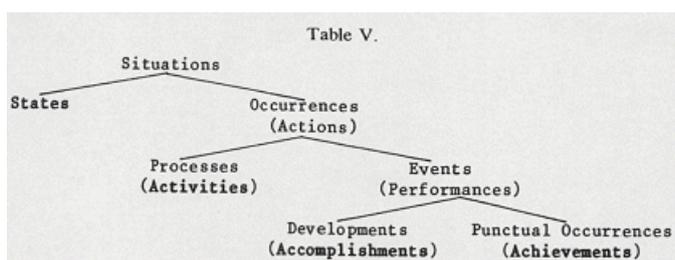
Table V.

bias by distinguishing supersets in which Vendler's non-States would fit as proper subsets. And finally, he proposed that the main partition in Table V involve States, Processes and Events, suggesting that the distinction between Developments and Punctual Occurrences is at least a secondary division.

It is interesting to see that Mourelatos focusses more on the Progress-parameter than Taylor: non-States *occur*, they take time, but in a more dynamic way. As far as Vendler's Definiteness-parameter is concerned, Mourelatos interprets this in terms of an opposition[± Count], where [+Count] is similar to Vendler's [+Definiteness], but [-Count] applies only to Processes. Mourelatos seems to concentrate on the quantification over temporal entities: events can be counted, processes cannot.

Table IIIb

	Occur (Process)	Count (Definite)	Punctual (Momentary)
State	-	Ø	Ø
Process	+	-	Ø
Development	+	+	-
Punctual Occurrence	+	+	+

Mourelatos' analysis can be compared with Vendler's by considering the Tables IIIa and IIIb. The striking difference is, of course, the value assigned to Achievements in the leftmost column of the two tables.

4.2. Dowty (1979)

Making them far more explicit, Dowty reproduced Vendler's criteria in a more linguistic fashion, presenting them in a very systematic and neat way. Though he sees many observational problems with respect to the criteria proposed by Vendler, Dowty ends up by accepting them as basically sound.

Dowty acted as a grammarian by trying to represent the aspectual classes, as he called the Vendler-classes, as part of grammar. He proposed a 'reductional analysis'. The analysis is reductional because Activity verbs, Accomplishment verbs and Achievement verbs are constructed out of one or more Stative predicates which directly underlie State verbs, and operators.

Extending Vendler's system, Dowty distinguishes agentive from non-agentive classes. He does so because he observed that many criteria given by Vendler have to do with agentivity, control, animacy or other agentive and quasi-agentive notions. But Dowty did not draw the conclusion I drew in Section 3, namely that the criteria given by Vendler are mixed up and that in this mixture they cannot be used to determine aspectual oppositions. They mix up agentivity and phasal constituency. However, agentivity is not essential to aspect, as I said earlier, even though it is a very important ingredient in most of the sentences expressing aspect due to the fact that we often talk about human or animate actions. Thus, Dowty adopts a 'broad perspective' by dealing with aspect in terms of both agentive factors and non-agentive temporal factors.

In this section I want to do two things. Firstly, I would like to describe how Dowty incorporates Vendler's proposal in his grammatical system. Secondly, I would like to show that the final aspectual classification offered by Dowty is in fact a major deviation from Vendler's quadripartition.

4.2.1. A reductionist analysis of aspectual classes.

Dowty's position with respect to the relationships between the aspectual classes, can be captured by the following characteristics:

(a) each verb can be represented as a propositional function containing (at least) one predicate which is assigned one or more arguments;
   (b) each stative verb can be taken as a stative predicate;
   (c) non-stative verbs are constructed from stative predicates and specific operators: *DO, BECOME*, and *CAUSE*.

The notion of stative predicate is primitive. Compared with predicates expressing change, they need only one point of evaluation. Those who are familiar with the thematic approach of Gruber (1976) or any localistic case theory will easily associate Dowty's notion of stativity with the notion of a Theme being in a Location.
   Change predicates need two points of evaluation: the location of a

Table VI.

State	$P(x_l, \ldots, x_n)$	
Activity	$DO(x_l, P(x_l, \ldots, x_n))$	
Accomplishment	CAUSE(BECOME $P(x_l, \ldots, x_n)$,	BECOME R $(y_l, \ldots, y_m))$
Achievement	BECOME $P(x_l, \ldots, x_n$	

Theme is checked at two points. Dowty does not deviate here very much from analyses of state and change such as in Jackendoff (1976), Verkuyl (1972, 1978), Platzack (1979), these all being based on the Von Wright-pTq-analysis of change, where change is taken as a transition from a state p to a state q (cf. also Kamp, 1980). Table VI shows how Dowty starts out to order the Vendler-classes with respect to each other. P and R are stative predicates. Restricting ourselves to the non-problematic part of Table VI, we should add that both Accomplishments and Achievements can occur non-agentively, as shown here, or they can be agentive. In that case, a predication of the form BECOME φ is extended to BECOME [DO(x_1, φ)], where φ contains x_1 as an argument holder.

Dowty gives exact modeltheoretic interpretations to structures of the form BECOME φ and CAUSE(φ, ψ). These represent a change structure: both involve two points of evaluation. Making some notational adaptations to cut out unnecessary information, I shall give these interpretations in (31a) and (31b), given Table VII.

Table VII.

_____

<div align="center">S   G</div>

(31)
   (a) *BECOME φ* is true at the interval (S, G) iff (a) φ is false at some interval containing S; (b) φ is true at some interval containing G and (a) and (b) do not hold for any proper subinterval of (S, G).
   (b) *CAUSE(φ, ψ)* is true at the interval (S, G) iff (a) φ is true at some interval containing S; (b) ψ is true at some interval containing G; (c) conditions (a) and (b) do not hold for any proper subinterval of (S, G); and (d) there is some causal connection between φ and *psi;*.

Clause (d) in (31b) is formulated far less precisely than in Dowty's exposition, but for my exposition no more detail is required.
   With respect to DO, Dowty remains very vague, to his own dissatisfaction. All he wants to say about it is that DO(x, φ) always represents a

relation between an agent x and a proposition φ such that φ is under the immediate control of x. However, the notion of immediate control is unclear as is the notion of agentivity.

It is important to observe that in Table VI the *DO*-predicate is inherent to the class of Activities, as indicated in Dowty's Aspect Calculus (p. 124), where no Activities without *DO* occur. Later on, however, Dowty allows for non-agentive Activity terms such as *make noise, rain, roll*, etc. without clearly correcting Table VIb.

As far as I can see the correction he makes has the following form. In discussing Taylor (1977), Dowty seems to adhere to a so-called Activity Postulate saying that Activities should be conceived of as a movement of some (Theme) x during some interval I such that x is at a location at the lower bound of I, say $Q(x)$ holds there, that differs from its location at the upper bound of I, where $-Q(x)$ holds (1979), pp. 168-9).[2] In other words, Activities too receive a sort of BECOME-analysis, which is also expressed by the Meaning Postulate 3 on page 362. I said 'a sort of', because there is a difference: BECOME p expresses a 'definite change', whereas the simple change from $Q(x)$ to $-Q(x)$ in the case of Activities is called 'indefinite change'. But it should be understood that Dowty is not very clear about this, as becomes clear if we compare (31a) with his remarks about the change from $Q(x)$ to $-Q(x)$. He does not come forward with an explicit representation of Activities after the one offered in Table VI. As to States, Dowty even allows for agentive State terms such as *sit, stand*, etc., without adding a *DO*-predicate to Table VIa. This takes away much of the attractive part of his analysis, as it is not clear how non-agentive Activities and agentive States should be represented. MP1 (p. 361) does not give any indication.

Anyway, Dowty distinguishes agentive and non-agentive subclasses of each of the four aspectual classes, which gives him eight classes. He also subdivides States into two subcategories by introducing an opposition 'Interval vs. Momentary' (pp. 173-80). This splits up the class of States: a subset of the State predicates, such as *know, be a hero, hate*, etc. is [+Momentary], whereas another subset containing *stand, lie, sit*, etc. is [-Momentary] together with non-States. However, habituals in all classes are [-Momentary].

4.2.2. A partial ordering of Dowty's aspectual classes.

Let us now consider the interrelationships between the classes. The basic division seems to be the one between States, which have just one point of evaluation, and non-States which have two points. This distinction is given its shape by the absence or presence of the operators DO, BECOME and

Table VIII.
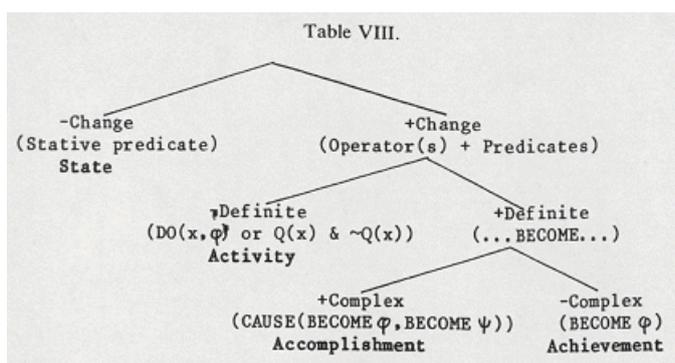
CAUSE. Note that Dowty assigns two points of evaluation to Achievements, thus changing the minusvalue in Table IIIa into a plusvalue, just like Mourelatos. Thus, he seems to do what everybody has done: to distinguish between Progress/Occurrence/Taking time/Change and Interval/Period. His idea seems to be that processes going on in time are changes, but that the concept of change between two points of evaluation cannot be equated with the concept of the length of a stretch between two points.

The second division involves the parameter Definiteness: a change can be indefinite. In this case an agent relates to a stative predication, or there is a $Q(x)$ to -$Q(x)$ transition, if we follow MP 3, as pointed out earlier. Definite changes are characterized by their having a BECOME-operator, which makes the interval of change closed. Dowty's Definiteness-parameter does not deviate crucially from Vendler's.

The third division involves the presence or absence of CAUSE together with BECOME, which is also maintained in the later revision, as can be seen in MP4. Accomplishments require that these two operators go together, which accounts for the label [+Complex] to characterize this class, Achievements being Singularly or [-Complex]. The resulting classification has the structure of a partial ordering as can be seen in Table VIII which is constructed from three of the 'five partially cross-classifying semantic distinctions' underlying Dowty's final scheme that is seen by him as a revision of Vendler's Verb-classification (p. 184).

It does not incorporate the agentivity parameter, but it is easy to double Accomplishments any Achievements as I have indicated: any ψ of the form *BECOME φ* can be taken as the second argument of a *DO(x, ψ)*-predication. And according to Dowty, States and Activities can be doubled as well.

Dowty considers the fifth parameter a major one: in his view it opposes momentary States to interval States and to non-States and it opposes habituals from processes and events actually taking place. The criterion used to support the distinction, is ProgF. Predicates that are positive, are [-Momentary]. Though Dowty accepts the Progressive Form in *She is knowing that*, he does only so at the Carlsonian 'stage level'; that is, to express some very ephemeral state of knowledge. It cannot apply to her at the object-level, say to the body of knowledge that is stored in her memory. Recall our *The village was lying in the valley*-example in Section 3.2.

However, 'habituals' - as Dowty calls them - in all classes are negative to ProgF: one cannot say *The ball is rolling* or *He is drawing a circle* to describe a habitual disposition of some body or somebody. Thus, on his own account, the division between state (token) and object (type) runs through all categories, since 'habituals' are situations taken at their object-level. Hence, on this account the Momentary parameter subdivides each aspectual class and it is unnecessary to incorporate them in Table VIII.

As far as I can see, the Momentary-parameter does only pertain to durative aspect. In the Slavonic literature, it appears as the distinction between several ways the imperfective aspect can manifest itself (cf. Forsyth 1970). Thus, though the opposition between an actualized and a habitual process (= state) asks for an explanation, it does not bear on the opposition between terminative (perfective) aspect and durative (imperfective) aspect.

If we leave out agentivity, Dowty's final position can be represented as in Table IIIc. Mourelatos and Dowty do not really differ very much as far as the first three columns are concerned. The fourth column of Table IIIc represents the unclarity of Dowty's position. The left column reflects his scheme on page 184, the right one the explanation of the parameter on the same page. In the former case, the Momentary parameter requires the matrix in Table IIIc, but note that it is a strange matrix, having neutral values due to a partially ordered substructure. In the latter case, Dowty's position is the one given in Table VIII.

Table IIIc.

	Change	Definite	Complex	(Momentary)	(Momentary)
State	-	Ø	Ø	+/-	+/-
Activity	+	-	Ø	-	+/-
Accomplishment	+	+	+	-	+/-
Achievement	+	+	-	-	+/-

4.3. The Explanatory Value of Dowty's Aspectual Classes

The classification of predications in Table VI tends to enrich Dowty's descriptive potential considerably. It must be acknowledged that he presented one of the most detailed and precise grammars of the English verbal system thus far. Whatever its merits may be, the question must be raised whether the incorporation of the Vendler-classes in his grammar provided it with more explanatory value than it would have without them.

I think it does not. The places to look for are sections in which each of the classes is used to explain certain aspectual phenomena assuming a one-to-one relation between an aspectual class and a certain aspectual phenomenon that asks for an explanation. There are no such places.

I shall clarify this point. In aspectual theory, the difference between the a- and b-sentences of (32)-(34) must be explained:

(32)
    (a) John slept for an hour.
    (b) *John slept in an hour.

(33)
    (a) John awakened in an hour.
    (b) #John awakened for an hour.

(34)
    (a) #John discovered the treasure in his yard for six weeks.
    (b) John discovered treasures in his yard for six weeks.

Dowty (1979, pp. 332-6) gives a very precise formal description of sentences like (32a) and (33a), which I shall represent here by giving the exact paraphrases:

(32)
    (a') There is a time t (an interval) in the past and at that interval t which is an hour, it is the case that for all subintervals t' of t it was true that John slept at t'.

(33)
    (a') There is a time t (an interval) in the past and at that interval t which is an hour, it is the case that there is a unique subinterval t' at which John becomes awake.

Dowty admits that that there are problems with (32b) because this sentence seems to have an inchoative reading which might require there to be two verbs *sleep*. But leaving that problem aside, one can say that, in their formal dress, the representations (32a') and (33a') reach a level of descriptive adequacy which beyond any doubt exceeds competing analyses. However, Dowty says:

> Thus the semantics given here for *for*-adverbials and *in*-adverbials explain why *for*-adverbials are appropriate for states and activities (i.e. both these classes of predicates are

true of most or all subintervals of the interval of the predicate's truth) but not for accomplishments and achievements (since they are 'non-subinterval predicates') and, conversely, why *in*-adverbials are appropriate for accomplishments and achievements (since they can satisfy the 'uniqueness' requirements in the semantics of *in*) but not for activities and states (except with the inchoative reading just mentioned) p. 336.

This passage shows clearly that Dowty appeals to a division between Activities and States on the one hand, and Accomplishments and Achievements on the other. But we have seen from Tables V and VIII, that Activities and States do not form a natural class. Table II shows that the division itself can be made without any appeal to Vendler-classes at all. So, again we are in a situation where aspectual phenomena do not call for Vendler-classes.

The sentences in (34) are discussed by Dowty. He explains the difference along the following lines, staying unclear about the representation of (34a). But the idea seems to be that there is no quantifier, because *the treasure* is a definite description. The durative interpretation of (34b) is explained in terms of scope. Dowty is quite explicit at this point, saying: 'There may be reason to assume that indefinite plurals and mass nouns are to be logically represented as variables whose binding existential quantifier lies within the scope of the time quantifier or the surface sentence in which they arise' (ibidem). Thus he assigns (34a) the logical form (34a') and (34b) the logical form (34b'):

(34a')
   $(\forall t: t \in 6 \text{ WEEKS})$ AT $(t, \text{BECOME[John knows,}\dots])$.
   (34b')
   $(\forall t: t \in 6 \text{ WEEKS})$ $(\exists x)$ [AT $(t, \text{BECOME[John knows, }\dots, x, \dots])$].

Since the existential quantifier in (34b') is in the scope of the universal quantifier, 'the value for *x* may differ from one *t* to the next and indeed will have to avoid contradiction' (p. 80).

I have severe difficulties with this explanation. First of all, Dowty is wrong in opposing Indefinites (and Mass Nouns) to Definites, as shown by the following sentences:

(35)
   (a) For hours Judith ate sandwiches.
   (b) #For hours Judith ate three sandwiches.

(36)
   (a) He discovered cockroaches for hours.
   (b) #He discovered some cockroaches for hours.

(37)
   #He heard for hours that John is ill.

In sentence (35b), the NP *three sandwiches* is indefinite, but yet it pertains to a specified quantity of sandwiches. Dowty would be forced to analyze (35b) analogously to (34b), which is wrong, because (35b) is on a

par with (34a). The same applies to indefinite NPs such as *some cockroaches*, in (36b). The very notion of Definiteness as an aspectual feature can be proven to be wrong if one observes that embedded sentences like *that John is ill* cause repetition, when combined with verbs like *hear*. Would Dowty say that *that is ill* is [+Definite]? Are there indefinite clauses?

Facts like these were observed and discussed extensively in Verkuyl (1972, pp. 54-73), but it took a while before I was able to semantically characterize the factor 'Specified Quantity of A' beyond saying that it pertains to the finite amount of sandwiches in (35b), the finite amount of cockroaches in (36b) and the finite amount of information in (37). But in Verkuyl (1987a), I think, a rather precise definition is given of the factor at issue and it is clear that this semantic factor contributing to terminative aspect has nothing to do with Definiteness in Dowty's sense. I will come back to it in Section 6.

In the latter paper, I have also shown that in Dutch the position of durational adverbials like *een uur lang* (for an hour) in S-structure can influence aspect.

(38)
   (a) ?Een uur lang fotografeerde hij veel kinderen
   ?For an hour he photographed many children

(b) #Veel kinderen fotografeerde hij een uurlang
   #Many children he photographed for an hour

Sentence (38a) does not make much sense in Dutch nor in English. It cannot mean that he photographed many individual children repeatedly, whereas (38b) has a forced repetitive reading: from a set of children there were many which were photographed repeatedly. The same scope differences occur with *de meeste* (most of the), *enkele* (several), *alle* (all), etc. They do not occur with quantified NPs such as *dat glas* (that glass), *de drie glazen* (the three glasses), etc. I have no explanation for this fact, but it ruins Dowty's proposal because Dowty puts durational adverbials only in front of the representation to obtain the (for him) proper scope.

4.4. Conclusion

The above considerations show, I think, that the incorporation of Vendler-classes in the grammar given in Dowty (1979) did not pay off. It caused more problems than it solved and it did not contribute to the explanatory power of his aspectual theory. More generally, I have the feeling that all the proposals discussed in this section suffer from the

partial ordering they imposed on situational types: States are separated from non-States, thus severing a natural aspectual tie between States and Activities (Processes), namely that they are durative.

I would like to add that in Dowty (in preparation) there is in this respect an important difference with Dowty (1979): he accepts a hinge ordering as in Table ID rather than the partial ordering in Table VIII or the ordering in Table IIIc. It is my impression that Dowty must always have had this view, but that the incorporation of Vendler-classes in his grammar simply blocked it, as can be deduced from Table VIII and Table IIIc.

5. Generalized quantification and temporal structure

In this section I shall discuss two proposals trying to accommodate the four Vendler-classes by appealing to the theory of generalized quantification as developed by Barwise and Cooper (1981), Keenan and Stavi (1986), Van Benthem (1983), Zwarts (1981, 1983), among others. They differ in their treatment of the Vendler-classes: Ter Meulen (1983, 1984) orders them hierarchically, as illustrated in Table IC, whereas Hoeksema (1984) follows Vendler by giving a cross-classification, as in Table II. In Section 5.1, I shall first discuss some aspects of the theory of generalized quantification to facilitate the comprehension of the proposals at issue, proceeding then to discuss Ter Meulen in 5.2 and Hoeksema in 5.3.

5.1. Temporal Structure

Both Ter Meulen and Hoeksema extend the application of the theory of generalized quantification in such a way as to include temporal phenomena. In the non-temporal domain this theory treats the interpretation of an NP having the syntactic form [Det *N*] as a collection of sets. Set-theoretically this means a second order analysis: an NP like *both children* does not pertain to two individual children in a given domain, but to a set containing all the sets containing two children. Likewise, *several children* has as its interpretation a collection of all sets X such that the intersection of X and the set of children in the domain contains at least two children. If the interpretation of N in [Det *N*] is a set A, (39) contains some general definitions of atemporal quantifiers in a more formal dress, assuming, as in Barwise and Cooper (1981) and in De Jong and Verkuyl (1985), interpretations to be partial rather than total:

(39)

(a) [both](*A*)	= {*X* ⊆ *E*: *A* ⊆ *X*} Presupposition: |A| = 2
(b) [all](*A*)	= {*X* ⊆ *E*: *A* ⊆ *X*} Presupposition: |A| ≥ 1
(c) [the (sg)](*A*)	= {*X* ⊆ *E*: *A* ⊆ *X*} Presupposition: |A| = 1
(d) [several](*A*)	= {*X* ⊆ *E*: |A ∩ *X*| ≥ 2}
(e) [no](*A*)	= {*X* ⊆ *E*: *A* ∩ *X* = Ø}
(f) [exactly](*A*)	= {*X* ⊆ *E*: |A ∩ *X*| = 2}

Suppose we have a model consisting of a set of individuals *E* and an interpretation function [ ], where *E* = {*a, b, c, d*}, *B* = {*a, b, c*} and *C* = {*d*}. Then the following interpretations would hold for *E*:

(40)

(a) [both](*B*)	= uninterpretable because *B*| = 3
(b) [all](*B*)	= {{*a, b, c*}, {*a, b, c, d*}}
(c) [the](*C*)	= {{*d*}, {*a, d*}, {*b, d*}, {*c, d*}, {*a, b, d*}, {*a, c, d*}, {*b, c, d*}, {*a, b, c, d*}}
(d) [several](*B*)	= {{*a,b*}, {*b, c*}, {*a, c*}, {*a, b, d*}, {*a, c, d*}, {*b, c, d*}, {*a, b, c*}, {*a, b, c, d*}}
(e) [no](*B*)	= {Ø,{*d*}}
(f) [exactly 2](*B*)	= {{*a, b*}, {*a, c*}, {*b, c*}, {*a, b, d*}, {*a, c, d*}, {*b, c, d*}}

Generalized quantifiers are distinguished from one another in a quite systematic way. For example, there is a clear difference between (39a)-(39d) on the one hand and (39e) on the other. The former belong to the family of so-called monotone increasing quantifiers, which meet the following (equivalent) conditions:

(41)
(a) ∀*X, Y* ⊆ *E*, (*X* ∈ *Q* & *X* ⊆ *Y*) → *Y* ∈ *Q*
(b) ∀*X, Y* ⊆ *E*, *X* ∩ *Y* ∈ *Q* → (*X* ∈ *Q* & *Y* ∈ *Q*)

One can easily check this. Monotone increasing quantifiers always have *E* as a member. Quantifiers like (39e) are monotone decreasing. They meet conditions (42a) and if they meet it, they have also the property of closure under finite intersection in (42b):

(42)
(a) ∀*X, Y* ⊆ *E*, (*X* ∈ *Q* & *Y* ⊆ *X*) → *Y* ∈ *Q*
(b) ∀*X, Y* ⊆ *E*, (*X* ∈ *Q* & *Y* ∈ *Q*) → *X* ∩ *Y* ∈ *Q*

Proper quantifiers are characterized by their not being empty or being the power set of E: they must select a proper nonempty subset of the power set of E (cf. B & C's notion of sieve). Given some reasonable provisions with respect to properness, monotone decreasing quantifiers can be argued to be characterized by their containing the empty set Ø (De Jong and Verkuyl 1985, 25 ff.), whereas monotone increasing

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quantifiers do not contain $\emptyset$. The quantifier in (39 f) is neither monotone increasing nor monotone decreasing.

There is a further split: (39a)-(39c) can be distinguished from (39d) by meeting both (41b) and (42b). Thus, they can be regarded as filters which are defined as their conjunction:

(43)
$\forall X, Y \subseteq E, (X \in Q \,\&\, Y \in Q) \leftrightarrow X \cap Y \in Q$

There is one further refinement: (39c) is called an ultrafilter. It not only meets (43), but also meets the condition that for all $X \in Q$ the complement of x is not a member of Q. Nps that are interpreted as ultrafilters are considered uniquely referring expressions, such as (40c) or proper names. Though further refinements can be made, this explication should suffice here.

5.2. Ter Meulen (1983, 1984)

Ter Meulen assigns to all verbs of a language a set of processes: 'primitive, unstructured chunks of the temporal domain' (1983, p. 179) from which VP-interpretations are constructed, which are intervals and moments. She characterizes the four Vendler-classes at the VP-level by interpreting every VP as a set of subsets of $P([VP] \subset POW(P))$, where P is the set of processes p partially ordered by a strict precedence relation $\leq$. A process p_1 is part of p_2 ($p_1 \leq p_2$) if p_1 is located in the partial order on P within the 'bounds' of p_2: a day is a part of a week; writing the letter p is part of writing the word *part*, etc.

Table IX shows how Ter Meulen conceives of the relationships between the Vendler-classes, where $X \subseteq P$:

Table IX.

State	a. $\forall x \in X\ \forall y \in P\ (x \leq y \rightarrow y \in X)$
Activity	a. $\forall x \in X\ \forall y \in P\ (x \leq y \rightarrow y \in X)$
	b. $\forall x, y \in X\ \exists z \in X\ (z \leq x \,\&\, z \leq y)$
Accomplishment	a. $\forall x \in X\ \forall y \in P\ (x \leq y \rightarrow y \in X)$
	b. $\forall x, y \in X\ \exists z \in X\ (z \leq x \,\&\, z \leq y)$
	c. $\forall x \in X\ (x = x_1 \cup x_2 \rightarrow$ either $x_1 \in X$ or $x_2 \in X)$
Achievement	a. $\forall x \in X\ \forall y \in P\ (x \leq y \rightarrow y \in X)$
	b. $\forall x, y \in X\ \exists z \in X\ (z \leq x \,\&\, z \leq y)$
	c. $\forall x \in X\ (x = x_1 \cup x_2 \rightarrow$ either $x_1 \in X$ or $x_2 \in X)$
	d. $\exists x \in X\ \forall y \in P\ (x \leq x \rightarrow y \in X)$

Let us have a brief look at Table IX. States are defined as monotone increasing. Activities are on a par with structures having the same

properties as [*several N*] in (39d), and (44):

(44)
$$Q_A = \{\{b\}, \{a, b\}, \{a, b, c\}, \{b, c, d\}, \{a, b, c, d\}\}$$

This means that they are weaker than filters: (44) is not closed under finite intersection, because $\{b, c\}$ is not an element of Q_A. Again, there is not one argument explaining why or making it plausible that Activities should be weaker than filters.

Condition *c* leaves structures like (39d) behind, but it still allows for (44). Thus, Accomplishments do not quite meet the requirements for filters. Condition *d*, an existential version of monotone decrease, makes Achievements filters, but also ultrafilters.

From a classificatory point of view Ter Meulen offers a highly suspicious quadripartition: the classes are not mutually exclusive. Achievements are Accomplishments, both Achievements and Accomplishments are Activities, and Achievements, Accomplishments and Activities are States. I said 'highly suspicious' because I cannot get rid of the thought that the classification in Table IX is simply modelled after the hierarchy of generalized quantifiers discussed in Section 5.1 where ultrafilters are filters which are monotone increasing structures. That a classification has this rather peculiar sort of structure should evoke skepticism which can only be taken away by forceful empirical argumentation.

My skepticism is not taken away: I have three sorts of objections to make. Firstly, there is hardly any linguistic argumentation for Ter Meulen's division. Secondly, the idea of an hierarchy can be shown to be wrong in view of the negation of non-States, and thirdly the classification does not explain anything.

As to the first objection, there is no linguistic problem that can be solved by Ter Meulen's definitions. The scarce evidence adduced is based upon entailment. In defense of her definition of States as monotone increasing structures she says that (45a) holds (1984, p. 267):

(45)
   (a) John was ill last week $\vDash$ John was ill on Wednesday.
   (b) John was ill on Wednesday $\nvDash$ John was ill last week.

However she also says: 'if some state holds in a part of a temporal domain p_1, it continues to hold in p_2, that has p_1 as part' (1983, p. 180). This is a rather unclear formulation. It looks as if Ter Meulen is defending here the validity of (44b) which she probably will not do if *last week* is to mean 'the whole week that preceded this one'. Presumably Ter Meulen means that if John was ill last Wednesday, then one can say that John was ill *during* some time last week. What she really seems to be saying is that if something holds at a certain time, it will also hold as part

of a larger period. But this holds for non-States as well. If I say that his car hit that pole on the 18th of March 1985, then his car hit that pole in 1985 and in the eighties of this century, and so on. Is persistency, then, what States are about?

Galton (1984) makes it clear that 'the distinction between states and events is not a distinction inherent to what goes on, but rather a distinction between two different ways we have of describing it' (1984, p. 24). In this context he observes: 'a state is *dissective* in the sense that any stretch of time in which a particular state obtains can be broken down into substretches in each of which that state holds' (1984, p. 24), an opinion also held by Vendler, Taylor (1977), and Hoeksema (1984). That is, the view upon states is 'downward', as in (44a); that is, monotone decreasing.

Why is it increasing in Ter Meulen's view? I think, because she has been caught by the prima facie attractiveness of 'filtering down' to an ultrafilter. Her analysis is primarily preoccupied with the notion of homogeneity, a notion which is only relevant to non-States. Activities are relatively homogeneous, condition c makes Accomplishments more heterogeneous, because it says that no part of a set of processes X has the same structure as X. Condition d is simply putting a heavier constraint on this by requiring that X is not divisible. In this sense, Ter Meulen is close to Taylor (1977). However, by her wish to 'filter all the way down' from States to Achievements, she is forced to define States in such a way that condition a in Table IX carries over to Activities.

The second type of objection is the following. As observed in Verkuyl (1972) negation of nondurative aspect blurs the very distinction between nondurative and durative aspect, as shown in:

(46)
   (a) She has lived there for years.
   (b) She has not run for years.
   (c) She has not eaten one single sandwich for days.
   (d) She has not won for months.

This fact brings Ter Meulen into severe problems, because if monotone increase is part of non-States, then negation of these three classes cannot result in monotone increase. One may rather expect monotone decrease. This is a problem for all classifications discussed thus far.

Finally, Ter Meulen's proposal lacks any explanatory value. It does not contribute to a better understanding of what aspect is about. None of the four classes is used to explain a linguistic phenomenon. And if so, then one starts to be puzzled. For example, Ter Meulen (1984, p. 270) points out that 'conjunction and disjunction of indivisible entities have all the

expected Boolean properties:

(47)
   John and Peter walk to school ⊨ John walks to school and Peter walks to school.

(48)
   John walked to school ⊨ John or Peter walked to school'.

If *walks* in (47) is read as *walked*, (47) surely is valid. But if one drops *to school* in this entailment to obtain Activities, its validity will not change. And if one adds *like to* before the verb *walk*, to get a State, the entailment still holds.

   My conclusion is that Ter Meulen's proposal fails to make clear why a Vendler-classification based on hierarchy in this way could possibly be of interest for aspectual theory.

5.3. Hoeksema (1984)

Hoeksema's enterprise can be characterized as an attempt to give an exact interpretation of Vendler's cross-classification in Table III. There are terminological differences: [±Definiteness] is taken as [±Count], [±Process/Interval] as [±Duration]. Hoeksema assumes models containing a set I of individuals, a set W of so-called possibilities (actual and possible events) and a set $E - (W \cup I)$ of quantities. The summation operation + is defined on $E - (W \cup I)$ and on W giving join-semilattices $(x + x = x; x + y = y + x; x + (y + z) = (x + y) + z)$. The corresponding partial order is defined by assuming that $x \subseteq y$ holds iff $x + y = y$. Given these provisions, Hoeksema defines four features as in (49), where $X \subseteq W$:

(49)
   -Count: $\forall x, y \in W ((x \in X \& y \in X) \to x + y \in X)$
   + Count: $\forall x, y \in W ((x \in X \& y \in X) \to x + y \notin X)$
   -Duration: $\forall x, y \in W ((x \in X \& y \subseteq x) \to y \in X)$
   + Duration $\forall x \in W ((x \in X \to \exists y(y \subseteq x \& x \nsubseteq y))$

which square as shown in Table X.

Table X.

State	**Activity**
[-C] $(x \in X \& y \in X) \to x+y \in X$	[-C] $(x \in X \& y \in X) \to x+y \in X$
[-D] $(x \in X \& y \subseteq x) \to y \in X$	[+D] $x \in X \to \exists y (y \subseteq x \& x \nsubseteq y)$
Achievement	**Accomplishment**
[+C] $(x \in X \& y \in X) \to x+y \in X$	[+C] $(x \in X \& y \in X) \to x+y \in X$
[-D] $(x \in X \& y \subseteq x) \to y \in X$	[+D] $x \in X \to \exists y (y \subseteq x \& x \nsubseteq y)$

The [-Duration] feature for States seems plausible, certainly in the light of what I said in Section 5.2. It provides for monotone decrease, whereas [-Count] adds the so-called property of closure under finite union: if two sets are members of X, their union is also a member of X. However, monotone decrease is equivalent to (50a):

(50)
  (a) $x + y \in X \rightarrow (x \in X \ \& \ y \in X)$
  (b) $(x \in X \ \& \ y \in X) \leftrightarrow x + y \in X$

By the conjunction of (50a) and [-Duration], States are required to meet condition (50b), which makes them Ideals (cf. Zwarts 1981). Ideals are the monotone decreasing counterparts of filters. I do not know if Hoeksema is aware of this result of conjoining [-Count] and [-Duration]. He does not comment on it.

As to Activities, [-Count] allows that $\emptyset$ be a member of X. What [+Duration] amounts to is saying that $\emptyset$ may not be a member of X. So [+Duration] seems to have the effect of eliminating $\emptyset$. However, if one required, as in De John and Verkuyl (1985), that $\emptyset$ not be an element of a monotone increasing X, in order to eliminate improper structures, the impact of the feature [+Duration] on [-Count] would be empty. To my knowledge, Hoeksema (pers. comm.) wants to have his structures acting as sieves.

As to Accomplishments, the interaction of the features [+Count] and [+Duration] also raises problems. [+Count] allows only for non-monotone structures like (39 f), but [+Duration], in order for it to be of any use, presupposes monotonicity. I shall demonstrate this point. Suppose $x \in X$ and $y \subseteq x$ and $y \in X$. Then, of course, $x + y \in X$, because if $y \subseteq x$, $x + y = x$ and $x \in X$. Suppose now, that $x \in X$ and $y \subseteq x$, and $y \notin X$. Then there are three possible situations: $|x| > 1$ or $|x| = 1$ or $|x| = 0$. If $|x| > 1$, then [+Duration] is empty, because all sets having two members meet it; the same applies to $|x| = 1$, because $\emptyset \subseteq x$, and $|x| = 0$ is excluded by [+Count] because any summation of $\emptyset$ with an element of X is element of X. Thus, I conclude that [+Duration] is unnecessary as it operates trivially.

The same applies to Achievements. Again, [+Count] requires a non-monotone structure, which excludes any structure of the form $x \in X \ \& \ y \subseteq x$, as shown in the previous paragraph. But this means that the antecedent of [-Duration] is always vacuous, making the consequent always (trivially) true.

Apart from the above objections it is also hard to see how the negation of Activities, Accomplishments and Achievements would be on a par with States. Hoeksema does not seem to offer a promising route, because

the very nature of a cross-classification seems to prevent negation from bringing us from three of the squares of Table X to the fourth one. In addition to this, it sould be observed that the negation of [-Count] as defined in (49) is not [+Count], and the same applies to the negation of [-Duration].

Finally, there are some other objections that can be made. One of the virtues of Hoeksema's approach is that he set out to explain certain linguistic regularities in Dutch morphology in terms of his classification. The suffix -*ing* in Dutch differs from the prefix *ge*- aspectually as shown in (51) and (52):

(51)

*de leving (the living)	State
de wandeling (the walk)	Act
de ontmoeting (the encounter)	Acc
de ontploffing (the explosion)	Ach

(52)

*het geblijf (the staying)	State
het geren (the running)	Act
*het gebouw van een huis - the building of a house	Acc
*het gewin van de race - the winning of the race	Ach

However, as shown by the asterisks, the modeltheoretic explanation of this phenomenon has to appeal to sets of classes, that is, to the parameters involved rather than pairs of features. In the case of -*ing* the generalization is that its interpretation is a function whose domain is restricted to Accomplishments, Achievements and Activities 'with definite endpoints', a notion not properly defined. Given the fact that 'with definite endpoints' is incompatible with [-Count], the generalisation seems to be that the domain is open to [+Count] structures. In the case of *ge*-, the interpretation function in question is restricted to Activities, that is, to the feature [-Count], as I tried to make clear.

In my view, the empirical data can be accounted for without an appeal to the cross-classification in Table X. On the contrary, this classification seems to prevent a better understanding of the phenomena at issue, because it suggests that the Vendler-classes are of explanatory value, whereas it turns out to be the case that at best some of the features from which they are constructed contribute to the appropriate generalisations.[3]

5.4. Conclusion

My conclusion is that Ter Meulen's proposal does not make clear why she appeals to Vendler-classes. Hoeksema's proposal is an interesting

attempt but as could be predicted from the failure of Vendler's own cross-classification, it fails because it is not classes that contribute to generalizations.

6. Aspect construction

In this section, I shall discuss the principles underlying the 'hinge ordering' in Table II. The basic idea is that it is possible to explain the aspectual behaviour of terminative sentences with the help of two aspectual parameters, provisionally called A and B, but that these parameters can be used to define the three situational types that are distinguished in Table II: States, Processes and Events.

This idea has been developed gradually in a compositional aspectual theory (CAT), on the basis of Verkuyl (1972, 1976), where CAT was formulated rather impressionistically in the generative framework. Meanwhile CAT has extended its scope so as to include modeltheoretic tools, because it had become clear that the generative framework could not deal satisfactorily with the essentially semantic aspectual phenomena (Verkuyl 1978, 1987a, 1988, 1987b). In terms of Table II, this means that features like A and B are given modeltheoretic interpretations in order to provide for explanatory power. These interpretations turn out to play a crucial role indeed in the explanation of the aspectual behaviour of sentences.

The presentation of CAT will proceed step by step to facilitate its exposition. I shall first give some examples which make it possible to show the 'aspectual algebra' involved at the syntactic level. I still use A and B because Table II is taken as the point of departure for the description of the sentences in (53):

(53)

(a) She	(+B) played	(+A) that sonata	(+B) terminative
(b) She	(+B) played	(+A) sonatas	(-B) durative
(c) She	(+B) hated	(-A) that sonata	(+B) durative
(d) She	(+B) hated	(-A) sonatas	(-B) durative
(e) Soldiers	(-B) played	(+A) that sonata	(+B) durative
(f) Adults	(-B) hated	(-A) that sonata	(+B) durative
(g) Nobody	(-B) hated	(-A) sonatas	(-B) durative
(h) She	(+B) didn't play-	(+A) that sonata	(+B) durative

This 'algebra' is syntactic in so far it is syntactic constituents that carry the semantic information expressed by A and B. It can be seen that both the verb and the NPs are taken as aspectual carriers.

As observed earlier, (53a) is the only terminative sentence in this set;

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the others are durative. This can be explained by assuming that terminative aspect can be assigned if and only if all features involved have a plus-value. In Verkuyl (1988) it is argued at least that aspect formation proceeds asymmetrically: in (53a) the [+A] of the verb takes the [+B] of the direct object to yield a terminative VP-feature, [+T], which combines with the subject-NP to yield the sentential terminative value [+T'], if and only if the subject is [+B]. The other sentences are durative, for different reasons: (53b)-(53d) due to minus-values in the VP, whereas (53e)-(53g) have subject-NPs with a minus-value. In (53h) the negation element can be taken to turn the [+A]-value of (53a) into [-A]. The facts in (53) are accounted for by (54):

(54)
  VP-aspect:

([+A]+[+B])→[+T]	(53a/e)
([+A]+[-B])→[-T]	(53b)
([-A]+[+B])→[-T]	(53c/f/h)
([-A]+[-B])→[-T]	(53d/g)

S-aspect:

([+B]+[+T])→[+T']	(53a)
([+B]+[-T])→[-T']	(53b/c/d/h)
([-B]+[+T])→[-T']	(53e)
([-B]+[-T])→[-T']	(53f/g)

This asymmetrical treatment of aspectual composition distinguishes CAT quite substantially from the theories discussed earlier in this paper. In terms of the Tables I and II, the aspectual algebra in (54) provides for the following characterization of situational types:

(55)

[+B]+([+A]+[+B]): (terminative) event	(53a)
[+B]+([+A]+[-B]): process	(53b)
[-B]+([+A]+[+B]): process	(53e)
[+B]+([-A]+[+B]): state	(53c/h)
[+B]+([-A]+[-B]): state	(53d)
[-B]+([-A]+[+B]): state	(53f)
[-B]+([-A]+[-B]): state	(53g)

That is, aspect construal bears on the way we look at things while using language. Scheme (55) underlines the importance of Galton's statement that the distinction between aspectual classes is not a 'distinction inherent in what goes on' (1984, p. 25), but rather a distinction between the different ways we have of describing it.

Thus it is important to see that the choice of a [-A]-verbs always brings about states. If someone

chooses a [+A]-verb, the information associated with the NPs determines whether he ends up with describing a process or a state.

Now, what are A and B? What is their status and what is their interpretation? The first (somewhat impressionistic) answer was given in Verkuyl (1972) where A was interpreted as a semantic predicate assigned lexically to verbs expressing change, a going through time of entities involved in the predication:[4]

> hellip; we could say that moving from some point P_i to another point P_j, where the distance between P_i and P_j is the interval (P_i, P_j), can also be conceived in terms of the predicate 'ADD TO'. If someone is walking at P_m, where $P_m \in (P_i, P_j),\ldots$, we can say that he is adding some distance measuring units to the interval (P_i, P_{m-1}). It is not possible to use the sentence *Hij wandelt nu* (He is walking now) if he is at P_i. (1972, pp. 95-6)

In terms of features, this 'predicate' is taken as a lexical feature [+ADD TO] assigned to verbs like *play, lift, hit, walk*, etc. to distinguish them from verbs like *hate, believe*, etc. [+ADD TO] is rather close to Vendler's [+Process]. Recall from Section 3.2 that Vendler characterized processes as consisting 'of successive phases following one another in time'. This definition is too vague, however, to say that [+ADD TO] is essentially Vendler's [+Process]. Anyhow, [+ADD TO] will be interpreted in terms of a function which is akin to the successor's function used in the so-called Principle of Mathematical Induction which defines natural numbers by stating (a) $0 \in \mathbf{N}$; (b) if $n \in \mathbf{N}$, then $n + 1 \in \mathbf{N}$. I shall return to this interpretation shortly.

As far as the nominal feature is concerned, Noun Phrases are either [+SQA] or [-SQA], where SQA stands for 'Specified Quantity of A' and where A is the interpretation of the Noun Phrase, as pointed out in connection with (35)-(37) in Section 4.3. [+SQA] is formed compositionally on the basis of information contained by the Determiner and by the Noun. The following is a (short) list just to show that many different quantifying expressions are captured by the distinction between the two composite values. In (56) all the NPs are [+SQA], in (57) they are [-SQA].

(56)
   (a) A man from Boston lifted four tables.
   (b) This car was stolen by his cousins.
   (c) The patients here died of jaundice.
   (d) Several pages and some illustrations were missing.
   (d) Many children drank a litre of water.
   (e) All glasses here were broken by some thief.

(57)
   (a) None of the men lifted tables.
   (b) Glasses of whisky were stolen.

(c) The patients here died of jaundice.
  (d) Thieves have stolen gold.

Sentence (56c) is taken to pertain to a finite set of patients, whereas *the patients here* in (57c) is interpreted as 'whoever was patient here, he or she died of jaundice' (cf. Verkuyl 1972, 1987 for an extensive discussion of cases like these).

   [+SQA] is not an independent feature of the NP itself. Let us stipulate that in an NP of the form Det N, $A = ||N||$. Given a set A in the domain of discourse, [+SQA] pertains to a specified quantity, a subset of A, say to $A^{\#}$, where $A^{\#} \subseteq A$. For example, in *lift four tables* the noun *table* refers to a given set in the domain of discourse E, whereas the NP itself refers to subsets of this set containing four tables. $A^{\#}$ pertains to a set containing four tables which is involved in the lift-prediction. In the theory of generalized quantification Determiners can be seen as relating sets (cf. Zwarts, 1983). That is, given an NP of the form [Det N] interpreted as [Det](A) and a verb V pertaining to a set B, a specific relation [DET](A, B) can be defined on the basis of the meaning of the Determiner in question. Applying this insight to the VP *lift four tables*, one can think of the situation sketched in Table XI,

Table XI.
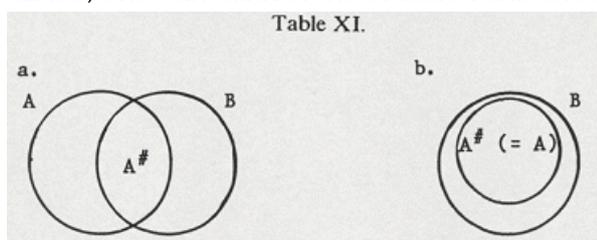
where $A^{\#} = \{x \in B: x \in A \cap B\}$, which says that [+SQA] assigned to an NP pertains to that subset of A which is involved in the predication. Some Determiners require that all members of A be included in B: *all, the, both*. In that case $A \subseteq B$, as in *A man from Boston lifted all tables*. Sentence (57a) fits Table XIb if E contains only four tables.

   In Verkuyl (1987a) a more detailed analysis of [+SQA] has been given in the framework of the theory of generalized quantification. I include from that paper the relevant definitions:

(58)
  (a) Definition: *Specified Quantity of A*
  An NP of the form Det N, where [N] = A and where [Det] relates a set B to A in a specific model M_i denotes a specified quantity of A in E, $A^{\#}$, ($A^{\#} \subseteq A \subseteq E$) iff
  (i) E is bounded

(ii) $A^{\#} = A \cap B$

  (iii) $|A^{\#}|>0$.

(b) Definition: *Unspecified Quantity of A*.

  An NP of the form Det *N* denotes an unspecified quantity of *A*

  (i) if $A \cap B = \emptyset$

  (ii) if there is no number given by the definition of the quantifier by which the cardinality of the intersection is bounded.

The definitions in (58) characterize the NPs denoting the quantifiers (39a)-(39d) and (39f) as [+SQA] in the particular model chosen, whereas (39e) is the denotation of a [-SQA] - NP, exemplifying (58bi). All NPs in (56) meet the conditions defined in (59a), whereas the NPs in (57) meet either (58bi) or (58bii). As to the latter, bare plurals, e.g., are defined in Verkuyl 1987a as $\{X \subseteq E^*: A \subseteq X \,\&\, |A \cap X| =$ undetermined$\}$. The idea is that most quantifiers presuppose a bounded *E*, so that $|A \cap B|$ in a specific model can be determined. Bare plurals contain in their definition the information that the cardinality of E is not bounded, as indicated by E^*. Hence, the cardinality of the intersection $A \cap X$ cannot be determined.

  The NP *four tables* in (56a) can be interpreted like (39f), i.e., as pertaining to the quantifier [exactly *n*] (A) = $\{X \subseteq E: |A \cap X| = n\}$. Note that the NP remains [+SQA] even if we were to interpret this NP in terms of the quantifiers [*n*](A) defined as $\{X \subseteq E: |A \cap X| \geq n\}$. That is, the man from Boston might have lifted *at least* four tables. This does not mean, however, that the man lifted infinitely many tables. Applying the well-known aspectual criteria discussed in the early sections of this paper, this point can be made due to the terminative behaviour of *at least n* in sentences like (59):

(59)

  (a) ?For hours a man from Boston lifted four tables.

  (b) A man from Boston lifted four tables in an hour.

Thus, even if we take *four tables* to mean 'at least four tables', the sense of aspectual repetition is inherent to (59a). So even though we know from arithmetics that *at least four* opens up an infinite domain of numerical values, the use of language can close off this domain such that *at least n* is going to mean 'some value $\geq n$ but we do not know which one'.

  Let us now show how CAT deals with a sentence like (57a) where *a man from Boston* is interpreted as *m*1. What does it mean if we represent progress in time with the help of 'successive phases'. Let us provisionally
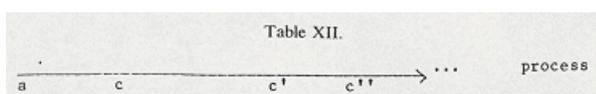
Table XII.

represent the generation of temporal structure by *lift* as sketched in Table XII, where the temporal process structure can be extended indefinitely, because it is not bounded. It is not difficult to define a function which produces this structure. There are several options, but I will select a rather 'dynamic' version. Restricting myself here to just a minimum of modeltheoretic notions, I am assuming a model having a domain of discourse E of individuals, the set of points of time T, the set of intervals I and a set of relations among which the inclusion relation $\subseteq$ ($I \subseteq T$) and the precedence relation $<$, defined as a strict partial ordering (transitive and irreflexive).

The temporal structure that is going to be generated by s is an interval point structure T in the sense of Van Benthem (1983). A point structure is a pair $\leq T, <>$, where T is the set of points of time and $<$ a strict partial ordering (transitive and irreflexive) on T. An interval point structure T is defined by Van Benthem as a triple $\leq T, <, S>$ where $\leq T, <>$ is a point structure and S is any set of non-empty subsets of T which is 'closed under the formation of (nonempty) intersections' (1983, p. 83). Now the period structure induced by T is $P(T) = \leq S, \subseteq, <>$, where the precedence relation $<$ is defined as follows: $X < Y \leftrightarrow \forall t_1 \in X \, \forall t_2 \in Y(t_1 < t_2)$.

On the basis of this machinery a function, say s, can be defined from the set I of intervals to I itself assigning to each interval i its successor $i + 1$ which includes i. This function is characterized (provisionally) in (60):
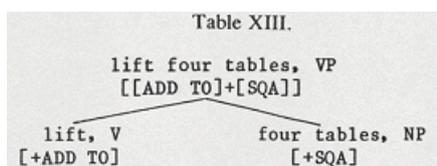
(60)
    [+ADD TO] is to be interpreted as (involving) a function $s: I \to I$ such that if $i = (a, b)$, then $\exists c(s(i)) = (a, c)$, and if $a, b, c \in T$, then $a < b \leq c$.

That is, part of the interpretation of the verb *lift* includes the function s. It is important to notice that in this version of s the point of origin plays a role: progress in time is always related to a point zero, the point where one 'starts to count', so to say. It will become clear shortly why I have chosen this version of s (for an alternative, less dynamic version of s see Verkuyl 1987a).

The next step is to take the merger of the V and the direct object NP as restricting the function s if the NP is [+SQA], whereas there is no restriction if it is [-SQA]. In cases like *lift tables*, (60) could be appropriate: one does not have information about any termination of the

lifting-process.[5] In the case of *lift four tables*, let us first consider a situation in which m1 lifted four tables in the following way: 1 + 2 + 1. That is, he was involved in three liftings, the second of which involved two tables. How would one describe this with the help of a restriction on *s*?

Syntactically this interpretation is to be assigned to a VP-structure of the following form:

```
                    Table XIII.

            lift four tables, VP
               [[ADD TO]+[SQA]]
         _____
   lift, V                 four tables, NP
  [+ADD TO]                    [+SQA]
```

With respect to the interpretive process of merging the V and the NP into the VP, there is an interesting empirical reason to employ a set theoretical theorem which says that every finite set X can be mapped canonically onto the quotient set X/E, where E is a suitable equivalence relation. It is interesting because the so-called thematic role of the direct object NP can be taken as an equivalence relation determining the way in which the NP-denotations participate temporally in the argument structure associated with *lift*.

The theorem accounts for the fact that in any VP of the form V NP, there are a finite number k of V-partitions of [NP], if $[NP] = A^{\#}$. In other words, the 1 + 2 + 1 partition of the set of four tables in the particular situation of (57a) is just one of the k partitions determined by the cardinality of the set of tables in E, given an appropriate equivalence relation induced by V. This accounts for our intuition that *lift four tables* pertains to a set of ways in which members of a set of four tables can be lifted.

As pointed out in Verkuyl (1988) the equivalence relation necessary to yield a proper partitioning can be formulated in terms of the fulfillment of the thematic roles of the NPs of an argument structure. It can be described as 'counting as being involved as participants at the same time (interval) in the predication expressed by the verb'. Let us first illustrate the consequences of this theorem with respect to the 1 + 2 + 1-situation of (57a), where the equivalence relation P (read: participancy-relation) is illustrated as a mapping from the set $A^{\#}/P$ of partitioned object-denotata into I, where $A^{\#}$ (in this case) = $\{t1, t2, t3, t4\}$ and where $[a_1] = \{t1\}$, $[a_2] = \{t2, t3\}$ and $[a_3] = \{t4\}$. The bounded interval which results is called I.
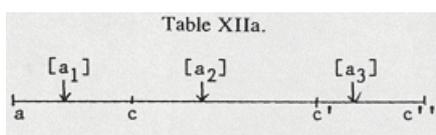
Table XIIa.

In order to map partitions of $A^{\#}$ into temporal structure a participancy function, say p_v, can be defined which associates partitioned subsets of $A^{\#}$ with subintervals of I':

(61)

Given a structure of Table XIII where [V] is a function from $A^{\#}$ to [VP], there is an injective function $p_v: A^{\#}/P \to I$ s.t.

(a) $p_V([a_k]) = i_k$, where $[a_k]$ is the k-th member of $A^{\#}/P$;

(b) $A^{\#} = \{x | x$ is V-ed by the denotation of the subject NP$\}$.

We can now make use of (61) by defining the function s in terms of the output of the function p_V.

(62)

If [+ADD TO] is assigned to a V in the configuration [NP [V NP]], then the interpretation [[+ADD TO]] (in a model M) requires there to be a function $s: I \to I$ such that:

if $i = p_V([a_j]) = (a, b)$ and NP_{su} is engaged in V-ing NP is true at i, $\exists c \in T (b \leq c)$ such that $s(i) = (a, c)$ and NP_{su} is engaged in V-ing NP is true at $s(i)$.

In our $1 + 2 + 1$-situation, (61) and (62), which are part of the (Fregean) interpretation bringing together the V-meaning and the NP-meaning into a VP-meaning, bring about a situation sketched in Table XIV. More in general, s and p_V together constitute a composite function, say t, which is exactly the function explaining why the VP *lift four tables* in (57) is terminative. This function t exhausts the domain A/P, so s comes to a stop. The terminative function t is defined in (63):[6]

(63)

Given (61) and (62), there is a function $t: A^{\#}/P \to I$ defined as: $t([a_j]) = s(p_V([a_j]))$
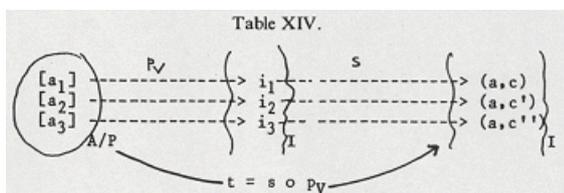
Table XIV.

As said, I have given just one arbitrarily chosen application of the function t. Our man from Boston $m1$ could have lifted the tables 2 + 2 or 3 + 1 or all at once, etc. Let us call the interval produced in Table XIIa a terminative interval relative to t. This notion is defined in (64):

(64)
   Given a terminative function defined as in (63):

i_t is a terminative interval (relative to t) iff $i_t = {}^k\Sigma_1\ i_j$

where k is the number of partitions of $A^{\#}/P$

The function t is, of course, a set of pairs, the first member of which is a subset of E, whereas its second member is a member of I. That is, $t \subset POW(E) \times I$. A terminative interval is defined as the union of all applications of t. If there are k mutually disjoint subsets of $A^{\#}$, a terminative interval has the following form:

(65)
   $\leq\leq[a_1], i_1> \cup \leq[a_2], i_2> \cup \ldots \cup \leq[a_k], i_m\leq\leq$ (1 ≤ k ≤ m)

The temporal structure produced by t can be seen by considering its range Ran(t), e.g., with respect to the 1 + 2 + 1-partition of (57a). The largest one is the temporal structure associated with the terminative interval relative to t: (a, c'') is associated with the partitioned subsets of $A^{\#}$, as indicated in Table XV.
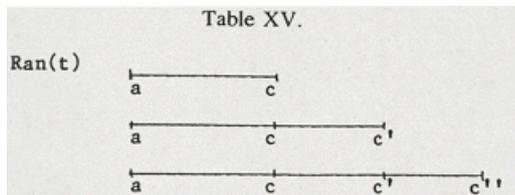
Table XV.

As said, VPs like *lift four tables* are to be associated with a *set* of terminative intervals relative t having the one in Table XIV as just one of its members. Let us call this set I_T, where:

(66)
   $I_T := \{i_t:\ i_t$ is as defined in (64)$\}$

Note that the cardinality of I_T with respect to *lift four tables* is completely determined by the number of sets in the domain E containing four tables. However, each of the terminative intervals belonging to I_T is the largest interval of the co-domain of the function t. I_T can be considered the set of applications of t to the possible $A^{\#}$-partitions in a model.

   Returning now to the topic of generalized quantification in its relation to temporal structure discussed in Section 5, we can observe that each member of I_T has a twofold monotone increasing structure, that is

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temporally and atemporally. To begin with, each i_t meets condition (41a) and its equivalent (41b) which I shall repeat here as (41b') though formulated within the present framework:

(41b')
$\forall i, j \in I, i \cap j \in \text{Ran}(t) \rightarrow (i \in \text{Ran}(t) \,\&\, j \in \text{Ran}(t))$
(42b')
$\forall i, j \in I, (i \in \text{Ran}(t) \,\&\, j \in \text{Ran}(t)) \rightarrow i \cap j \in \text{Ran}(t)$
(43')
(a) $\forall i, j \in I, (i \cap j \in \text{Ran}(t) \leftrightarrow (i \in \text{Ran}(t) \,\&\, j \in \text{Ran}(t))$
(b) $\emptyset \notin \text{Ran}(t)$

It can be seen easily with the help of Table XV that Ran(t) meets (42b') as well. That is, Ran(t) satisfies (43'a), which is the conjunction of (41b') and (42b'). In Barwise and Cooper (1981), Zwarts (1981), and Van Benthem (1983), a temporal structure meeting (43'a) would qualify as a filter. However, this would turn out to be a rather vacuous characterization of Ran(t) because this structure also satisfies condition (67a):

(67)
(a) $\forall i, j \in I, (i \cup j \in \text{Ran}(t) \leftrightarrow (i \in \text{Ran}(t) \,\&\, j \in \text{Ran}(t))$
(b) $\emptyset \in \text{Ran}(t)$

A temporal structure meeting (67a) only, is called *ideal*, e.g. in Zwarts (1981). It is the negative counterpart of (43'a) because structures defined by (67a) are monotone decreasing.

We seem to face a problem now, because the characterization of Ran(t) in terms of the filter notion threatens to become vacuous. However, due to the fact that Ran(t) is generated by the presence of [+ADD TO] and [+SQA], it never contains the empty set as a member. That is, $\emptyset \notin \text{Ran}(t)$, by necessity. As observed in Section 5, De Jong & Verkuyl (1985, p. 35) proposed to characterize a quantifier as a filter only if it meets both (43'a) and (43'b). Ideals are characterized by adding the requirement that they meet both (67a) and (67b). This solves the problem: terminative intervals have filter structure, if we define filters as in (43').

The same applies, of course, to the partitioned subsets of $A^{\#}$ which are mapped onto I'. Note that $\emptyset \notin A^{\#}/P$, so it follows automatically that the partitions associated with terminative intervals are structured as filters.

Thus, it is possible to give a characterization of the features involved in terminative aspect formation in terms of generalized quantification. I will return to this point shortly, but first it must be made clear how sentential aspect is construed on the basis of the information contained by the subject-NP and the information expressed by the VP.

Let us illustrate the formal machinery necessary to interpret the NP VP-structure in CAT with the help of sentence (68).

(68)
   Two men lifted four tables

To account for the distributive and collective reading of this terminative sentence, the following line of thought is followed. The VP constitutes a set, say A' (which is the subject $A^{\#}$). Now, let us take A' to be the domain of a function whose co-domain is I_T. In doing so, we have to determine for each member m of A' which unique image can be assigned to m. Sentences like (68) do not offer any direct clue to which interpretation must be chosen, a distributive one or a collective one. So we must define a choice between two options, as formulated in (69):

(69)
   Let I_T be the set defined in (64) and let [NP$_S$] be a (finite) set $A' \subseteq D$. Then the Fregean interpretation of the structure [NP VP] is (or involves) a function from A' into I_T defined:
   either as
(a) $P_d(a) = i_t$ s.t. $\forall a, a' \in A'$, if $a \neq a'$, then $p_d(a) \neq p_d(a')$
   (b) $p_c(a) = i_t$ s.t. $\forall a, a' \in A'$, if $a \neq a'$, then $p_c(a) = p_c(a')$

Let us generalize over (69a) and (69b) by saying that we have a function p which manifests itself in two different forms, a distributive one, p_d, which is an injective function; and a collective one, p_c, which is a constant function. Thus distributivity is analyzed as 'plural' in the sense that for all members of A' there is a different function value, whereas collectivity is 'singular' in the sense that there is just one function value.
   To illustrate the application of (69) to situations that can be described by (68), I will briefly discuss the following situations:

(70)
   (a) $\leq m1, \leq\leq[a_1], i_1> \cup \leq[a_2], i_2> \cup \leq[a_3], i_3>>> \cup \leq m2, \leq\{A\}, i_4>>$
   (b) $\leq m1, \leq\leq[a_1], i_1> \cup \leq[a_2], i_2> \cup \leq[a_3], i_3>>> \cup$
   $\leq m2, \leq\leq[a_1], i_1> \cup \leq[a_2], i_2> \cup \leq[a_3], i_3>>>$
   (c) $\leq A', \leq\leq[a_1], i_1> \cup \leq[a_2], i_2> \cup \leq[a_3], i_3>>>$

The situation described in (70a) is the one in which $m1$ lifted four tables consecutively in a 1 + 2 + 1-partition, whereas $m2$ lifted four tables all together though at a different time. For each m in A' there is a different value in I_T and (68) pertains to two different events. In (70b) a possible instantiation of a situation is given in which two men lifted four tables collectively. Assuming Boolean principles to reduce identical information, we end up with (70c) as pertaining to one event.
   It is important to note that (70a) and (70b) do not represent readings: situations as in (70) belong to a set of possible actualizations associated with (68). This is how it should be: a sentence like (68) should be

applicable to all sorts of situations and the functions p_c and p_d appear to provide for this property.[7]

The present machinery solves a problem that seduced some people into taking the event as a primitive notion. What happens if two men each lifted a table at the same time, though separately (cf. Parsons, 1985; Bach, 1986)? The function p_d would pick out, e.g. $\leq\{t_i\}, i_1>$ and $\leq\{t_2\}, i_1\}$, which are different function values. What happens if two soldiers hit the same target at the same time though as separate 'events' because they shoot from different sides? Note that (62) offers a solution, because the successor's function is defined such that a successor may be coincide temporally with its predecessor, due to the requirement $b \leq c$. The relevant interval indices would be different.

Thus CAT is rather conservative with respect to the notion of the event as a primitive notion. Rather than analyzing (68) a priori in terms of $\exists e\,[\ldots\,e\,\ldots]$, the idea is that sentences like (68) contain certain conditions on the basis of which one is allowed to introduce events a posteriori in the domain of discourse.[8] In (68) these conditions are fulfilled, but not in sentences like (71):

(71)
   (a) Two men did not lift four tables.
   (b) Nobody lifted four tables.

It can be argued that the VP-negation in (71 a) eliminates the co-domain of the functions p_c and p_d: there is simply no I_T containing terminative intervals associated with four tables. The subject-negation in (71b) eliminates the domain of the functions p: they cannot find any argument-value. In both cases there is no event described in (71b). The present framework appears to explain quite naturally why the sentences in (71) are durative, do not pertain to an event.[9]

This concludes the (brief) sketch of CAT. I hope to have made clear that in this approach there is no room at all for four Vendler-classes as part of the explanation of why it is that sentences like (53a), (57a), and (68) are terminative.

7. Some final remarks

Returning briefly now to the ontological tripartition given in Table II, we are able to be more precise. From Galton (1984) I borrow the wonderful wordplay with respect to the three classes that are distinguished. From Hoeksema I borrow his characterization of States as Ideals, however, without using his features [-Count] and [-Duration]. Both Processes and Events are treated as filters, the former unbounded, the latter bounded.

Table IIa.

Table IIa provides for the close relationship between Processes and Events observed by Kenny, Taylor, Mourelatos, Dowty and others. But it also provides for the close relationship between States and Processes which was impossible to do in partially ordered classifications. Finally, it is not the aspectual classes that explain aspectual data. It is the inter-action of the semantic information carried by the aspectual features that is crucial to the composition of aspect in the type of sentences under discussion.

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Eindnoten:

1 Carlson (1981) distinguishes six classes of a matrix-basis. He puts a class of 'dynamics' (like *stand*) between Statives and Activities, whereas his Achievements are split up in Momentaneous Achievements, like *notice, hit, blink*, as against Achievements proper, like *close the door, miss the ball, take off*, etc. The Momentaneous class seems to be intermediate between Accomplishments and Achievements. The six classes are constructed with the help of three parameters. Again one can observe that it is the parameters which play a role in aspectual generalizations rather than the classes themselves. The same applies mutatis mutandis to Brecht (1985), who applies the Vendler-classification to the study of Slavonic aspect. Carlson rightly stresses the importance of 'additivity' (dynamicity) in the analysis of aspect, but again, this does not follow from the classification itself.

2 In Dowty (1986) it is pointed out that Dowty (1979) is close to Taylor by accepting (30). However, Dowty does not go into the corrections Taylor has made with respect to (30).

3 Hoeksema also gives an analysis of the Progressive Form, stating that his Progressive operator PROG may only apply given the (interpreted) feature [+Duration]. Thus, he generalizes with respect to the value of an aspectual parameter rather than to an aspectual class. Moreover, the observational objections against Vendler's ProgF carry over to Hoeksema's analysis, as he accepts Vendler's treatment of the data.

4 In Verkuyl (1972, 1976) I distinguished some underlying predicates like PERFORM, TAKE, ADD TO, DO, etc. Eventually I ended up with ADD TO, as the 'most abstract' way of expressing change, eliminating DO for the same reasons as advanced in my discussion about Vendler's agentivity.
Dowty (1979, 1986) criticized my generative-semantic 1972-approach as being too syntactic. I agree with his criticism only partly: I would rather characterize that approach as sloppy semantics, because I interpreted predicates like ADD TO, but only impressionistically (though quite accurately from the intuitive point of view). As it turned out, generative semantics was also bad syntax.

5 As said, durativity is 'the garbage can'. Tanya Reinhart and Remko Scha (pers. comm) convinced me of the necessity to exclude the presence of *s* in the case of *lift tables* altogether. Perhaps *s* is to be excluded if its domain is not closed. However, in the non-generic sentence *She walked miles* I still feel as if *s* can be assumed. I leave this matter open for future research.
A problem for the present approach is Vendler's example *push the cart*, and examples like *stroke a cat, caress his wife, wash his shirt*, etc. In these examples the NPs are [+SQA]. There are several plausible solutions being investigated into presently, one of them being so-called Theta-role absorption. This would mean that *push* is lexically complex formed from parts that are [+ADD TO] and [-SQA]. Note that *He pushed the cart away* is terminative, whereas *He pushed carts away* is durative, due to a [+SQA]→[-SQA]-alternation. So the present CAT-machinery is still operating even in these cases.

6 In Verkuyl (1987a) the function *t* is defined less 'dynamically': it produces the terminative event *I'* 'at one blow'. I prefer the present version.

7 It is tempting to compare (69) with standard scope analyses in which $\forall x\, \exists y$ interchanges with $\forall y\, \forall x$. Actually, (69a) can be related to such a scope analysis only in terms of $\forall x\, \exists! y$, whereas (69b) corresponds to $\exists! y\, \forall x$. The other situations covered by the interchange of $\forall x$ and (the sloppy) $\exists y$ is captured by the pairs constituting terminative intervals. For example, (70c) accounts e.g. for an $\forall x\, \exists y$ reading in which $m1$ lifted the tables [$a1$], $m2$ lifted the tables [$a2$] and both $m1$ and $m2$ lifted [$a3$]. Again, these are not readings in CAT, just situations that are captured by the functions.

8 Thus there is a substantial difference between statements like $\exists x[\ldots x \ldots]$ and $\exists e[\ldots e \ldots]$. The criteria for ascertaining the existence of atemporal values for *x* are basically non-linguistic: one has to check the domain. In the present analysis the existence of *e* can only be ascertained derivatively: if there are $A^{\#}$-denotata in the domain and if accordingly the truth conditions with respect to sentences like (57a) are fulfilled, as in (62), then the existence of a temporal value for *e* can be ascertained (for a detailed analysis, see Verkuyl (1987b). In that case one can allow for $\exists e$ .... Thus, temporal existence is codetermined by language itself. (This may sound Whorfian, but [+SQA] and [+ADD TO] are not that language-specific. After all, aspect formation is quite universal. So I take this risk.)

H.J. Verkuyl, *'Aspectual Classes and Aspectual Composition'*

9 For negation and aspect, Togeby (1980). The work on negation by Jacobs (1982) proved to be very useful for the attempt to explain why terminativity is neutralized under negation (Verkuyl 1987b).