CHAPTER 3

Telicity

3.1 Introduction

The influence of noun phrase semantics on the telicity of verbal predicates has been discussed with respect to examples like those in (1) and (2):

(1) a. Mary ate a sandwich in an hour / ?for an hour.
b. Mary ate blueberries ??in an hour / for an hour.

(2) a. The paper was printed on the laserjet in ten minutes / ?for ten minutes.
b. Wine was drunk all day / ?in one day.

There is a remarkable agreement that we must take into account the following ingredients[1]: (i) the lexical semantics of the main verb, which is episodic; (ii) its relation to the nominal argument that determines the telicity of a predicate (or a sentence); and (iii) the quantization status of this nominal argument.

The common intution behind (i)-(iii) is that a typical understanding of (1), for instance, involves (in its unmarked telic sense) the knowledge that there was an eating event during which the sandwich was gradually consumed, part by part, until all its parts were eaten, at which point the eating event *necessarily* ended. In this sense, the participant denoted by *a sandwich* is intrinsically tied to and delimits the temporal extent of the event denoted by *Mary ate a sandwich*. Since *a sandwich* is quantized, and denotes a clearly delimited entity, the event denoting by *eat a sandwich* is quantized (telic or event-denoting). In (1b) a cumulative object *blueberries* yields a cumulative (atelic or process) predicate. The difference in the quantization status of a predicate is reflected in the distribution of temporal adverbials. The domain of application of durative *for*-phrases is restricted to cumulative (atelic or process) predicates. The domain of application of time-span *in*-phrases is restricted to quantized (telic or event) predicates. The predicate-argument relation in (1) is referred to as the "ADD-TO" relation in Verkuyl (1972, 1993), the "measuring out" relation in (Tenny, 1987, 1994), the "gradual"/"successive" Patient relation in Krifka (1986, 1992), the

"Incremental Theme" relation in Dowty (1988, 1991) and the "structure-preserving" relations in Jackendoff (1996). The same type of predicate-argument relation is also exhibited in (2) with *print* and *drink*, where the subject arguments determines the telicity of sentences.

By contrast, complex verbal predicates headed by verbs such as *like* or *watch* are atelic, regardless whether their nominal arguments are quantized or cumulative:

(3) Mary liked / watched the documentary on Kafka /
five documentaries / (these) documentaries ?in an hour / for an hour.

The state of liking of a documentary is not temporally delimited by any property of the documentary.

Here the agreement ends, and the rest is still a matter of lively controversy. In particular, the following question is discussed: What type of rules, syntactic, semantic or some combination of both, can adequately account for the quantized-cumulative and telic-atelic interactions? Syntactic approaches propose that the effects of nominal arguments on the telicity of verbal predicates arise from certain structural configurations in the lexical representation of verbs and the way they are projected from the lexicon to syntax (see Tenny's, 1987, 1992, 1994; Verkuyl, 1993; Borer, 1996). I will discuss one implementation of this general idea, namely, the *Aspectual Interface Hypothesis* proposed by Tenny (1987, 1992, 1993). It is based on the claim that telic predicates and clauses share the same d-structure syntactic configuration and only internal (direct or indirect) objects in the d-structure are event delimiters, and hence determine the telicity of verbal predicates. That is, *Mary ate a sandwich* is telic or "delimited" (in Tenny's terms), because *a sandwich* is the internal direct object argument and it is delimited (or quantized).

I will compare Tenny's syntactic account to the semantic compositional account of Krifka (1986) and Dowty (1988, 1991) that relies mainly on differences in the thematic structure of verbs. Their proposal can be summarized as follows: a part of the meaning of certain episodic predicates, such as *eat*, is (modelled by means of) a homomorphism between the lattice structure associated with the Incremental Theme argument (Dowty 1991:568) and the lattice structure associated with the event argument. On this account, *Mary ate a sandwich* is telic, because *a sandwich*, the Incremental Theme argument, is quantized and stands in a homomorphic relation to *ate a sandwich*.

I will argue in favor of Krifka-Dowty's semantic account, because it captures in a direct way the role of nominal arguments in calculating the

telicity of complex verbal predicates and sentences by modelling in an explicit way the semantic parallels between the verbal and nominal predicates and by defining structure-preserving mappings between them.

Problematic for both the syntactic and semantic approaches are various types of 'aspect shift', which were introduced in chapter 2, section 2.5.5.: e.g., *He ran to the store, He laughed himself silly, The elevator wheezed upward to the fourteenth floor.* In English the meaning 'shift' from the atelic to telic interpretation, and vice versa, is not morphologically marked on the verb forms involved. It is enforced by some properties of the linguistic or extra-linguistic context. The description of such shifts poses a number of interesting problems for the theory of lexicon and the nature of the mapping between syntax and semantics, given the apparent non-compositionality of the relevant data. The main reason is that these are cases in which the telicity of verb phrases and sentences is not a projection of the inherent lexical semantic properties of their head verbs, and it cannot be calculated by compositional rules on the basis of independently motivated syntactic structures.

3.2 Syntactic Factors in Telicity: Tenny (1987)

Tenny claims that there is a uniform mapping between the argument in the conceptual structure that has the aspectual role of 'measuring out' of the event and the internal direct object argument in the d-structure. In the surface syntax, this argument can be realized as the direct object of a transitive verb (3a,c), the subject of an unaccusative verb (3b) or the direct object of a transitively used verb (3d), which is inherently intransitive.

(3) a. I ate an apple.
b. The butter melted.
c. He crossed the desert.
d. He walked the road to the town.

Tenny uses the notion of 'measuring out (of the event)' in an informal sense, "as a convenient metaphor for uniform and consistent change, such as change along a scale" (Tenny, 1989:7). For example, in (3c) it is the length of the path across the desert that measures the event of crossing the desert. Since the path is delimited, the event denoted by (3c) is delimited, as well. What Tenny calls 'measuring-out' and 'aspectual delimitedness' corresponds to 'telicity' (see Garey, 1957; Comrie, 1976; Hopper and Thompson, 1980; Zaenen, 1988; Rappaport and Levin, 1988; Dowty, 1991, among many others) and to 'quantization' in Krifka (1986, 1992).

In contrast, none of the arguments in the following examples with episodic (4) and stative (5) verbs measures the denoted eventualities:

(4) a. Dan pounded the wall.
b. Lisa studied French.
c. Susan shook the tree.
d. Bill pushed the cart.

(5) a. John likes Bill.
b. The candle glows.
c. Mary knows calculus.

Verbal predicates that express delimited events are associated with an aspectual structure in the Lexical Conceptual Structure (LCS). As in Levin and Rappaport (1988), Hale and Keyser (1988) and Jackendoff (1990), among others, so in Tenny's framework the LCS represents the syntactically relevant parts of the verb's lexical meaning. In Tenny's framework the LCS contains a special level of lexical representation, namely, the aspectual structure, that serves as an interface between a LCS and a syntactic argument structure. The role of the aspectual structure as a syntax-semantics interface is formulated in the Aspectual Interface Hypothesis (AIH):

> **Aspectual Interface Hypothesis (AIH):**
> The mapping between thematic structure and syntactic argument structure is governed by aspectual properties. A universal aspectual structure associated with internal (direct), external and oblique arguments in syntactic structure constrains the kinds of event participants that can occupy these positions. Only the aspectual part of thematic structure is visible to the syntax (Tenny, 1989:3).

The Aspectual Interface Hypothesis is divided into three constraints that are stated over three syntactic argument positions in the d-structure (see Tenny, 1992:13). First, the *Measuring-out Constraint on Direct Internal Arguments* functions as the main linking principle between the LCS and syntactic structure. It says that with "verbs in which the internal argument undergoes any change or motion, all and only direct internal arguments, or D-structural objects of the verb, measure out events" (Tenny, 1989:35).

Second, the *Terminus Constraint on Indirect Internal Arguments* says that an indirect internal argument can participate in aspectual structure by providing a terminus for the event described by the verb. For example, in (6), the internal direct object the cart in (6a,b) 'measures out' the event. In (6b), the indirect internal argument, the Goal-PP *to New York*, *delimits* the event through reference to the

location of the referent of the internal direct object argument, *the cart* (see Tenny, 1989:10). The Goal-PP *to New York* "participates in defining the temporal endpoint of the event by naming the spatial terminus that correlates with the event's temporal terminus" (Tenny, 1992:4).

(6) a.	to push the cart	non-delimited
b.	to push the cart to New York	delimited

The *Terminus Constraint on Indirect Internal Arguments* and the *Measuring-out Constraint on Direct Internal Arguments* together amount to the claim that only internal arguments, only constituents inside the verb phrase in the d-structure, can delimit events. An external argument cannot participate in the 'measuring-out' or the delimitation of the event described by a verb. This is captured by the third *Non-Measuring Constraint on External Arguments*. This asymmetry of the external argument and internal argument(s) is of crucial importance to Tenny's Aspectual Interface Hypothesis[2]. "[A]spectual roles are associated only with verb's internal arguments, while thematic roles may be associated with verb's external or internal arguments" (Tenny, 1992:2). There are three aspectual roles: MEASURE, TERMINUS and PATH which accompanies TERMINUS. The linking of these roles to syntactic positions is constrained as follows: a MEASURE must be an internal direct argument, a TERMINUS must be an internal indirect argument, a PATH is either implicit or an internal argument. Verbs with Aspectual Structure are represented lexically with an aspectual role grid, as is shown in (7) (Tenny, 1992:6):

(7)	Aspectual Structure	Example
eat:	[(MEASURE)]	eat an apple
melt:	[MEASURE]	melt the butter
*walk*1:	[(MEASURE)]	walk the Appalachian Trail
*walk*2:	[(PATH, TERMINUS)]	walk the road to the town

Verbs that have no Aspectual Structure are represented as in (8) (Tenny, 1992:20):

(8)	Aspectual Structure	Example
float:	[ ]	The bottle floated.

Tenny (1989) and Tenny and Heny (1993:9-12) distinguish three verb classes according to the 'measuring-out' relation they entail:

(i) incremental-theme verbs: *eat, drink, load (a wagon)*;
(ii) change-of-state verbs: *melt, freeze, cure (a patient), darken (a photograph), ripen*;
(iii) verbs of consuming distance (Path-object verbs) and verbs of imparting distance: *climb, push (a cart).*

In each of these three classes "there is a measurable quantity or property which is not temporal, and which is associated with the direct or indirect object, which the verb converts into a temporal measure of the event" (Tenny and Heny, 1993:9)[3]. The 'scale' for incremental-theme verbs is related to a volume-like quantity of the object. The 'scale' for change-of-state verbs is related to a *property* applied to the participant denoted by the internal direct object argument: for example, it is related to the darkness of the photograph and the ripeness of the fruit, or the consistency of the piece of butter. The 'scale' for motion verbs is the linear scale of *distance*.

The main problem with the AIH concerns the claim that arguments in Lexical Conceptual Structure are reflected directly and uniformly in syntactic relations, and in particular, that the internal direct object argument is invariably associated with the participant in the aspectual structure that 'measures out' the event (see also Filip, 1990). It has been observed (see Jackendoff, 1990:150ff., for example) that there are many mismatches between conceptual arguments and syntactic arguments. To illustrate this point, consider (9a):

(9) a. Martha pushed the cart into the corner.
b. Martha danced into the corner.

According to the AIH, the internal indirect argument *into the corner* delimits the event through the reference to the location of the moving entity denoted by *the cart*. *The cart* is the internal direct object argument that "measures out" the event. Now consider (9b). By the same line of reasoning we should be able to say that in (9b) the internal indirect argument *into the corner* also delimits the event through the reference to the location of the moving entity. However, in (9b), what is at stake is the location of the referent of *Martha*, but *Martha* is the external subject argument and Agent. Hence, it should have no role in the 'measuring-out' and/or delimitation of the event. Nevertheless, the subject *Martha* in (9b) and the internal direct object *the cart* in (9a) have

the same aspectual property of "measuring-out" of the event. The only way to block this inconsistency is to stipulate that it is all and only internal direct object arguments, and not external (subject) arguments, that can measure out events. To take another example that illustrates the same problem for the AIH, consider sentences in (10):

(10) a. Martha pushed John into the pool.
b. John dove into the pool.

Tenny mentions that in such examples as *Martha danced halfway* "the property which is measuring out the event (location), although it is changing in the external argument (Martha), can only be expressed in its pure form through an internal argument, as in *Martha danced half the distance (home)*" (Tenny, 1989:19, fn. 8). Following this proposal, we may suggest that in examples like (10a) there is an implicit internal direct object argument, PATH, and we may paraphrase (10a) as 'Martha pushed John *all the way* to the pool'. However, this move cannot be applied to transitive verbs of motion, as in

(11) John entered the icy water (very slowly).

Since *enter* has an internal direct object argument, we cannot claim that there is some understood internal direct object argument that measures out the event. As Dowty (1991:570) suggests, with transitive verbs of motion like *reach, leave, depart* and *abandon*, it is the subject argument that delimits the eventuality denoted by the whole sentence. One might further try to argue that *the icy water* is an underlying oblique argument that is advanced to the direct object position, while *John* is an underlying internal direct object argument that is advanced to the subject position. This is in principle possible given that the theory has the tools of transformational movement between d-structure and s-structure. However, if we used movement in order to guarantee that arguments in Lexical Conceptual Structure are reflected directly and uniformly in syntactic relations on the various levels of syntactic representation, the claim that an internal direct object position in the d-structure has a special "measuring-out" property would lose any empirical force. The question then would arise whether the AIH "still had any empirical content or had been elevated from empirical hypothesis to methodological assumption, i.e. that one was in actuality prepared to postulate any syntactic abstractness necessary to maintain a uniform semantic association with a certain syntactic position" (Dowty, 1991: 571, fn. 15).

But now one may ask to what extent the AIH is an interface between semantics and syntax, given that it is so much driven by syntactic assumptions and tools. Another weakness has to do with the aspectual notion of 'measuring out' at the syntax-semantics interface, which is not explicitly defined, and hence its application in many cases is unclear. These problems become evident in Tenny's account of psychological verbs, for example. Examples with psychological verbs are given in (12) and (13):

(12)	John fears solitude.	stative
(13)	a. Solitude frightens John.	stative
	b. Harry frightened John yesterday when he slammed the door.	eventive

Only the Experiencer of *frighten* verbs class (in their eventive/causative reading), but not of *fear* verbs, "measures out" the denoted mental event. Due to this aspectual difference the *frighten* class assigns the Experiencer to the internal direct object argument, while the *fear* class to the external argument. What is at issue then is the change of mental state of the Experiencer participant entailed by the *frighten* It is not clear how the notion of 'measuring-out' (on a scale) can be applied here. *Frighten* can be used to denote an instantaneous transition from the state of not being frightened to the state of being frightened. In this use, the 'measuring out' relation could be applied only in a trivial way, without exploiting any interesting aspects of the 'measuring out' relation.

Frighten class verbs may be also understood as involving a gradual transition from one mental state to another. Examples are verbs like *calm, disillusion, sadden, soothe* and *disarm*:

(14) The music gradually saddened / calmed / depressed John.

It is certainly possible to monitor the process of John's becoming more and more sad. However, it is not clear what it would *mean to say* that John is halfway sad. There is no point at which we can say that John is partly sad and on his way to being completely sad. (A similar problem seems to be posed by "degree achievements", see Dowty, 1979). Hence, the following sentences are odd or ungrammatical.

(15) a. ?The music halfway saddened John .
b. The music gradually saddened John, *a little of him at a time.

If the Experiencer argument 'measured out' a psychological event, then the predicate expressing it would have to be clearly telic, because by definition the 'measuring out' relation characterizes telic events and their participants only (see Tenny, 1992:4). However, psychological predicates of the *frighten* type understood as denoting a gradual change do not consistently behave like telic predicates, and *fear* and *frighten* classes of verbs do not clearly differ in terms of their aspectual properties, according to the variety of tests used in the Vendler-Dowty tradition. (For arguments see Van Voorst, 1992.) This also means that the categorical differences in the d-structures into which they are projected are not well-motivated.

Apart from psychological verbs of the *frighten* class, there are other verbs that entail a change in the argument associated with the internal direct object position, and for which the AIH predicts that they must 'measure out' events in their denotation. (See the *Measuring-out Constraint on Direct Internal Arguments* above.) Take, for example, predicates like *stir (the soup), sweat, breathe, shiver (from fear),* and many others. Nevertheless, it is unclear how the entailed change can be measured on a scale. What is missing is a clear distinction between *eat an apple* versus*push the cart* versus *stir the soup.* The 'measuring out' constraint is too broad, and we cannot base on it any interesting predictions about the syntax-semantics interface. The notion of 'delimitation' cannot replace the notion of 'measuring out', because not only direct internal arguments (such as *an apple* in *eat an apple*), but also indirect internal arguments (such *into the corner* in *Martha danced into the corner*) can delimit the event.

Another problem has to do with the assumption that the mapping between the LCS and the syntactic structure can be constrained by a *single* property: In general, the syntax-semantics mappings do not seem to be constrainable by one *single* property, regardless whether it is related to telicity, or to some other single determining factor. Predicate-argument relations denoted by many episodic verbs are not related to aspect (as in the case of psychological verbs), therefore, we cannot formulate the rules mapping them to syntactic arguments in terms of aspectual semantics. The mapping between lexical semantic and syntactic structure, seen both from the cross-linguistic and language-particular perspective, is determined by a number of interacting principles: syntactic, semantic and pragmatic. In particular, there are many studies in which it has been convincingly argued that the mapping rules must refer to thematic roles defined in terms of a number of semantic notions (see Fillmore, 1968, 1977 and elsewhere; Dowty,

1988, 1991; Bresnan and Kanerva, 1989, Alsina and Mchombo, 1990, among many others).

Finally, the last problem related to the AIH has to do with its predictions with regard to the influence of nominal arguments on the telic and atelic interpretation of verbal predicates. Since the "aspectual structure is a structure associated with bounded events" (Tenny, 1992:4) "activities or states (in Vendlerian terms) do not have Aspectual Structure" (Tenny, 1992:4). From this it follows that the telic sentence *John ate an apple* is associated with Aspectual Structure, while the atelic *John ate soup* is not. In addition, each of its senses would trigger a different linking mechanism. The reason is that the aspectual and non-aspectual information is represented in the LCS on two distinct role tiers (see Tenny, 1992:14), whereby only aspectual roles are tied to syntax in a direct way, and contain only that semantic information which is relevant to Universal Linking Principles. "The Universal Linking Principles based on event structure and Aspectual Structure give us a range of possible forms for argument structures cross-linguistically. Other language-particular, non-universal linking patterns may be stated over non-aspectual thematic information in (Lexical) Conceptual Structures" (Tenny, 1992:23). Hence, the Universal Linking Principles would apply to *ate* in *John ate an apple*, while language-particular, non-universal linking patterns to *ate* in *John ate soup.* This amounts to the claim that the verb *ate* is ambiguous and has a different meaning in *John ate an apple* and *John ate soup.* This, however, defies the intuition that the verb *ate* has the same lexical semantic properties, and that the aspectual difference between the above sentences is due to the different semantic contributions made by the quantized measure noun phrase *an apple* and the cumulative mass noun phrase *soup.*

Tenny (1989:12, fn. 5) also observes that undetermined plural noun phrases must be considered a separate phenomenon for the purpose of the AIH. This also means that yet another mechanism would determine the influence of bare plural noun phrases on the atelic interpretation of verbal predicates in (16). Also notice that in (17) it is the quantization of the external subject argument that determines the telicity of the whole sentence, a situation that is doubly problematic for Tenny.

(16)	a. John ate blueberries.	non-delimited
	b. John ate (all) the blueberries.	delimited
(17)	a. Guests arrived.	non-delimited
	b. A/the guest arrived.	delimited

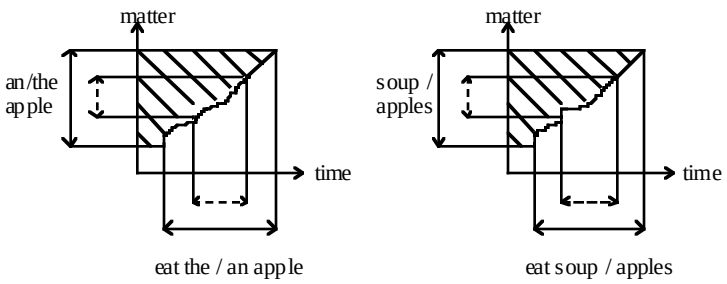
Yet all the examples, *John ate an apple, John ate soup*, (16) and (17) share one important property: Quantized nominal arguments yield quantized (telic) verbal predicates (or sentences) and cumulative (mass, bare plural) ones cumulative (atelic) verbal predicates. However, in Tenny's framework, it is not possible to capture this observation in a uniform way.

3.3 Semantic Factors in Telicity

3.3.1 Krifka (1986, 1992): Lattice Analysis of Nominal and Verbal Predicates

Krifka's (1986, 1989, 1992) contribution is to define systematic mappings, technically homomorphisms, between the denotational domains of nominal and verbal predicates, both of which have the form of a complete join semi-lattice[4]. Let us take, for example, sentences like *John ate an/the apple* and *John ate apples/soup*. The observation that the referent of the direct object is subjected to the event in a gradual manner is modelled in terms of mappings between the lattice structure of objects and events (or, more precisely, the time intervals assigned to events). They can be roughly schematized in a space-time diagram given in (18):

(18) **Space-Time Diagram** (Krifka, 1986)



The diagram shows that parts of individuals, an apple, apples and soup, are correlated with parts of eventualities, events (*eat the/an apple*) and processes (*eat soup/apples*). For example, *an apple* is analyzed as having various proper parts which are apple pieces of various sizes, whereby no one of these is itself an apple. This 'part structure' of the denotation of *an apple* is modelled as the lattice of objects. Similarly, *John ate an apple* denotes an event with a part structure. We can

recognize various eating subevents (each of which has further subevents), none of which is the event of the same kind as the main event described by *John ate an apple*. The idea that the denotational domains of nominal and verbal predicates can be represented in terms of the mereological based 'part' relation modelled as lattice structures is motivated in the work of Link (1983, 1987) and Bach (1981, 1986)[5]. This allows us to represent in a clear way the intuition that there is a special kind of relation between an individual like an apple and the event of eating of that apple. In the process of eating, the apple undergoes successive changes, part by part, which can be correlated with the incremental development of the eating event. (18) also shows that every part of an apple is mapped into a part of the eating of that apple, and vice versa. This then motivates the influence of nominal arguments like *an apple* on the telicity of a predicate *eat an apple*.

Krifka (1986, 1989, 1992) proposes that the homomorphic mapping between objects and events is an entailment of a certain class of predicates with respect to one of their arguments. This argument is assigned a special thematic role 'Gradual Patient' or 'Successive Patient' (see Krifka, 1986, 1992), which is defined in terms of the algebraic relations (or mapping conditions) given in (19):

(19) Definition of the thematic role 'Gradual Patient' (Krifka, 1986, (1992:39, 42):

$$\forall P[GRAD(P) \leftrightarrow UNI\text{-}O(P) \wedge MAP\text{-}O(P) \wedge MAP\text{-}E(P)]$$

a. Mapping to objects
$\forall R[MAP\text{-}O(R) \leftrightarrow$
$\forall e, e', x[R(e, x) \wedge e' \leq e \rightarrow \exists x'[x' \leq x \wedge R(e', x')]]]$
[If x is the Patient of an event e and e' is a proper part of e, there is a proper part of x that is the Patient of e'.]

b. Mapping to events
$\forall R[MAP\text{-}E(R) \leftrightarrow$
$\forall e, x, x' [R(e, x) \wedge x' \leq x \rightarrow \exists e'[e' \leq e \wedge R(e', x')]]]$
[If e is an event, and x' is a proper part of x, the Patient of the event, there is a proper part of e' of which x' is the Patient.]

c. Uniqueness of objects
$\forall R[UNI\text{-}O(R) \leftrightarrow \forall e, x, x' [R(e, x) \wedge R(e, x') \rightarrow x=x']]$
[If x is the Patient of an event e, and x' is also the Patient of e, x=x'.]

The linguistic encoding of the event-object homomorphism in terms of a thematic relation presupposes that a verbal predicate is semantically split into an event property and the thematic information, as is commonly assumed in event semantics, following some suggestions of Davidson (1967). Thematic relations are characterized as relations between individuals (variable x) and events (variable e). For example, a simple sentence *Max sings* will be assigned the representation *sing'(e) & AGENT(e, max').*

Mapping to events ensures that every proper portion of the apple that is eaten corresponds to a part of the drinking event, for example. *Mapping to objects* ensures that every part of the eating of an apple corresponds to a proper part of that apple[6]. *Uniqueness of objects* is intended to ensure that an event is related to one specific object[7]. For example, the event of eating of an apple is related via the Gradual Patient role to one particular apple, and to nothing else.

In addition, Krifka formulates the notion of 'uniqueness of events' specifically for those cases in which the denoted eventuality is non-resettable with one and the same object token and an iterative interpretation is excluded. We find this situation with predicates that denote eventualities during which an object gradually comes into existence or disappears, as in *drink a cup of coffee, destroy a city, compose a sonata.*

(20) Uniqueness of events
$\forall R[\text{UNI-E}(R) \leftrightarrow \forall e, e', x\,[R(e, x) \wedge R(e', x) \rightarrow e{=}e']]$

The *uniqueness of events* ensures that there is only one event related to the object by the thematic relation. In contrast, type-oriented predicates like *read, play (a sonata), copy (a file)* denote resettable eventualities that involve a realization of a certain type, a performance piece like *a sonata*, for example. The same sonata can be played many times without bringing about any (permanent) changes in the type underlying the actual performance of a sonata. The difference between 'token-oriented' and 'type-oriented' predicates is reflected in the interpretation of sentences with durative adverbials, for example, as (21) shows:

(21) a. Pavarotti sang this aria with enthusiasm for three years.
b. ?Scarlatti composed this sonata for three years.

The general rule for the interactions between the Gradual Patient arguments and verbal predicates, the rule of aspectual composition, is given in (22):

(22) aspectual composition: An episodic verb (in sentences denoting single eventualities) combined with a quantized Gradual Patient argument yields a quantized complex verbal predicate, while with a cumulative Gradual Patient argument it yields a cumulative complex verbal predicate (see Krifka, 1986, 1989, 1992).

The mereologically based notions of 'quantization' and 'cumulativity', which were defined by Krifka and introduced in chapter 2, are here repeated for convenience in (23):

(23) A predicate P is **cumulative** iff
$\forall x,y[[P(x) \wedge P(y) \rightarrow P(x \oplus y)] \wedge card(P) \geq 2]$
[whenever P applies to x and y, it also applies to the sum of x and y, provided that it applies to at least two distinct entities.]

A predicate P is **quantized** iff
$\forall x,y[P(x) \wedge P(y) \rightarrow \neg\, y<x]$
[whenever P applies to x and y, y cannot be a proper part of x.]

Krifka (1992:33) also introduces a temporal trace function τ, which is a function from the extensions of events (U_E) to the extension of times (U_T). This function maps an event to its "run time". It is a homomorphism relative to the sum operation: $\forall e,e'[\tau(e) \otimes \tau t(e') = \tau(e \otimes e')]$. Temporally ordered parts of events are then mapped into the corresponding parts of objects subjected to them.

Krifka's proposal amounts to the claim that the interactions between noun phrases and verbal predicates have their origin in the lexical semantics of verbs taking the Gradual Patient argument.

3.3.2 Dowty (1988, 1991): Incremental Theme

Dowty (1988, 1989, 1991) integrates Krifka's 'Gradual Patient', for which he coins the term 'Incremental Theme', into his full-fledged theory of thematic roles. It is one of the properties in the cluster constituting the Proto-Patient role (see Dowty, 1991:572). Instead of a set of discrete thematic roles, Dowty (1989:111, 1991:571ff.) argues for positing only two thematic Proto-roles, Proto-Patient and Proto-Agent, the latter also characterized by a set of verbal entailments:

(24) Contributing properties for the Patient Proto-Role:
a. undergoes change of state
b. incremental theme

(24) c. causally affected by another participant
d. stationary relative to movement of another participant
(e. does not exist independently of the event, or not at all)

(25) Contributing properties for the Agent Proto-Role:
a. volitional involvement in the event or state
b. sentience (and/or perception)
c. causing an event or change of state in another participant
d. movement (relative to the position of another participant)
(e. referent exists independent of action of verb)

"[A]n argument of a verb may bear either of the two proto-roles (or both) to varying degrees, according to the number of entailments of each kind the verb gives it" (Dowty, 1991:547). The basic semantic concepts that characterize the Proto-Roles Proto-Roles are used by the first-language learner as defaults for the meanings of transitive verbs of his language (see Dowty, 1989:111). The Proto-Agent and Proto-Patient properties are directly associated with the syntactic arguments in accordance with the following Argument Selection Principle (Dowty, 1991:572):

(26) Argument Selection Principle (Dowty, 1991:576)
In predicates with grammatical subject and object, the argument for which the predicate entails the greatest number of Proto-Agent properties will be lexicalized as the subject of the predicate; the argument having the greatest number of Proto-Patient properties will be lexicalized as the direct object.

With respect to the behavior of telic predicates and their Incremental Theme arguments, Dowty proposes the following:

(27) "THE MEANING OF A TELIC PREDICATE IS A HOMOMORPHISM FROM ITS (STRUCTURED) THEME ARGUMENT DENOTATIONS INTO A (STRUCTURED) DOMAIN OF EVENTS, modulo its other arguments. (...) A homomorphism is a function, from its domain to its range, which preserves some structural relation defined on its domain in a similar relation defined on its range. (See Partee et al., 1990 for formal discussion.) In the case of telic predicates, this relation which is preserved is the 'part-of' relation: If x is part of y, then if a telic predicate maps y (as Theme) onto event e, it must map x onto an event e' which is part of e" (Dowty, 1991:567)[8].

The 'Incremental Theme' is intended to cover those nominal arguments that are entailed to undergo a definite change of state "in distinguishable separate stages, i.e. subevents" (Dowty, 1991:568). Examples of arguments that bear the thematic role Incremental Theme in Dowty (1991:568ff.) are:

(28) a. *build a house, write a book, knit a pullover* ('effected object');
b. *destroy a presidential finding* ('destroyed object');
c. *eat a sandwich, drink coffee* ('consumed objects');
d. *paint a house, polish a shoe, proofread an article* ('affected object');
e. *play a sonata* ('object of performance');
f. *enter, exit, reach, leave, depart, abut, abandon* (transitive verbs of directed motion with Incremental Theme subjects, see Dowty, 1991:570);
g. *melt, emerge, submerge, deflate, bloom, vaporize, decompose* (intransitive verbs with Incremental Theme subjects, see Dowty, 1991:571).

As the above examples show, the notion of 'Incremental Theme' is narrower than the traditional thematic role Patient, as it does not include the relation between the verb and the direct object in such predicates as *stroke (a cat)* or *stir (a soup)*, which are not homomorphic. While stirring soup in a pot, we cannot (at least under the most usual circumstances) determine what constitutes the first half of soup-stirring. Even if it appears that we could, as in *He stirred the soup until all the clumps were dissolved*, the predicate *stirred the soup* cannot be shifted into a homomorphic and a telic interpretation. Notice that the above sentence does not sanction the time-span adverbial *in five minutes*. (Interestingly, it does not sanction the durative adverbial *for five minutes* either.) Although the real world facts allow for the situation in which the soup changes one of its properties (consistency) in successive stages, the verb *stir* cannot be interpreted as entailing a homomorphism. Therefore, the quantization status of its direct object noun phrase is predicted to have no effect on the quantization status of complex predicates like *stir (the) soup, (the) soups, the soups in all the pots*, and the like. They all are atelic.

At the same time, the notion 'Incremental Theme' is broader than the thematic role Patient, because it includes subjects of verbs of motion, such as *the winning turtle* in (29):

(29) At the turtle race, the winning turtle crossed the finish line in 42 seconds.

In traditional terms, the subject noun phrase *the winning turtle* has the Theme role: Themes are characterized as those arguments that the verb entails to undergo a change of location or state, whether or not it is caused by Agent (Gruber, 1965; Jackendoff, 1972, 1974:93-95). However, in (29) what counts for the delimitation of the denoted event is the extent of the turtle, once all of its body parts are across the finish line, the event necessarily ends. Hence, *the winning turtle* is the Incremental Theme.

For the traditional 'Theme' thematic role Dowty coins the term *Holistic Theme*. In such sentences as *John drove from New York to Chicago* John is assigned the *Holistic Theme* role. Holistic Themes "undergo a change of state in stages, the change is 'incremental' only because of some relationship they bear to the true Incremental Theme, not because they undergo a change part by part" (Dowty, 1991:569). In *John drove from New York to Chicago* the Incremental Theme is here the implied Path and its part-structure is correlated with the part-structure of the denoted motion event. However, the Incremental Path Theme is not syntactically realized as a single argument, but rather the prepositional phrases *from New York* and *to Chicago* refer to its beginning and end points. Dowty (1991:569) observes that in semantically parallel examples, such as *cross the desert, traverse the United States (in six days)* or *drive the Blue Ridge Skyway (from beginning to end)*, the Incremental Path Theme is syntactically realized as a single argument, namely as the direct object. Other predicates that take a Holistic Theme argument and that have an implied Path are given in (30):

(30) *Holistic Theme*:
walk from the bank to the post office, run a mile;
grow into an adult; become an architect.

In *John was becoming an architect but was interrupted before he could finish his degree*, the subject-noun phrase *John* is also the Holistic Theme. Here, "the 'Path', if we want to call it that, is even more removed from syntactic expression [than in cases like *John drove from New York to Chicago* , HF]--the stages that one goes through to reach the status of architect were partly but not exhaustively achieved, NOT 'part of John but not all of him has become an architect'" (Dowty, 1991:569).

Another type of 'incremental participant' is that associated with Representation-Source Theme arguments. Here what incrementally comes into existence is the representation of a given 'source' object or underlying type.

(31) *Representation Source Theme*: copy a file, read a book, memorize a poem.

3.4 Comparison of Syntactic and Semantic Accounts

There are four main differences between Tenny's and Krifka-Dowty's accounts of telicity. First, Tenny's Aspectual Interface Hypothesis (AIH) is couched within the Government and Binding (GB) Theory. The AIH is motivated by the autonomy of syntax thesis, one of GB's basic tenets. It attempts to reconcile two seemingly conflicting goals: namely, to specify correspondences between the Lexical Conceptual Structure (LCS) and syntactic structure, and to do so without compromising the autonomy of syntax. It assumes a multistratal syntax and a uniform mapping between elements in the LCS and syntactic d-structure mediated only via the Aspectual Structure, which constitutes an autonomous module within the LCS. Various mismatches can be in principle obviated by the transformational movement between various levels of semantic and syntactic representation.

Dowty and Krifka presuppose a mono-stratal syntax and Montague style compositional semantic analysis. The implementation of the compositionality principle has important consequences for the relation between syntax and semantics: Semantics imposes heavy constraints on syntax, consequently syntax is not autonomous. Their model-theoretic account is couched within an event semantics that is enriched with lattice structures and directly makes reference to certain fine-grained lexical semantic properties of verbs.

Second, Tenny's account depends on the syntactic asymmetry between the external subject argument and the internal (direct and indirect) arguments in the d-structure. Only the internal direct object position in the d-structure is systematically associated with the nominal argument that determines the telicity of verb phrases. In Dowty's and Krifka's account, both the subject and object arguments can determine the telicity of complex verbal predicates and sentences, provided, they are linked to the Gradual Patient role (Krifka) or Incremental Theme (Dowty).

Third, both proposals are based on the intuition that the argument that determines the telic or atelic reading of complex verbal predicates denotes a participant undergoing a 'gradual' or 'cumulative change'[9]. In Tenny's, there is no explicit definition of the 'measuring out' notion nor of the closely related notion of 'delimitation'. The lack of precise characterizations of these two crucial notions substantially weakens the predictive power of the Aspectual Interface Hypothesis and its role as an interface between lexical semantics and syntax. Krifka-Dowty's semantic account captures in a direct way the role of nominal arguments in calculating the telicity of complex verbal predicates and sentences. They model the relevant interactions in an explicit way by defining structure-preserving mappings between the denotations of verbal and nominal predicates, which have an algebraic structure of complete join semi-lattices.

Fourth, on Tenny's account, it is not possible to state the rules that govern the influence of count (*ate an apple*), mass (*ate soup*) and bare plural (*ate blueberries*) nominal arguments on the telicity of complex verbal predicates in a uniform way. It also suggests that the verb *eat* will have different meanings depending on the quantization properties of its direct object arguments. (See also section 3.2.) In Krifka's and Dowty's account the verb *ate* has the same lexical semantic properties, and the influence of nominal arguments (Gradual Patient, Incremental Theme) is treated in a uniform and fully compositional way, as stated in the principle of aspectual composition (22).

3.5 Unresolved Problems: Shifts Revisited

Krifka and Dowty solve certain problems related to "Vendler's attempt to classify surface verbs once and for all as activities and accomplishments", which Dowty (1979:60) rightly criticizes. Their solution involves analyzing certain complex activity predicates (e.g., *John drank beer*) and accomplishment predicates (e.g., *John drank a glass of beer*) in terms of two semantic properties: the homomorphism entailment of the verb and the quantization property of its Incremental Theme argument. However, they are now faced with a new problem. Just as we cannot classify individual verbs once and for all as activities and accomplishments, so we cannot classify individual verbs once and for all as homomorphic or non-homomorphic. Whether a given (simple or complex) predicate entails a homomorphism property is subject to contextual influences, both linguistic and extra-linguistic. For example, take *waltz* and *rattle* in (32):

(32) a. Tom waltzed.
b. Tom waltzed into the room.

Waltz is an intransitive manner of motion verb that does not entail a homomorphism. In (32b) it is used with an optional directional prepositional phrase in a sentence that is telic and entails an incremental change. The incremental change is measured according to the positional changes of Tom, the subject noun phrase (*Holistic Theme* in Dowty's sense) along the implied Path. Given that in (32a) the Holistic Theme is quantized and the implied Path has a definite extent, there is also a finite succession of positional changes of *Tom*, and hence (32a) is quantized or telic. In general, in sentences denoting directed motion events, it is the extent of the Path together with the quantization properties of the Holistic Theme that determine the telic or atelic reading of a sentence. In (33a) we have essentially the same situation as in (32b), except that the directional phrase *off the shelf* indicates the source of the motion. In (33b) the plural Holistic Theme *books* generates reference to a plurality of events, one for each book in the group of books.

(33) a. The earthquake shook a book off the shelf in a few seconds / ?for a few seconds.
b. The earthquake shook books off the shelf ?in a few seconds / for a few seconds.

Although each book traverses a Path with a definite extent, the pairings of each book with its corresponding event gives rise to an indefinite number of positional changes, as *books* is cumulative. Hence, the denoted eventuality is cumulative (atelic), as well. The same general observations made for (32) and (33), hold for examples in which the Holistic Theme is realized as subject, as in Jackendoff's (34a,b):

(34) a. The rabbit jumped into Harriet's arms in a minute / ? all day.
b. Rabbits jumped into Harriet's arms all day / ?? in a minute.

From this we can conclude the following: only if *both* the Incremental Path Theme and Holistic Theme are quantized, the sentence to which they make their semantic contribution will be quantized or telic. Once we determine the 'incremental participant' or 'object' with respect to which a predicate is a homomorphism, the telicity of a complex predicate or a sentence can be determined in a way analogous to that in the familiar examples like *John drank wine* vs. *John drank a glass of*

wine. Although this appears to be straightforward, it is less obvious how the telicity of sentences like (32)-(34) can be calculated by compositional rules (such as the aspectual composition principle, given here in (22)) on the basis of independently motivated syntactic structures and the semantic argument structure of verbs.

Additional complications can be brought in if the verb's lexical semantic properties also (appear to) shift, over and above the atelic-to-telic shifts. This is shown in examples like (35), discussed in B. Levin (1989), Levin and Rappaport Hovav (1995), for example, and like (36) and (37), discussed in Jackendoff (1990:233). None of the main verbs in (36) - (37) entails motion, they are all intransitive and atelic. *Rattle* is inherently a verb of sound emission, for example. The intransitive verbs *laugh* and *sneeze* are used in the transitive caused-motion construction in (36b) and (37b):

(35) a. The old car rattled.
b. The old car rattled down the street to the university.

(36) a. The critics laughed.
b. The critics laughed the show out of town.

(37) a. Harry sneezed.
b. Harry sneezed his handkerchief right across the room.

In (35b, 36b, 37b), *the old car*, *the show* and *the handkerchief* function as Holistic Themes, and the directional phrases, *to the university*, *out of town* and *right across the room* imply the Incremental Path Theme. However, neither prepositional phrases nor the direct objects (36b, 37b) are here subcategorized arguments of the main verbs.

There are also cases in which the main verb appears to shift and although the 'incremental participant' is syntactically realized as a single argument, it is not a subcategorized argument of the main verb. For example, in (38b) the inherently intransitive verb *walk* that is used transitively with what is called "fake" object *ourselves* in a resultative construction.

(38) a. We walked.
b. We walked ourselves into a state of exhaustion.

The resultative phrase *into a state of exhaustion* introduces both a property scale with a relatively high value into the semantic representation of (38b). The part structure of the event can be mapped

onto the degrees of a property scale that measures the exhaustion of the participant denoted by the reflexive "fake" object *ourselves* and the coreferential subject *we*. In analogy to the transitive constructions with Incremental Theme direct objects, *ourselves* can be linked in (38b) to the Incremental Theme. (38b) implies that some critical and contextually determined value on the property scale was reached and this value coincides with the temporal delimitation of the denoted event. The relevant value can be thought of as being correlated with the onset of the state of exhaustion.

Whether a given sentence can be taken as denoting a set of telic events and involve some 'incremental participant' in its semantic representation may also depend on extralinguistic context and general world knowledge. Consider (39a):

(39) a. The doctor examined the patient for an hour / in an hour.
b. The doctor examined his motives (?in a few minutes/for a few minutes) and decided to let the patient die.

(39a) has a telic interpretation in a situation in which the doctor follows a certain established examination procedure that consists of a number of successive steps. For every part of the examination event, there is a corresponding part of the examination procedure. The telic interpretation does not here depend on what is explicitly coded in the linguistic expressions, but on what the interpreter knows about the larger scenes evoked by the linguistic material. That is, in order to understand the use of *examine* in (39a), we need to evoke the type of knowledge structures that Fillmore refers to as 'frames', which he uses

> "in a maximally general sense, including not only visual scenes but also familiar kinds of interpersonal transactions, standard scenarios defined by the culture, institutional structures, enactive experiences, body image, and, in general, any kind of coherent segment of human beliefs, actions, experiences or imaginings" (Fillmore, 1975:124).

It is one of the tenets of Frame Semantics that meanings are relativized to conceptual scenes or frames (see Fillmore, 1977a:59). Notice that if we use *his motives* in (39b) instead of *the patient*, as in (39a), the telic interpretation is odd. That is, the telic or atelic construal will depend on the knowledge associated with the lexical semantics of the main verb and the noun phrases filling its argument positions. Dowty (1991:569) gives a similar example along these lines: *John was becoming an architect but was interrupted before he could finish his degree*. Here, the

part structure of the event correlates with the steps on an implicit Path one must go through to become an architect. In this connection, it may be also mentioned that "very often the frame or background against which the meaning of a word is defined and understood is a fairly large slice of the surrounding culture, and this background understanding is best understood as a 'prototype' rather than as a genuine body of assumptions about what the world is like" (Fillmore, 1982b:118).

Given the examples in this section, it may be concluded that the homomorphism is not associated with the verb's meaning alone, but rather with a sentence in which the verb is used. The propositions conveyed by actual utterances of such sentences must take into account the background of the speaker's and interpreter's knowledge about the linguistic and extra-linguistic context (see also Dowty, 1979:185). Dowty (1991) and Krifka (1989, 1992) are aware of such examples and the problems they pose. Dowty (1991:567, quoted here in (27)) states that the meaning of a telic predicate is a homomorphism from its Incremental Theme argument denotation into a structured domain of events, "modulo its other arguments". However, he does not discuss how the influence of these "other arguments" should be handled. More importantly, in connection with the unaccusative-unergative distinction, Dowty (1991) observes that "the class of predicates permitted to appear in constructions specific to one class can be extended beyond the normal class in certain contexts, for some fanciful, metaphorical, humorous, or otherwise nonliteral effect" (p. 609). The possibility of such an analysis is provided in the context of "a grammatical construction (or some morpheme serving as head of the construction) [that] can be analyzed as having a meaning and/or conventional implicature of its own but it is a feature of compositional semantic theories since Montague 1974 that they permit constructional as well as lexical meaning" (Dowty, 1991:609). "Certain grammatical constructions have certain meanings associated with them (entailments or conventional implicatures) involving Proto-Agent or Proto-Patient properties, ..." (Dowty, 1991:608).

Krifka (1992) mentions that the mapping properties are not necessarily always "'hard-wired' in the thematic relations, but follow from other knowledge sources. Consequently, we should assume that even the object role of verbs like *eat* does not exhibit graduality as some grammatical feature, but simply because the normal way of eating enforces the graduality properties" (Krifka, 1992:45). This is clearly compatible with Fillmore's use of 'frame': "It is frequently useful, when trying to state truth conditions for the appropriateness of predicating the word of something, to construct a simple definition of

the word, allowing the complexity of fit between uses of the word and real world situations to be attributed to the details of the prototype background frame rather than to the details of the word's meaning" (Fillmore, 1982b:118).

To summarize, the homomorphism property, and hence also the telic and atelic reading of sentences, has the following sources:

(i) It is an entailment of a verb with respect to one of its arguments, the Incremental Theme, which is a syntactically realized argument: cp. *John drank beer* vs. *John drank a glass of beer*.

(ii) It is an entailment (or a conventional implicature) of certain grammatical constructions. The participant whose part structure is mapped onto the part structure of the event (e.g., Incremental Path Theme) is not a syntactically realized argument: see *The old car rattled down the street to the university*, *The earthquake shook a book/books off the shelf*, *The critics laughed the show out of town*.

(iii) It is an entailment (or a conventional implicature) of certain grammatical constructions. The Incremental Theme is a syntactically realized argument, but it is not a subcategorized argument of the main lexical verb: see *We walked ourselves into a state of exhaustion*.

(iv) The homomorphism is pragmatically determined by the extralinguistic context of a sentence and/or implied in the interpretive 'frame' (in Fillmore's sense) evoked by a verb predicate and its argument fillers: cp. *The doctor examined the patient (in an hour)*, *John was becoming an architect but was interrupted before he could finish his degree*.

Examples that illustrate (ii)-(iv) are problematic for Krifka-Dowty's account, because there is not enough information in just the surface syntax of such examples and the list of thematic roles in the argument structure of the main lexical verbs to calculate the telicity of verbal predicates and sentences by compositional rules on the basis of independently motivated syntactic structures and the semantic argument structure of verbs.

3.6 Incremental Theme and Incremental Eventuality

As in Krifka (1986, 1992) and Dowty (1988, 1991) I use the thematic role 'Incremental Theme' in order to capture the semantic commonality of verbs that are inherently homomorphic. At the same time, I allow for the possibility that a homomorphism may have other sources than just the lexical semantics of individual verbs, sources whose domain may be a verb phrase or even a whole simple sentence.

In general, the homomorphism property can be thought of as being associated with certain patterns of thematic roles and certain patterns of morpho-syntactic structure in simple clauses. This view allows us to account in a systematic way for those cases in which the 'object-event' homomorphism is clearly implicated in the calculation of the telicity of complex verbal predicates, but in which the 'object' does not correspond to a syntactically realized single Incremental Theme argument.

The proposal that the homomorphism property is an entailment of certain patterns of thematic roles and certain patterns of morpho-syntactic structure in simple clauses, rather than being just an entailment of a certain class of verbs, is consistent with Dowty's suggestion that "[c]ertain grammatical constructions have certain meanings associated with them (entailments or conventional implicatures) involving Proto-Agent or Proto-Patient properties, ..." (Dowty, 1991:608).

I propose that the 'object-event' homomorphism (as defined by the mappings given in (19)) characterizes a fragment of conceptual structure: an incremental eventuality type. An incremental eventuality type is one of the interpretive schemas or frames (in Fillmore's sense) against which sentences are interpreted. The status of the incremental eventuality type in the representation of sentences is comparable to that of a scalar model with respect to which, for example, the *let alone* construction is interpreted, as in (40a), and in the comparative conditional 'the X-er the Y-er', construction as in (40b):

(40) a. He does not like shrimp, *let alone* squid.
(i) He does not like shrimp.
(ii) He does not like squid.
b. The more carefully you do your work, the easier it will get.

According to Fillmore, Kay, O'Connor (1988), the general effect of the construction is to assert the first full clause preceding *let alone* (i), and to entail that the second (ii), the reduced clause (or fragment), necessarily follows. The two derived propositions (i) and (ii) are seen as points on this scale, where the proposition represented by the initial full clause is stronger than the other. "The lexical entry *let alone* thus implies an entire grammatical construction in which syntactic, semantic, and pragmatic information are interrelated. *Let alone* is but one such item among many; other examples include *even, almost, few, merely*, and many more" (p. 530). In (40b) a semantic scale is presupposed by a whole grammatical construction. Here, the two parts of the construction establish two semantic scales (or perhaps two ranges

on the same scale), and the utterance as a whole is interpreted as asserting a correlation or dependency relationship between values on these two scales, the antecedent providing the independent variable, the consequent providing the dependent variable: 'The degree to which X holds determines the degree to which Y holds'.

Similarly, the incremental eventuality type can be associated with a single verb, such as *eat*, but also with a grammatical construction, such as a directed-motion construction that contains an optional directional prepositional phrase that implies a Path: *Mary waltzed into the room.*

Having both the Incremental Theme and the incremental eventuality type at our disposal to represent what is a single grammatically relevant semantic property may at first sight seem redundant. However, this is justified given that there is no one-to-one correspondence between the Incremental Theme argument and the 'object' whose part structure is mapped into the event, and vice versa, as examples given in section 3.5 show.

We may distinguish two main canonical types of the incremental eventuality type depending on the domain from which the denotation of the 'object' is taken. By 'object' I understand any entity whose part structure is mapped into the event, and vice versa, as specified in (19):
(i) The 'object' corresponds to the participant whose spatial extent or volume is directly related to the temporal extent of the event. The best examples comprise the denotations of Dowty's Incremental Theme arguments (28a-28d) and the Incremental Path Theme.

(ii) The 'object' corresponds to some property of the participant that is affected degree by degree, and can be measured on some relevant property scale. The scale is structured by the mereological 'part' relation. The part structure of the event is correlated with the part structure of a property scale. Since the property scale measures a gradual change of some participant that does not concern (exclusively) its spatial extent, we cannot here *directly* apply the object-event mapping relations defined by Krifka, and given here in (19).

The second case corresponds to Tenny's (1987:86, 98; 1994) 'measuring-scale' associated with change-of-state verbs like *cure* in (41), for instance, and a similar notion of a property scale is mentioned in Jackendoff (1990:239) with respect to examples like those in (42):

(41) The doctor cured the patient.

(42) a. The candybar melted into a gooey mess.
b. The lake froze solid.

(41) denotes an event during which the patient changes along the (sickness-health) scale that measures his/her gradual recovery. According to Jackendoff (1990), verbs like *melt, freeze* have "an implicit Goal argument that encodes the final state of the Theme"(p.239). The implicit Path and the Goal can be thought of as the length of a scale with some contextually determined end-point. For example, in *The candybar melted into a gooey mess* the subject *the candybar* is the Incremental Theme and the relevant changing property is the *consistency* of its referent as it is gradually melting. The different physical stages of the whole piece of candybar in the melting process can be projected onto the degrees on a consistency scale. The degrees on the property scale associated with the melting candy bar are correlated with the part structure of the event. The final stage of the change is indicated by the resultative prepositional phrase *into a gooey mess*, which also coincides with the final temporal boundary of the event. This second canonical subtype also includes abstract 'Paths' (which could also be mapped onto scales) that are implied in examples like Dowty's (1991) *John was becoming an architect but was interrupted before he could finish his degree.*

One piece of evidence for the distinction between these two canonical types comes from the German partitive construction with the partitive preposition *an* (lit.: 'on', 'at') that serves to convey partial (or incomplete) events (see chapter 6, and also Filip, 1989). Its use is restricted to predicates denoting object-event mappings of the first canonical type with 'unique objects' (see (20)). Another piece of evidence comes from the English resultative construction that presupposes the second canonical type (see section 3.9.5). The two canonical types do not constitute discrete classes. For example, *grow into an adult* can be predicated of a participant (Incremental Theme) that gradually changes along the spatial (physical extent) scale as well as in terms of its qualitative aspects (like set of beliefs, dispositions, etc.).

The notion of 'incremental change' appears to be an essential category of human experience[10]. The most typical examples of verbal predicates denoting the incremental eventuality type are verbs that describe creation and destruction objects, consumption of some stuff, as well as the change of location of objects. Therefore, it is not surprising that verbal predicates denoting such incremental changes are also semantically privileged and that the participant undergoing the incremental change should make its way into the argument structure of

a given verb. The question of how the incremental eventuality type fits into the tripartite distinction into states, events and proceses will be addressed in the next section, in which I will outline the classification of eventuality types assumed here.

3.7 A Revised Classification of Eventuality Types

3.7.1 The Integration of 'Incremental Eventuality'

Verbs that denote incremental eventualities are not specified with respect to telicity or quantization. Take *John drank beer*. If we assumed that *drink* is telic (as Dowty's quote in (27) appears to suggest), we would be forced to say that in *John drank beer* the undetermined mass Incremental Theme argument makes a sentence with an inherently telic verb behave as if it were atelic (see also Dowty, 1979:62-3; 1991:567). We could then capture such data directly by formulating meaning postulates, that is, by constraints on how lexical items are related to one another. The relevant meaning postulate can be roughly given as follows: P[quantized +] + Incremental Theme[quantized -] → P[quantized -]. However, the solution in terms of such meaning postulates is ad hoc. Another option would be to assume that the cumulative Incremental Theme argument overwrites the inherently telic (or quantized) specification of *drink*. The use of overwriting presupposes that there is a clash between the properties of the verb and its Incremental Theme argument and that the cumulative property of the Incremental Theme is given precedence, given the asymmetry of the interpretive rules. However, it would be counterintuitive to assume that there is such a clash in a sentence like *John drank beer*.

By choosing either the meaning postulate or the overwriting option we would fail to account for the systematic and compositional nature of the data. There is an agreement that the contribution of nominal arguments to the telic and atelic interpretation of complex verbal predicates is predictable on the basis of the lexical meaning of a verb and the quantization properties of its Incremental Theme argument. Following the intentions behind Krifka's account, and the aspectual composition in (22), I propose that homomorphic verbs like *drink* are not specified with respect to quantization or telicity.

We have seen that not all the predicates that are homomorphic (as defined in (19)), and hence also denote incremental eventualities, are telic. And vice versa, not all the telic predicates entail an object-event homomorphism. For example, telic predicates like *touch the finish line* or *recognize a face* are not homomorphic, except in a trivial sense,

because they denote punctual events (see also Dowty, 1991:568). In short, the properties of 'telicity' (or 'quantization') and 'homomorphism' are independent of each other and we need to draw a clear line between the two.

However, this also means that at the lexical level we have a large class of verbs that cannot be classified as either process-denoting (atelic) or event-denoting (atelic). I propose, therefore, that individual verbs that take Incremental Theme arguments are assigned an eventuality type of their own, namely 'incremental eventuality'. At the level of lexicon and 'unsaturated' predicates (i.e., predicates whose argument positions are filled with variables) we the have the following eventuality types:

(43) quantized - : states, processes
quantized + : events
quantized α : incremental eventualities

'α' is a feature value variable standing for '+', '-' and the indeterminate value '[ ]'. The existence of incremental eventuality is independently motivated by other verbal predicates (than just those that take the Incremental Theme argument) that entail or conventionally implicate the object-event homomorphism. Examples were given in sections 3.5 and 3.6 (see points (ii)-(iv)). The 'saturated' projections of verbs denoting incremental eventualities are type-resolved with respect to telicity (or quantization). They are telic (or quantized, event-denoting), or atelic (or cumulative, process-denoting), depending on the quantization status of their Incremental Theme argument or the implied 'incremental object' (e.g., Path, a scale that measures the changing property of some participant, for example).

As far as the rest of the classification of eventuality types is concerned, I essentially follow the proposal in Bach (1981, 1986) as well as some suggestions in Dowty (1979) and Parsons (1990). Predicates and simple sentences fall into three main categories, states, processes and events, with further subdivisions of states into static and dynamic, and events into incremental, culminations and happenings. (See chapter 2, section 2.4.3 for further examples).

Eventuality types are distinguished from one another by certain basic semantic concepts from which languages draw in constructing lexical meanings. These are 'quantization' (and its opposite 'cumulativity', as defined in chapter 2, section 2.5.2), 'change of state' ('Does the denoted eventuality entail change?', 'Is the change simple or complex?'), and 'temporal extent' ('Is the denoted eventuality protracted or momentaneous?').

The following table summarizes the cross-classification of eventuality types in terms of the three notions 'quantization', 'change' and 'temporal extent'. Even though the specific grammatical criteria for distinguishing among eventuality types may vary across different languages, every language has at least the verbal categories proposed here. If we based our description only on the mereological notion of 'quantization' (and even if we added 'temporal extent') and did not include 'change', the distinction between states and processes would be impossible to draw. According to Bach (1981:68), who mainly relies on mereological criteria to characterize eventuality types, the line between states and processes is difficult to draw.

Table 1: Properties of eventuality types

	change	quantization	temporal extent
1. static state	-	-	+
2. dynamic state	-	-	+
3. process	+	-	+
4. protracted event	+	+	+
5. culminations	+	+	+
6. happenings	+	+	-

As far as the criterion of 'temporal extent' is concerned, Verkuyl (1989) comes to the conclusion that "the length of a time unit involved in an event does not qualify as a meaning element that distinguishes certain verbs from others" (Verkuyl, 1989:58). He argues that verbal predicates denoting happenings, such as *blink*, can be construed as events with an extended temporal frame in appropriate contexts, and vice versa, we can construe typical protracted events, such as *draw a circle*, as taking place at a single of moment time, that is, as happenings. For example, *blink* can be understood in a non-punctual way, if the interval that elapses between closing and reopening of one's eyes can be thought of as being spread out (as in a slow-motion movie clip). In a situation in which we produce a drawing of a circle on a computer screen by hitting a single key on a keyboard, we may felicitously say *He drew a circle on his Mac at three o'clock*. However, such construals are highly marked and they do not invalidate the usefulness of the temporal extent as a semantic criterion. Certainly, producing a drawing of a circle on a computer screen by hitting a single key does not constitute an unmarked, typical, way of understanding the meaning of the predicate *draw a circle*. (Nor do such marked interpretations justify that we speak in such cases of ambiguity, as Mittwoch (1988:75) suggests.)

In what follows let me briefly outline how the three notions 'change', 'quantization' and 'temporal extent' apply to the classification of verbal predicates and sentences into eventuality types. Sentences denoting **static states**, such as *Mary likes calculus,* entail no change, at least not a directly perceivable one. They concern permanent, 'atemporal' properties of individuals. Sentences denoting **dynamic states** like *John stood on the corner* entail a potential for an imminent (indefinite) change, they concern contingent, changeable, or temporary property of individuals[11].

All the other eventuality types entail changes of state. **Process** sentences like *Mary played poker (last night*) entail indefinite changes, while **event** sentences entail definite changes of state. *John reached the top* and *Mary spotted her suitcase right away* denote events that involve a single change. *Mary closed the door* denotes an event involving a series of definite changes (different positions of the door with respect to the door frame) that culminate at a state at which the event necessarily ends (when there is no space left between the door and the door frame). The event is clearly delimited by this state.

Depending on the way their temporal extent is lexicalized, events are divided into **protracted events**, such as *Mary closed the door*, and **momentaneous events**. The latter fall into **culminations**, such as *John reached the top*, and **happenings**, such as *Mary spotted her suitcase right away*. Protracted events and culminations are extended in time. Culmination events differ from protracted events in that they have no expression in their semantic description associated with the process preceding the culmination (see Pustejovsky, 1988:30ff.)[12]. Happening predicates denote events about which, with some idealization, we can say that their beginning and end fall together into a single moment. They are lexicalized as having neither duration nor internal structure.

Predicates and sentences that entail an indefinite change (process predicates) or no change at all (state) denote eventualities that are extended in time, but they have no culmination or an inherent limit in their semantic description. This lack of an inherent limit motivates why process and state predicates are cumulative and divisible (up to a certain point). Event predicates and sentences entail definite changes of state, and hence an inherent limit in their semantic description. Therefore, they are quantized, and fail to be divisible as well as cumulative.

3.7.2 Grammatical Tests for Eventuality Types

The fine-grained classification of verbal predicates into static states, dynamic states, processes, protracted events, happenings and culminations as well as the coarse-grained two-way division into telic and atelic eventualities can be motivated by three grammatical criteria (also used in L. Carlson, 1981):

1. Point temporal adverbials, such as *at that moment, at once, at 3 o'clock*[13].
2. Progressive aspect.
3. Durative adverbials. Durative adverbials are adverbials that are used in an answer to the question 'For how long?'. They include *for*-PP (like *for a while), all day (long), from one to ten o'clock, until dawn, between May and July, since his birth on, for years.*

The tests are applied to simple sentences in the past tense. The results of the tests are summarized in the following table:

Table 3: Tests for Eventuality Types

	point adverbial	progressive	durative adverbial
1. static state	?	?	+
2. dynamic state	+	+	+
3. process	?	+	+
4. protracted event	?	+	?
5. culminations	+	+	?
6. happenings	+	?	?

In the table and in examples further below, '?' distinguishes marked cases from unmarked ones. The difference between the marked and unmarked examples is gradual and it depends on the meaning of the main verb in a particular sentence and the range of appropriate contexts of use. Many marked examples are acceptable under a special interpretation of a sentence which is shaped by the presence of one of the three grammatical criteria. Often, the special interpretation is iterative, habitual or inchoative. Various contexts of use, such as instruction, lively narrative, performative use, etc., can also make such examples acceptable.

Point Adverbials. Point adverbials distinguish dynamic states, culminations and happenings from static states, processes and protracted events:

(44) a. ?At three o'clock Boris was Russian.
b. At three o'clock the socks lay under the bed.
c. ?At three o'clock the fly swam in the soup.
d. ?At three o'clock Irv built a cabin.
e. At three o'clock Emily won the car race.
f. At three o'clock the light flashed.
g. At three o'clock, he found his watch.

Point adverbials are odd with static state predicates, as they attribute (more or less) permanent properties to individuals. The main reason for this seems to be a pragmatic one. Given the "atemporal" nature of static states, such as *be Russian*, it is not surprising that it would be odd to assert that the property obtains at one particular moment within that interval (see Taylor, 1977; Dowty, 1979:173, 179; Vlach, 1981:273; Bach, 1981:70). Other examples that illustrate this point are: *?John knew French at that moment, ?Sue believed in God today at 3:45pm, ?I understood the relativity theory when Albert entered the room.* On the other hand, with dynamic states, it makes sense and it is informative to assert that the denoted property obtains at one particular moment, as in (44b) *At three o'clock the socks lay under the bed.*

Since point adverbials indicate individual moments of time, the smallest, indivisible intervals, they are compatible with predicates denoting happenings, such as those in (44f,g). Other examples are *blink, knock, kick, hit, pat, wink, clap, tap, snap*, psychological verbs *like recognize, notice, spot, realize*, and also verb phrases like *be struck by lightning, find one's watch* and verbs like *break, burst, explode.*

Sentences headed by culmination predicates like *win, die, awaken* and directed motion verbs like *arrive, leave, depart, reach* are compatible with point adverbials. The point adverbial coincides with the time point when the culmination takes place.

Sentences denoting processes or protracted events are associated with protracted "run-times" and cannot usually occur with point adverbials. For example, (44c) *?At three o'clock the fly swam in the soup* is odd. (44c) is acceptable if it has an iterative or inchoative (the swimming starting at three o'clock) interpretation. To temporally anchor such processes to a particular time point, we must use them in the progressive construction: *At three o'clock the fly was swimming in the soup.* The same holds for sentences with predicates denoting protracted

events: cp. (44d) *?At three o'clock Irv built a cabin* and *At three o'clock Irv was building a cabin.*

The Progressive Aspect. The progressive applies only to dynamic states (45b), but not to static states (45a), at least not without a special interpretation. The class of dynamic states comprises stage-level predicates like *be drunk, be polite, be a hero, sit, stand, lie, perch, sprawl.*

(45) a. ?Boris was being Russian.
b. The socks were lying under the bed.
c. The fly was swimming in the soup.
d. Irv was building a cabin.
e. Emily was winning the car race.
(45) f. The light was flashing.
g. ?He was finding his watch.

As has already been mentioned in chapter 2, the progressive operator relates episodic eventualities, including dynamic (or temporary) states, to their proper parts. The progressive operator contributes the notion of 'partitivity'. Since verbs denoting happenings, such as *blink, flash, recognize, find, notice*, denote eventualities that take place at single moments of time, they have no proper internal parts, they are trivially indivisible, and hence the progressive cannot be applied to them. Such verbs are odd with the progressive, unless we think of some unusual contexts, like a slow-motion movie, in which their beginning and end do not fall into a single moment, but instead are separated by an interval of time. For example, a sentence like *John was blinking* is acceptable in a single event interpretation, provided that the interval that elapses between closing and reopening of John's eyes can be thought of as being spread out (as in a slow motion movie) with the distinctly gradual closing and reopening of his eyes.

In the unmarked case, however, verbs denoting happenings like *blink* or *flash* are associated with very short intervals of time. Therefore, they are most likely to give rise to an iterative interpretation when they are used in the progressive. In this case, the progressive picks out a proper subset of the series of iterated events. However, the possibility of an iterative interpretation depends on the resettability of the denoted happening. Happenings described by such predicates as *blink* are resettable, but those denoted by *find (one's watch), notice, spot, explode*, for example, are not resettable with one and the same object token: we do not repeatedly and within short intervals of time

become aware of and forget a certain fact (under normal circumstances), and we know that a bomb, for example, can explode only once. Such real world knowledge accounts for the observation that the iterative construal is not (easily) available. Since also the single-event interpretation in the progressive is not acceptable, because such happening predicates are not (easily) viewed as taking place over extended period of time, their use in the progressive is odd: *?He was finding his watch, ?She was noticing/spotting the squirrel, or ?The bomb was exploding.*

Culmination predicates differ from happenings in so far as they freely occur in the progressive[14]. As Vlach (1981:281-282) observes, they often allow for a single or an iterative interpretation. For example, (45e) *Emily was winning the car race* can be true in a situation in which Emily takes part in a race that starts at 9:00am and ends at 9:20am. Suppose that at 9:08am Emily is ahead of everyone else and stays ahead until 9:15am. The progressive picks out this intermediary stage, so we may assert *Emily was winning at 9:10am.* And we may assert without a contradiction *Emily was winning at 9:10am, but in the end she lost the race.* For an iterative interpretation of (45e) we can imagine the following situation: Suppose the car race lasts for a few weeks and at the end of every day its participants are ranked and Emily is ranked first for three consecutive days.

Vlach (1981:281-282) refers to the iterative and single eventuality interpretations of (45e) as the two "senses" of a sentence. If this were to imply that (45e) is ambiguous, it would be wrong. The two interpretations are better viewed as a matter of vagueness, a pragmatically determined variability. If the non-iterative reading is thought of in terms of subevents that are distributed over a set of contiguous intervals (partition), the distinction between the non-iterative and iterative reading becomes blurred. That is, the distinction between a single-event or an iterative reading is a matter of the density of the proper subevents into which the event denoted by *Emily was winning the race* can be divided. In either case, it holds that *Emily was winning the race* applies to events which are parts of events to which *Emily won the race* applies. Whether the subevent itself is internally continuous or iterative is to be determined by various pragmatic considerations.

Durative Adverbials. The domain of application of durative adverbials is restricted to cumulative (or atelic) predicates, that is, dynamic states and processes. The following examples illustrate this point:

(46) a. Boris was Russian for several years.
a.' ?Mary knew physics for three years.
b. The socks lay under the bed for a while.
c. The fly swam in the soup for a while.
d. ?Irv built a cabin for a year.
e. ?Emily won the car race for three days.
f. ?The light flashed for an hour.
g. ?He found his watch for three days.

(46a) can be interpreted as meaning that Boris was a Russian citizen for several years. Many predicates denoting static states are odd with durative adverbials (see Bach, 1981:74; Dowty, 1979:179ff.). The reason is that we view such static states as *knowing physics*, *being intelligent* as holding in large and vaguely defined intervals of time, rather than being restricted to certain relatively short intervals of time.

The durative *for*-PP, and other durative adverbials, carve out quantized portions out of cumulative eventualities. Bach (1981:74) points out that "[t]he combination of a specific durational adverbial with a process predicate (or sentence) acts in every way like an event predicate (or sentence)". *For*-PP requires that the eventuality denoted by the predicate in its scope lasts at least as long as specified by the temporal measure phrase that *for* combines with. That is, *The fly swam in the soup for a minute* can be felicitously uttered if the fly swam in the soup exactly for one minute as well as if it swam in the soup for three minutes. This then motivates why event predicates are anomalous with durative adverbials, unless they can be coerced into a cumulative (process) or an iterative interpretation.

The temporal extent of events can be measured by time-span *in*-PPs, as in *John built a cabin in three years*. The time-span adverbial in the expression '*in*-PP ϕ' specifies that ϕ obtains "in some subset of the interval indicated, though not necessarily in a proper subset" (see Dowty, 1979:334). In other words, *in*-PP can mean (i) 'throughout', i.e., counting the time units from the beginning to the end of an interval, and (ii) 'within', i.e., locating an event within some proper part of the interval assigned to it. These two readings have parallels in the domain of countable nominal expressions. (In addition, *in*-PP can have an 'after' interpretation, which I am not going to discuss here.) The above observations are supported by Mittwoch (1982:120, fn. 11) who notices that the time-span adverbial *in*-PP is "downward" entailing and can be combined with *at most*, but not with *at least*: cp. *John wrote it in at most two hours* and ??*John wrote it in at least two hours*. By contrast, the durative adverbial *for*-PP can be combined with both *at*

most and *at least*: cp. *John read for at least two hours* and *John studied for at most two hours*.

The conditions on the use of durative adverbial phrases are quite complex and depend on the lexical semantics of a cumulative predicate in its scope, the length of the time interval denoted by the measure phrase within the durative adverbial phrase, and on our general knowledge about eventualities, their typical extent in time, etc. For example, for a combination of a durative adverbial with a state predicate, such as *I was in my room all the time*, the most plausible interpretation is one in which the set of all moments within the contextually determined interval is relevant (see L. Carlson, 1981:46-7). In contrast, this is not necessarily the case for: *I worked all the time, Bill read until dawn*. Either the whole denoted time interval counts as the evaluation interval for these sentences, or there must be some vague and sufficiently large number of process chunks that are properly distributed within the interval denoted by the temporal measure phrase that *for* combines with. In this respect, the durative adverbial *for*-PP is comparable to the quantifier *all*. Take, for example, *All the ground was speckled with leaves*. It does not entail that there were no bare spots, "only that there were no bare spots big enough to break a pattern of speckles" (L. Carlson, 1981:55).

Cases in which the *for*-PP does not involve reference to all of the proper intervals (and not even to most of the proper intervals) of the temporal measure phrase are easy to find. We can assert *John taught for a year* if John taught literally for twelve consecutive months, but also if he did not teach during the summer months. Second, the proper intervals referred to by a *for*-PP need not be temporally contiguous. *John attended the concerts for a year* may be truthfully asserted even if the concerts were monthly or even quarterly, but not if they took place weekly in May only.

In light of the above observations it may be proposed that durative adverbials have two inherent properties: (i) they indicate a certain temporal measure and (ii) have the combinatorial potential to take cumulative predicates as their arguments. How the temporal measure is to be divided into its (proper) periods, the relevant temporal parts associated with given subevents, depends on the interaction of the semantics of the adverbial with that of the verbal predicate in its scope and on a variety of contextual (extra-linguistic) factors. Consider the examples (47):

(47) a. John ran for an hour.
b. John ran for a year.

Here, the division into proper subintervals depends on the length of the measure phrase in *for*-PP and the length of time typically associated with the eventuality denoted by the cumulative predicate in the scope of *for*-PP. While an hour full of running may be continuous without gaps, a year full of running is naturally assumed to have gaps, so (47b) is most likely to have an iterative interpretation. Happening predicates, which denote events of short (point-like) duration, will be acceptable in the scope of durative adverbials if they can be coerced into an iterative interpretation. For example, in (46f) *The light flashed for an hour*, "?" indicates that the sentence is acceptable if the light flashes sufficiently often over an hour interval[15].

An iterative construal may be preempted for independent reasons, as in (46g) *?He found his watch for three days.* It is odd due to the fact that it seems implausible that somebody repeatedly loses and finds one and the same watch over a period of three days. However, if each finding is associated with a different watch or watches, the above sentence becomes acceptable: *He found watches lying on his office desk for three days.* The iterative reading is also blocked if the denoted event is non-resettable, as in (48a):

(48) a. *The bomb exploded until dawn.
b. (The) Bombs exploded until dawn.

The corresponding sentence with a plural subject noun phrase *(the) bombs* (48b) is acceptable, because the plural subject generates reference to a plurality of events.

The final point concerns predicates that denote protracted events in the scope of durative adverbials, as in (46d, e). Under the most usual, unmarked, interpretation they are unacceptable in this context. However, they are acceptable in the scope of durative adverbials, if they can shift their meaning to an iterative or a cumulative (process) interpretation. (See also chapter 2, section 2.5.5, examples *Mary played the same waltz for an hour* and *John rode the bus to work for three year.*) There are interesting differences within the class of predicates denoting protracted events with regard to their interaction with the scope of durative adverbials. Take, for example, sentences in (49), pointed out by Fillmore (pc):

(49) a. Sally closed the door for two hours.
b. Sally put the beer into the fridge for two hours.
c. Sally stacked the beer into the fridge for two hours.
d. I went to my room for two hours.

Sentences (49a, b, c) can have an iterative interpretation, whereby the durative adverbial takes scope over a whole complex predicate: e.g., (for two hours (*Sally-closed-the-door)), where the plural predicate '*Sally-closed-the-door' is the set of atomic events and their plural sums (see Landman, 1996, for example). Under this 'external modifier interpretation' (see Dowty, 1979:250ff.), Sally was repeatedly closing and opening the door for two hours. However, only (49a) and (49b), but not (49c), can also have a reading in which the durative adverbial modifies only the result state: (for two hours (the-door-was-closed)), (for two hours (the-beer-was-in-the-fridge)). The verb *stack* in (49c) does not allow this 'internal modifier interpretation' (see Dowty, 1979:250ff), while for (49d) it is the preferred interpretation, namely the durative adverbial here takes scope only over the entailed result state 'being in the room'. In sum, the telic predicates in the scope of *for two hours* in (49) are acceptable, because the durative adverbial takes scope over a cumulative (atelic) predicate: Either the telic predicates are shifted into an iterative reading and denote an indefinite plurality of telic events, or the durative adverbial measures the length of the result state inherent in the semantics of the telic predicates. States are classified as atelic (cumulative).

Fillmore also observes that the placement of the durative adverbial in the clause initial position has a disambiguating effect:

(50) a. The dissidents were sent to Siberia for twenty years.
b. For twenty years, the dissidents were sent to Siberia.

(50a) is ambiguous between the iterative and result interpretation, while (50b) is not: it only means that over a period of twenty years dissidents were sent to Siberia and spent some unspecified periods of time there.

3.7.3 Genericity, Habituality and Iteration

The classification into states, processes and events concerns verbal predicates or simple sentences that denote *single* occurrences of various eventuality types. It has been observed that the rule of iterative interpretation applies to almost any type of sentence to 'pluralize' it (see chapter 2, section 2.5.3.5 on pluralities). Pluralities of eventualities, which are expressed by iterative and habitual sentences, belong to a dimension of conceptualization that is orthogonal to the classification of verbal predicates and sentences into states, processes and events. This is not to say that there not important semantic

parallels between single eventualities and sum or plural eventualities. Consider examples in (51):

(51) a. John speaks French.
b. John is speaking French.

(51a) expresses a generic statement and it contains a derived habitual verb *speaks*. Such statements constitute a subtype of generic statements, namely, habitual statements. They denote regularities that can be inferred from a number of particular episodes. For example, (51a) expresses a generalization over a number of particular episodes expressed by (51b). Generic sentences are semantically stative (see Carlson, 1989:168; Carlson and Pelletier, 1995). Why cannot we then consider genericity to be a special type of states? Generic sentences are not just stative sentences, and there are significant differences between generic sentences and those with lexically stative verbs. A detailed analysis of these differences can be found in Krifka et al (1995). Let me here mention just two. First, only generic sentences (51a), but not sentences with lexically stative predicates (52a), have perfectly acceptable corresponding progressive counterparts denoting an instance from which, along with other such instances, one can infer a regularity.

(52) a. John knows French.
b. ??John is knowing French so well.

The oddity of (52b) is motivated by the observation that lexically stative predicates "have no corresponding episodic predicate in the lexicon that characterizes all the situations which count as direct evidence of the 'knowing French' behavior" (Krifka et al, 1995:37). Ryle's explanation (1949, chapter 5) for such lexical gaps is that there are so many different behaviors in which 'knowing French' can manifest itself on a given occasion that there can be no single episodic verb to denote them all. However, both (51a) and (52a) are alike in that they are independent of particular eventualities, they do not depend on John's doing anything at a particular moment when (51a) and (52a) are uttered. They denote a disposition or potential to manifest a certain behavior that counts as evidence for the generalizations they express[16].

Second, inherent semantic properties of predicates denoting the individual instances that constitute a regularity are preserved in the derived generic sentence. For example, generics based on agentive stage-level predicates can be combined with a variety of expressions related to agency and control. In contrast, lexically stative predicates

never allow this, as is shown in the following examples (taken from Smith, 1991:42-3):

(53) a. Mary deliberately refuses dessert every Friday.
b. I persuaded Mary to play tennis every Friday.
c. What Mary did was play tennis.

(54) a. ?*John deliberately knew Greek.
b. ?*I persuaded Mary to know Greek.
c. ?*What Mary did was know the answer.

Sentences expressing particular single occurrences of various eventuality types (i.e., single occurrences of states, processes or events), as in (55a) and (56a), and those expressing pluralities of iterated eventualities, as in (55b), are both distinguished from sentences denoting pluralities of eventualities that are expressed by generic (habitual) statements like (56b):

(55) a. The light flashed (once).
b. The light flashed three times.

(56) a. Pluto is barking and chasing that UPS truck again, go and put him on a leash.
b. Pluto chases UPS trucks.

Three times is a count cardinal adverbial that functions as a quantifier over a definite number of events of the same type (here a momentaneous event type). Verbal predicates or sentences with definite count cardinal adverbials are telic (or quantized). They do not pass the divisibility and additivity tests.

Habitual sentences are atelic (or cumulative), because they pass both the additivity or cumulativity test: adding a plurality of eventualities expressed by *Pluto chases trucks* to another plurality of eventualities expressed by the same sentence, amounts to a plurality of the same kind, namely *Pluto chases trucks.* They fail to be quantized, because a plurality of eventualities denoted by *Pluto chases trucks* will have a proper part that will also fall under the denotation of *Pluto chases trucks.* Most importantly, the rule of habitual interpretation adds a modal or counterfactual condition over and above the plurality of events. Habitual sentences are associated with an interval of time that is (in most cases) large and vaguely defined and that includes a vague number of occurrences of a given eventuality type.

3.8 Telicity and Frame-Creating Adjuncts

3.8.1 Adjuncts and Incremental Eventuality Type

It has been observed above that the meaning components of 'telicity' and 'homomorphism' are not introduced into the semantic structure of sentences solely by the lexical semantics of verbs. Whether a given verbal predicate or sentence is telic, and in addition also entails an object-event homomorphism, is determined by the lexical semantics of the head verb, obligatory and optional arguments, adjuncts, the discourse-level linguistic context, the extralinguistic context of the utterance and general world knowledge associated with the meaning of sentences.

In this section, I will focus on certain adjuncts that influence the telicity of predicates and sentences. First, it must be emphasized that not all the optional adverbial phrases or adjuncts can function in this way. We may right away exclude from this discussion adjuncts that add further specifications to the frame activated by the verb ('frame' in the sense of Fillmore, introduced here in section 3.5) by filling in the necessary or potential aspects of the denoted eventuality, such as time, place, manner, reason, beneficiary, etc. However, such adjuncts do not affect the telicity of a sentence, nor do they introduce the object-event homomorphism. Examples are given in the following sentences:

(57) a. They danced on the deck.
b. They argued after they got home.
c. They basted the turkey with melted butter.

There is another class of adjuncts that "create[s] frames of their own, to which the predicators must make some semantic accommodation" (Fillmore, 1989:101). Fillmore illustrates the workings of a 'frame-creating' adjunct with the prepositional phrase *to my grandmother* in *I wrote to my grandmother* (ibid., p.102). Here, *to my grandmother* has a function that is not provided by the basic sense of the verb *write*, it does not fit the frame automatically activated by *write*. The *to*-phrase creates a frame of transmission of something to somebody into which the verb *write* is fitted. The whole sentence is interpreted in a new way shaped as much by the prepositional phrase as by the main verb, and *write to* is interpreted as *correspond with*. This change is motivated by connecting the goal meaning of the *to*-phrase with the meaning of *write*.

Among the adjuncts that are 'frame-creating' in this sense are those that determine the telic interpretation of a complex verbal predicate or a

sentence. Take, for example, resultative adjuncts, such as *smooth* in (58):

(58) a. The horses dragged the logs smooth in a day / ??for a day.
b. The horses dragged the logs for two hours/?in two hours.

(58a) is telic, as is shown by the compatibility with temporal adverbs. It entails that the logs underwent an incremental change during the event, they gradually became smoother. The part structure of the event is correlated with the part structure of a property scale related to the smoothness of the logs. (58a) also involves a resultant state that coincides with some relatively high and contextually determined value on the smoothness scale. Since (58a) contains the non-progressive verb form, this value is asserted to have been reached. Therefore, the event is considered complete, and hence also telic (event-denoting).

However, adding an optional adjunct that introduces an incremental event type into the logical representation of a sentence is not sufficient for a sentence to be telic. For example, take again examples like (33), repeated here as (59):

(59) a. The earthquake shook a book off the shelf in a few seconds / ?for a few seconds
b. The earthquake shook books off the shelf ?in a few seconds / for a few seconds.

Although in (59a,b) it implies a clearly quantized Path between the shelf and the floor (or the ground), only in (59a), but not (59b), the total sum of positional changes is quantized, and hence only (59a) is quantized or telic. (See also here the discussion in section 3.5.)

3.8.2 Adjuncts and Lexical Rules

In English, the interpretation of a verb as telic or atelic and/or homomorphic is typically not marked overtly in its verb form. The treatment of adjuncts that influence the telicity (and homomorphism) of predicates and sentences is directly related to the following general question: How do we account for systematic meaning shifts associated with the same lexical verb when it occurs with and without the telicity inducing adjunct? In general, how do we account for systematic meaning shifts associated with the same verb when it occurs in a range of syntactic patterns? The treatment of adjuncts poses the following questions: First, how should the introduction of adjuncts be treated by

rules of grammar? In particular, what type of rule licenses such adjuncts? Is it a lexical or an extralexical rule? Second, who selects whom? Do verbs select for adjuncts or vice versa, do adjuncts specify that they are compatible with certain verbs?

Lexical rule approaches to meaning shifts have received by far the most attention. They mainly rely on lexical ambiguity of verbs and postulate two (or more) senses for each verb (polysemy) or two (or more) different lexical items (homophony). The relation between different senses or lexical items is accounted for by general lexical rules or type-shifting operations, which may also involve word formation rules with zero-morphology.

Three arguments (among others) have typically been used in support of the lexical rule account. First, meaning shifts induced by syntactic contexts are rule-governed and productive over certain restricted classes of verbs. Second, certain expected meaning shifts do not occur. If we view the lexicon as storing idiosyncratic information (see Jackendoff, 1975; Wasow, 1977; Dowty, 1979, and others), such exceptions to meaning shifts would count as evidence for regarding them as being of lexical nature. Third, in a number of languages meaning shifts are obligatorily or optionally indicated by derivational morphemes on the verb, and hence are clearly lexical word formation processes.

Lexical strategy to meaning shifts has been implemented in a number of proposals. For example, *lexical redundancy rules* (see Jackendoff, 1975; Bresnan, 1978, 1982; Marantz, 1984, and others) create syntactic subcategorization frames and semantic representations of verbs that can occur in more than one construction. Pairs of verbs related in this way overlap in their syntactic and semantic properties. Members of a pair are equal in that neither is derived from the other and both are listed in the lexicon. *Lexical mapping theory* (see Foley and Van Valin, 1984; Carter, 1988; Pinker, 1988; Rappaport and Levin, 1988; Bresnan and Kanerva, 1989; Bresnan and Moshi, 1989; Bresnan and Zaenen, 1990; Alsina and Mchombo, 1990; and others) uses lexical rules that alter general default linking rules and map semantic representations of lexical items onto syntactic representations.

The most recent and detailed application of a lexical rule strategy can be found in Levin and Rappaport Hovav's (1995) *Unaccusativity.* The main goal of this book is the defense of Perlmutter's original hypothesis that unaccusativity is both syntactically encoded and fully semantically predictable (see p. 5-6)[17]. Levin and Rappaport Hovav's guiding assumption is that "verbs that are systematically associated with a range of meanings are also found in a range of syntactic configurations and display a range of patterns of syntactic behavior"

(Levin and Rappaport Hovav, 1995:180). The syntactic behavior of such 'variable behavior verbs', as they call them, is predictable from the lexical semantic representations of verbs. "Each meaning can be shown to be correlated with the appropriate syntactic behavior" (p.180). Variable behavior verbs are polysemous ('regular polysemy', see Apresjan, 1973, 1992) and they are related by a lexical rule, as in (60) and (61), or by the compatibility with more than one lexical semantic template, as in (62) (see Levin and Rappaport Hovav, 1995:182, 208).

(60) a. The truck rumbled.
RUMBLE$_1$: basic sound of emission sense

b. The truck rumbled into the yard.
RUMBLE$_2$: derived directed motion sense

(61) a. Evelyn wiped the dishes. (Levin and Rappaport, 1988)
WIPE$_1$ - Conceptual Structure:
[x 'wipe' y]

b. Evelyn wiped the dishes dry.
WIPE$_2$ - Conceptual Structure:
[x CAUSE [y BECOME (AT) z] BY [x 'wipe' y]]

(62) a. The log rolled down the hill.
b. Max rolled down the hill.

Pairs of verbs in such examples as (60) and (61) are related by lexical rules that alter semantic representation of verbs. They map members of one semantically coherent verb class onto another. For example, as (60) shows, English verbs of sound emission are mapped onto the class of verbs of directed motion. A lexical rule combines a one-place predicate *rumble* with a directional phrase to produce a new complex predicate *rumble into X*. In other words, the directional phrase *into X* augments the argument structure of the one-place predicate *rumble*[18]. In general, such lexical rules can be thought of as adding additional predicates and arguments to the semantic structure of verbs. In the case of *rumble* in (60b), we get a different sense of the verb than *rumble* has in (60a), namely RUMBLE$_2$: [x MOVES INTO y] BY [x rumble]. This new sense of the verb conflates 'sound' of the input verb RUMBLE$_1$ with 'motion+path'. The combination of 'motion+path' in independently motivated, because it is lexicalized in the directed motion verbs, such as *arrive, depart, enter, leave, return* (see Talmy, 1975,

1985, 1991)[19]. This strategy yields two different lexical representations for verbs like *rumble*, and hence two different syntactic subcategorization frames. Similarly, the difference between *wipe the dishes* and *wipe the dishes dry* is encoded through the difference in their Lexical Conceptual Structures. In the resultative construction, it is the underlying "[y BECOME (AT) z]" portion of the Conceptual Structure that imparts the resultative sense.

There are three main problems related to the lexical rules that alter the semantic representation of verbs. The first concerns the outputs of lexical rules. Goldberg (1992/95) observes that such an approach leads to a proliferation of lexical entries with unmotivated and implausible senses for verbs. To the proliferation of lexical entries counterargument Levin and Rappaport Hovav (1995:197) may object that it is unnecessary to give all lexical entries in full, because such rules generate potential lexical items that need not be actually listed in the lexicon, because English makes use of these rules in a completely productive way. On their view, the creation of new lexical items is as productive as the formation of passive participles from transitive verbs. However, what is more troublesome than the proliferation of lexical entries and senses for verbs generated 'on the fly' is providing empirical evidence for the proposed outputs of lexical rules. Given that some potential word outputs appear quite odd, we must ask whether these are actual words in any language: Can we find any language(s) that conflate(s) within a simple monomorphemic verb 'sound+motion+path', for example? The existence of simple verbs with such a lexicalization pattern could then be taken as empirical evidence in support of lexical rules that change the semantic representation of verbs. The lack of such verbs in English, for example, would be merely an accidental lexical gap. If simple verbs with senses generated by the proposed lexical rules cannot be found in any language, this would be taken as evidence that senses for verbs generated by the proposed lexical rules are cross-linguistically excluded. We would then have to explain why languages do not conflate within a simple verb 'sound+motion+path', for example. Moreover, in such a case, we would be faced with two options: treating some meaning shifts in terms of extralexical rules and some in terms of lexical rules, or, rejecting the lexical rules approach in order to treat all the meaning shifts in a uniform way.

The second main problem has to do with the consequences of such a lexical strategy to aspect shift. All the examples of meaning shifts that Rappaport Hovav (1995) discuss in *Chapter 5: Verbs with Multiple Meanings* involve a change in telicity: verbs of manner of motion and

verbs of sound emission in a directed motion construction, the resultative construction, and meaning shifts in causative alternations. Although a lexical approach may be defensible for certain cases of aspect shift, there are certain cases of telic-atelic shifts that resist a lexical account, and therefore it is impossible to provide a uniform lexical account for all the kinds of aspect shifts. For example, we may propose a lexical account for the shift from the telic interpretation of *blink* (closing and opening one's eyes exactly once) into the atelic one (closing and opening one's eyes an indefinite number of times). The process interpretation could be defined in terms of the event interpretation of the verb *blink*. The semantic relation between these two senses/verbs would be comparable to the telic *take a step* and atelic *walk* (see also similar comments in Dowty, 1979:173). The telic (possibly basic or inherent) interpretation is selected by a time-span adverbial like *in five minutes*, while the atelic (possibly shifted) one is selected by a durative adverbial like *for five minutes*.

Now, let us look at what happens when such aspectual operators like the durative and time-span adverbials, and directional prepositional phrases are nested. One and the same eventuality description can occur in the scope of multiple nested aspectual operators. Examples in (63b, c, d) illustrate various combinations of nested aspectual operators.

(63) a. John sang for an hour.
b. John walked across the bridge to campus.
c. John walked to campus in twenty minutes for three years.
d. John played the same waltz over and over for an hour.

We could argue that the complex verbal predicate *walked to campus* in (63c) is an output of a lexical rule, which crates a new lexical item conflating 'motion+path', just as in the case of *rumbled into the yard* in (60b). But the introduction of the same directional phrase *to campus* in (63b) cannot be treated in this way, namely as creating a new lexical item *walk across the bridge to campus*. Therefore, the application of aspectual operators (like *to campus*) to verbal predicates cannot be uniformly treated in terms of lexically governed rules. The same argument can be made for the behavior of temporal adverbials, such as *for an hour* in (63a) and (63d). This also means that we would need to treat some aspect shifts in terms of lexical rules and some in terms of extralexical rules, or, rejecting the lexical rules approach in order to treat all the aspect shifts in a uniform way.

A similar point is also made by Zaenen (1993) who argues that the "[t]he acceptability of the impersonal passive depends on the aspect of

the sentence as a whole, not just the Aktionsart [telicity, HF] of the lexical entry: the sentence has to be interpreted as referring to a situation that is atelic" (1993:139). "If impersonal passive were also a lexically determined rule we would expect that the determinants of sentence aspect that are not part of the lexical entry of the verb could not change the acceptability of impersonal passives. But the opposite turns out to be the case" (1993:138). This is shown in Dutch examples (64), where the acceptability of the impersonal passive is changed by the addition of the durative adverbial voordurend 'constantly':

(64) a. Er *werd* gelopen.
'There was run.' atelic
b. *Er *werd* naar huis gelopen.
'There was run home.' telic
c. Er *werd voordurend* naar huis gelopen. atelic
'There was constantly run home.'

The third main problem concerns the asymmetry in the relation between verbs and adjuncts presupposed by lexical rule approaches. In lexical rule approaches, the dependency between verbs and adjuncts is determined by some specification in the semantic representation of verbs and/or in their lexical entries. However, it seems that an equally convincing argument can be made for encoding the dependency between verbs and adjuncts by some specification on the adjunct. That is, we can treat the adjunct as the functor and the verb as its argument. This view of adjuncts is standard in categorial syntax (and also in formal semantics based on categorial syntax). Categorial Grammar treats adverbs, attributive adjectives and the like as modifiers. These are functors that take as their argument an expression of category X, and the whole functor-argument combination is of category X. Hence, modifiers are of category X/X. In adjunct constructions, adjuncts are standardly viewed as modifiers being both syntactically and semantically functions. For example, an adverb like *to the store* in *John ran to the store* has the syntactic category IV/IV (where 'IV' stands for 'intransitive verb') and its semantic type is *<<e,t>, <e,t>>*.

Both these options are discussed in Head-Driven Phrase Structure Grammar (HPSG). Pollard and Sag (1987) propose that "verbs include a specification for adverbial phrases in their ADJUNCTS value-set" (p.161ff.). Head verbs select their adjuncts, because "the class of signs that can be modified by a given adjunct can typically be characterized as a class of phrasal projections of some lexical category; ..." (Pollard and Sag, 1987:161). They assume that "each lexical sign specifies a value

(some finite set of syntactic categories) for the head feature ADJUNCTS. (...) The basic idea here is that an adjunct daughter in a head-adjunct structure is sanctioned as long as its SYNTAX unifies with one of the members of the ADJUNCTS value-set on the head daughter, which in turn is inherited from the head-daughter's lexical head" (Pollard and Sag, 1987:161). The feature "adjunct" is a head-feature that percolates upwards to phrasal projections of that head. This strategy has, according to Pollard and Sag (1987), the advantage that "the proliferation of special-purpose head-adjunct rules (...) is avoided, while compatibility between heads and adjuncts is maintained; ..." (Pollard and Sag, 1987:161).

Pollard and Sag (1994) reject their 1987 proposal, because it does not provide "a satisfactory account of how adjuncts contribute their content to the content of the phrases they occur in" (p.55ff.) Instead, they suggest that adjuncts select their heads, as in categorial grammar[20], that is, they assume a single rule interacting with categories for adjuncts which incorporate information about what type of head they combine with. In HPSG the semantic properties of phrases are derived from those of their daughters by certain general principles. In order to ensure that the content of the adjunct daughter contributes to the semantics of the whole sentence, they are forced to distinguish between syntactic and semantic heads. While the syntactic head is always the main lexical verb, the semantic head of a phrase corresponds to its syntactic head in head-complement-phrases, in adjunct-head phrases it is the adjunct[21]. The CONTENT value of a headed phrase is token-identical to that of the semantic head. This amounts to the the disjunctive statement: "The *semantic head* of a headed phrase is (1) the adjunct daughter in a head-adjunct structure, (2) the head daughter otherwise" (Pollard and Sag, 1994:322). That is, in a head-adjunct-structure "it is the adjunct daughter, rather than the head daughter, that determines the (nonquantificational part of the) CONTENT of the mother" (Pollard and Sag, 1994:322). However, Pollard and Sag (1994:57) point out the following problem with their treatment of adjuncts, namely the existence of 'polymorphic' adjuncts. These are adjuncts that "can adjoin to different kinds of heads with varying semantic effects" (1994:57). Let us look at such 'polymorphic' adjuncts from the point of view of aspect shift. We would, for example, need to distinguish *into*-phrases in telic constructions, such as (65a) from *into*-phrases in atelic constructions, such as (65b):

(65) a. The conductor danced into the orchestra pit.
b. The conductor smiled into the orchestra pit.

While in (65a) the *into*-phrase in combination with an atelic manner of motion verb *danced* yields a directed motion telic predicate, in (65b) this is not the case[22]. The combination of an atelic *smile* with the directional *into*-phrase does not yield a complex telic predicate[23]. Within HPSG, it is still a controversial matter what the right analysis of adjuncts is (see Borsley, 1996:110).

3.8.3 Adjuncts and Extralexical Rules

Treating verbs as arguments of adjuncts of a special type is also proposed by Jackendoff (1990). The adjuncts in question are "superordinate adjuncts" (Chapter 2, pp. 158, 272), which overlap with Fillmore's (1989) 'frame-creating' adjuncts and subsume adjuncts inducing telic-atelic shifts discussed here. Jackendoff focuses on three grammatical constructions with such adjuncts: directional, as in *Willy jumped into Harriet's arms*, resultative, as in *Charlie laughed himself silly*, and the adjunct in a *way*-construction, as in *Babe Ruth homered his way into the hearts of America.*

Jackendoff proposes that superordinate adjuncts be integrated into sentence's semantics by extralexical correspondence rules (his Restrictive Modifier Rules), rather than by lexical rules (Argument Fusion). In general, Correspondence Rules are required when the argument structure of a clause cannot be determined on the basis of the verb's argument structure in isolation. Adjunct rules/constructions are characterized by their fixed syntax and idiosyncratic semantic restrictions (Jackendoff, 1990:236). The integration of a verb into an adjunct construction is implemented in the following way: a superordinate adjunct sets up a correspondence between an extralexical syntactic configuration and a conceptual structure that incorporates the LCS of the verb (p.272). A verb (along with its conceptual argument structure) of the appropriate syntactic and semantic class is integrated into an adjunct construction by becoming an argument coindexed with some part of the adjunct's conceptual structure (p.211) and interpreted 'on the fly', or by "rules of construal" (see Jackendoff, 1991). Semantically, the meaning/conceptual structure of a verb is 'demoted' to a subordinate means or accompaniment modifier of the main conceptual clause. This can be shown by means paraphrases of adjunct sentences: For example, resultative sentences can be paraphrased with sentences in which the main verb is the causative *make* (if the resultative predicate is an AP) or *get* (if the resultative predicate is a PP) (Jackendoff, 1990:228, 231):

(66) a. The gardener made the tulips flat by watering them.
b. Charlie got himself into a stupor by laughing.

According to Jackendoff, the advantage of Correspondence Rules is that they simplify lexical entries in so far as the adjuncts do not appear as (optional) arguments in subcategorization frames of verbs, as lexical rule accounts propose. Adjunct rules also help keep linking theory maximally simple (Jackendoff, 1990:272).

However, the difference between the Correspondence Rule Strategy and Lexical Rule Strategy is not always clear-cut, in particular in those cases in which Jackendoff discusses the possibility of introducing adjuncts by a Lexical Correspondence Rule, a type of Correspondence Rules. They treat adjunct constructions as 'constructional idioms', special lexical items (Jackendoff, 1990:221, 223). For example, in the *way*-construction, the adjunct rule/construction could be thought of as "a specialized syntactic form with an idiomatic meaning, marked by the noun *way*" (p.221). The noun *way* "rather than the verb functions as the conceptual head of the VP. (The verb however is still the *syntactic* head)" (p.222). Similarly, the resultative adjunct/construction may be included in the lexicon "as a lexical item that specifies a 'constructional meaning'" (p.235). "[T]he lexical meaning of the verb is combined with the 'constructional meaning' associated with the resultative 'constructional idiom'"(p.229).

The Lexical Correspondence Rule, "as the most unusual approach, strikes my fancy, although it raises complex problems concerning the proper definition of 'head'" (Jackendoff, 1990:223). Jackendoff also observes that "at the moment I have little basis for deciding" among the Lexical Rule Strategy, Extralexical and Lexical Correspondence Rule strategy (p.223).

I will not go into the details of Jackendoff's account here, as it has been recently extensively discussed in Goldberg (1992/1995:18ff.) and Levin and Rappaport Hovav (1995:77 and elsewhere). One of the problems they point out regards Jackendoff's uniform analysis of the postverbal noun phrase in the resultative construction as constituting an adjunct together with the predicate AP. Not only in resultative constructions based on intransitive verbs, such as *Charlie laughed himself silly*, but "even in the transitive cases in (37) [*The gardener watered the tulips flat*, HF], the direct object as well as the predicate AP is actually an adjunct - not part of the verb's argument structure" (Jackendoff, 1990:228). Levin and Rappaport Hovav show that Jackendoff's analysis "disregards the syntactic properties of the postverbal noun phrase in resultative constructions based on transitive

verbs" (1995:77). Goldberg (1992/1995:181ff.) argues that the postverbal noun phrase behaves like an argument (more precisely, a semantic argument of the resultative construction, but not necessarily of the main verb), rather than an adjunct, even in resultative sentences based on intransitive verbs, such as *The dog barked the baby awake*. The reason is that it can appear as the subject of a passive sentence, as in *The baby was barked awake every morning by the neighbor's noisy dog*, and it must occur directly after the verb, which is shown by the ungrammaticality of **The dog barked ferociously the baby awake*.

3.9 A Constraint-Based Approach to Telicity

3.9.1 A Proposal

Aspect shift is traditionally accounted for at the lexical level, in terms of lexical ambiguity. In section 3.8.2, it has been argued that a uniform treatment of aspect shift in terms of lexical rule strategy is not viable, given that lexical rules are not flexible enough to handle the whole range of phenomena that fall under aspect shift.

Recent accounts of meaning shifts, discussed above, treat the dependency between the verb and the adjunct as encoded by some specification either only on the verb or only on the adjunct. There is yet another way to analyze this dependency: namely, verbs (along with their arguments) and adjuncts are mutually constraining, and therefore the relevant constraints could be stated over both of them. This is in essence the strategy I propose here for the treatment of adjuncts that function as aspectual operators. Recall the examples in (65): *The conductor danced into the orchestra pit - The conductor smiled into the orchestra pit*. The difference between such pairs of sentences indicates that it is not an adjunct on its own that determines the telicity of a given sentence. It is the inherent lexical semantics of the verb together with the semantics of the adjunct that together determine whether a sentence will have a telic or an atelic reading.

The approach presented here combines Krifka's (1986, 1992) and Dowty's (1991) semantic approach to telicity and constraint-based, monostratal and non-modular framework related chiefly to Head-Driven Phrase Structure Grammar (Pollard and Sag, 1987, 1994) and Construction Grammar approaches (Fillmore, 1988; Fillmore, Kay and O'Connor, 1988; Fillmore and Kay, 1994; Jurafsky, 1992; Goldberg, 1992/1995). I propose that simple sentence constructions have unsaturated denotations construed as functions just as verbs are standardly thought of as functions. Just as verbs are characterized by

their argument structure and semantics, so grammatical constructions are. Grammatical constructions have meanings that do not arise compositionally from the meaning of their constituents. This idea can be found in such divergent approaches as compositional semantic theories originating in Montague's work (1974; see also Dowty, 1991:608, fn. 41 and 609)[24], in Jackendoff (1990, chapter 10), and in Construction Grammar approaches, for example. Associating meanings with constructions is one of the main characteristics of Construction Grammar (see Fillmore, Kay, O'Connor, 1988:501). According to Fillmore, Kay, and O'Connor (1988:501), "constructions may be idiomatic in the sense that a large construction may specify a semantics (and/or pragmatics) that is distinct from what might be calculated from the associated semantics of the set of smaller constructions that could be used to build the same morphosyntactic object" (Fillmore, Kay, O'Connor, 1988:501).

Moreover, I propose that a subset of episodic constructions has meanings that involve a homomorphism between the Incremental Theme and event argument, and not just episodic verbs, as is standardly assumed[25]. This account has the advantage that it allows us to calculate the telicity properties of sentences in a compositional way in cases in which the 'incremental participant' is not a subcategorized and syntactically realized argument of the main lexical verb. I will show how the analysis of telic-atelic 'shifts' induced by the directional and resultative adjuncts can be linked to the compositional account of telicity proposed by Krifka and Dowty. This account also obviates 'shifts' or 'overriding' of the meaning of a verb (or a verbal predicate) in many cases in which the aspectual operator clashes with its inherent eventuality type.

3.9.2 An Outline of a Constraint-Based Grammar

The framework assumed here is constraint-based, monostratal, non-modular, and non-derivational. A grammar is a declarative collection of lexical and phrasal types. All properties of linguistic expressions, including rules and principles, are represented as feature structures. Feature structures are a subtype of rooted labelled graphs that are described as attribute-value matrices (AVMs) (see Pollard and Sag, 1994:19). Each feature structure encodes phonological, syntactic, semantic, and pragmatic information about a linguistic expression of a certain lexical or phrasal type[26]. Universal principles and language-particular grammars are characterized as systems of constraints on

feature structures. Feature structures that satisfy such constraints represent types of well-formed linguistic expression.

The framework proposed here, just like Head-Driven Phrase Structure Grammar (HPSG) and Construction Grammar (CG), is highly integrative, which clearly sets it apart from Government and Binding Theory and its offsprings. Syntax and semantics, and form and content in general, are mutually constraining, which entails a rejection of the autonomy of syntax thesis. Moreover, this framework allows for a direct association of linguistic information with information about the extra-linguistic context and general world knowledge.

The framework assumed here belongs to the family of unification-based approaches[27]. The main explanatory mechanism is unification in the narrow sense of structure sharing of token-identical feature structures (see Pollard and Sag, 1994). It is a method of combining compatible structures in a new coherent structure by linking them to a single feature structure that is shared by both original structures. Unification, in its purest form, is order-independent, non-procedural and non-directional. In its simplest form, all information accumulates in a monotonic way.

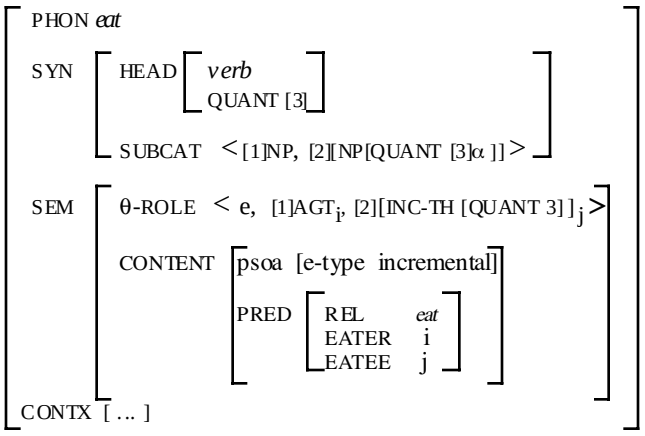
Lexical and phrasal types, including sentential constructions, are cross-classified in multiple inheritance hierarchies according to their shared information. Such hierarchies simplify the representation of linguistic expressions and, at the same time, capture significant linguistic generalizations. Lexical cross-classification obviates the need for additional rule types, such as lexical derivational or redundancy rules. Lexicon plays a central role in the organization of the grammar, rather than storing idiosyncratic information about lexical items. Lexicon encodes important information about the combinatorial properties of words. As in Head-Driven Phrase Structure Grammar phrase structure is built around the concept of a lexical head, that is, a single word whose lexical entry specifies information that determines crucial grammatical properties of the phrase it projects.

3.9.3 Lexical Entries

Following the common practice in Head-Driven Phrase Structure Grammar (HPSG) and Construction Grammar (CG), I assume that a sentence's interpretation requires satisfaction of multiple (possibly differentially weighted) constraints from various domains of linguistic and non-linguistic knowledge. Second, the integration of such diverse constraints is facilitated by the information contained in lexical entries. Verb-based syntactic and semantic patterns provide a guide for

interpreting key aspects of the sentence's structure and meaning, whereby semantic constraints often have a privileged status. Let me, therefore, introduce the main features of lexical entries, with special attention paid to verbs taking Incremental Theme arguments. Consider the simplified lexical entry for the transitive active *eat* in (67). (67) contains phonological, syntactic, semantic and pragmatic information, encoded as values of the feature attributes PHON, SYN, SEM and CONTEXT, respectively. The value of SYN encodes syntactic combinatorial properties that are required for constructing syntactic projections headed by *eat*. Syntactic arguments are given in an ordered subcategorization list, which is the value of the feature attribute SUBCAT in the syntactic part of the lexical entry (SYN). The elements in the subcategorization list are ordered according to their relative obliqueness: The left-most NP is the subject, the next NP is the object, etc. NPs are less oblique than PPs.

(67) The lexical sign for *eat*



CONTENT, as in HPSG, contains linguistic information that is relevant to semantic interpretation. CONTEXT contains linguistic information that is relevant to certain context-dependent aspects of semantic interpretation, i.e., information about various indexical coordinates such as 'speaker', 'addressee', indices of spatiotemporal location, for example.

The feature structures θ-ROLE and CONTENT in the feature structure SEM interact in determining the verb's lexical semantic properties. The thematic structure of a verb is represented as an ordered

list, which is the value of the feature attribute θ-ROLE. Each argument slot in the thematic structure of a verb corresponds to a cluster of Proto-Agent and/or Proto-Patient property or properties (see Dowty, 1991). They are ordered following 'thematic prominence', roughly as assumed in various thematic hierarchies (see Fillmore, 1968; Jackendoff, 1972; Foley and Van Valin, 1984; Kiparsky, 1987; Grimshaw, 1990, and others): Agent/Cause > Recipient/Experiencer > Instrument > Patient, Theme > Location, Source, Goal. In addition, episodic verbs have an event argument in their semantic argument structure.

The linking between the syntactic and semantic structure in the lexicon is mediated via co-indexation of syntactic arguments and thematic argument slots. This co-indexation is motivated by Dowty's Argument Selection Principle, given in (26) (section 3.3.2).

Thematic argument slots are also co-indexed with individuals in the predication feature structure PRED, which together with 'psoa' constitutes the value of CONTENT. Hence, each verbal lexeme is associated with two tiers of semantic structure: thematic structure and CONTENT. The feature structure PRED captures the assumption that verbs semantically express relations between individuals. It specifies what kind of relation is involved and who or what is participating in the relation. The value of PRED in (67) is to be understood as 'eat is a relation between two participants, where i eats j'. The attributes 'eater and 'eatee' include properties that we associate with the individuals 'i' and 'j' on the basis of knowing that the statement 'i raced j' is true. The attributes 'eater' and 'eatee' correspond to 'frame-specific participant roles' in Fillmore (1986) or 'individual thematic roles' in Dowty (1989). Such frame specific participant roles are determined by the meanings of individual verbs[28]. In a given single-clause predication, further semantic restrictions on participants are imposed by the interpretation of noun phrases. For example, '[eater i]' will be constrained by the content of the noun phrase filling the '[1]NP' place. A simple example that illustrates this point is (68):

(68) a. The baby is eating cooked carrots.
b. The bacteria in this petri dish eat flesh.

The verb *eat* has the same meaning in (68), but the subject noun phrases denote individuals playing different roles in the denoted situations. The proper association of '[1]NP' with '[eater i]' is ensured through the co-indexation in the thematic structure '[1]AGT_i'.

PRED does not provide an exhaustive account of all that we know about the meaning of a given verb. It can be thought of as an outline

of the meaning of a given verb, its details are filled in by the information given in the feature structure 'psoa', a parametrized state of affairs. (For a related, though not identical, use of 'psoa' see Pollard and Sag, 1994; Sag and Wasow, 1997.) 'Psoa' together with PRED encompasses the kind of verb-specific information for which Fillmore (1975) introduced the notion of 'frame'.

By linking semantic argument slots to frame-specific participant roles, we also imply that thematic roles semantically distinguish one argument from another; they are not merely syntactic labels, they have semantic content[29].

It is necessary to individuate arguments relative to argument-positions as well as relative to the roles they play in the eventualities in which they participate. One reason is that two different noun phrases may point to the same framal participant and the same noun phrase may pick more than one framal participant. Moreover, two different verbs can assign the same frame-specific participant role to distinct thematic roles (see Fillmore and Kay, 1992:4.14). For example, *Minnie* in (i) *Minnie sold the car to Max* is Agent, while in (ii) *Max bought the car from Minnie*, *Minnie* is Source. And vice versa, the same thematic role Agent is here assigned to different frame-specific participant roles, either to the seller *Minnie* in (i) or to buyer *Max* in (ii).

As has been observed above, the feature structure PRED captures the idea that the predication combines individuals with properties expressed by verbs to give states of affairs, or eventualities. The information about the eventuality type is encoded as the value of the feature attribute 'e-type' in the 'psoa' feature structure. For a verb like *eat*, 'psoa' takes as its value '[e-type incremental]', which is to be understood as a place-holder with an abbreviating function. It points to the place in the lexicon where all the relevant properties of the incremental eventuality type are characterized, including, most importantly, the information about the object-event homomorphism, defined by Krifka (1986), and given here in section 3.3.1. By stating the information about the properties of the incremental eventuality type explicitly only once in a single place in the lexicon, in a generic lexical entry, rather than specifying it in each and every lexical entry of a verb, we avoid redundancy and capture the grammatically significant properties shared by all the verbs that are associated with the incremental eventuality type. Each generic entry specifies constraints that must be satisfied by all actual lexical entries that instantiate it. The lexical entry for the verb form *eat,* for example, inherits all constraints imposed by the generic entry for the Incremental Theme verbs higher in the hierarchy. The only idiosyncratic information about its irregular forms, past tense

ate and passive participle *eaten* that has to be stipulated is its irregular form and the semantic relation in its PRED ('predication') value.

Notice that the English *eat* in (67) has no determinate specification for telicity or quantization. The noun phrase which is co-indexed with the Incremental Theme argument in the thematic structure is assigned the feature [QUANT α], where 'α' is a feature value variable standing for '+' and '-'[30]. In the lexical entry for *eat*, it is required that the verb and the noun phrase that is co-indexed with the Incremental Theme argument and the Incremental Theme argument itself have the same value for the QUANT attribute. This is encoded with the numeral '[3]' called the 'tag'. The tag indicates sharing of a feature structure, the shared value of two (or more) structures. In general, structure-sharing is indicated by two (or more) different occurrences of a tag, which amounts to expressing that two different feature attributes have the same value (Sag and Wasow, 1997:49)[31]. The sharing of the feature structure QUANT between the verb and the Incremental Theme noun phrase is here intended to capture two observations: First, the Incremental Theme and its governing verb form a syntactic and semantic unit from the point of view of the classification of verbal predicates into quantized (telic) and cumulative (atelic) eventuality types. Second, the quantization (telicity) value of this unit is determined by the quantization status of the noun phrase that satisfies the Incremental Theme requirement of the verb.

The syntactic unification operation, indicated by the tag '[3]', has as its semantic correlate the aspectual composition principle, given in (22) and repeated in (69).

(69) aspectual composition: An episodic verb (in sentences denoting single eventualities) combined with a quantized Gradual Patient argument yields a quantized complex verbal predicate, while with a cumulative Gradual Patient argument it yields a cumulative complex verbal predicate (see Krifka, 1986, 1989, 1992).

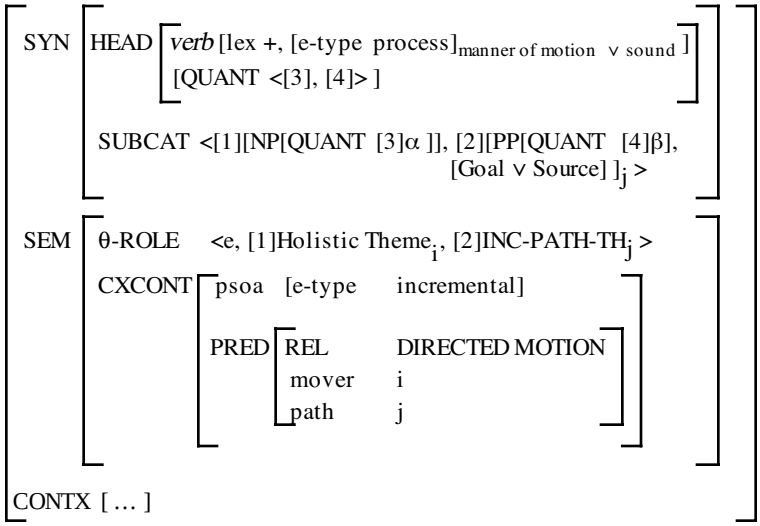
The aspectual composition can be thought of as one of the integration functions (see also Jurafsky, 1992:119) that combine the meaning of sentence's constituents into an interpretation of a sentence by integrating partial information provided by each constituent.

3.9.4 The Directed-Motion Construction

I propose that directional PP-adjuncts are introduced by a directed-motion construction that has the directional PP-adjunct as one of its

syntactic arguments. The treatment of adjuncts here resembles the treatment of the preposition *by* in the passive linking construction in Construction Grammar (Fillmore and Kay, 1991, 1994). Linking constructions are constructions "that effect the linking of theta roles with grammatical functions, thus establishing the connection between the minimal valence of a lexeme and the fully specified valences of its various lexical forms. These linking constructions may also contain morphological information (e.g., active versus passive morphology) and also information regarding the syntactic form of the required complements" (Fillmore and Kay, 1991, *Chapter 6 Linking (Part 1)*, p.1). The difference is that the template for the directed-motion construction is not a lexical, but rather a phrasal sign existing independently of both the verb and the adjunct. (As in Head-Driven Phrase Structure Grammar I assume that word structure and phrase structure are governed by independent principles[32].) A schematic representation of a partially specified phrasal sign representing a directed-motion construction is given in (70) and examples that instantiate it are given in (71):

(70) adjunct construction: directed-motion



(71) a. The frogs jumped to the pond.
b. John drove (Mary) from Chicago to New York.
c. The old car rattled down the street to the university.

The verb that is integrated into the construction functions as its syntactic head. Semantically, the verb and the directional PP-adjunct are mutually constraining and both contribute to the meaning of a directed-motion construction. The meaning of a construction is associated with the whole template and not with any particular lexical item it contains. This is encoded in the feature structure CXCONT. This feature structure is used in CSLI's English Resource Grammar (ERG) project (described in detail in Copestake et al (1995)) to encode the semantics of constructions.

Both the construction and its constituting lexical items have semantic and syntactic constraints. The directed-motion construction licenses as its syntactic heads manner of motion verbs and verbs of sound emission (see Talmy, 1975, 1985; C. Rosen, 1984; L. Levin, 1986; B. Levin, 1989; Jackendoff, 1990; Levin and Rappaport Hovav, 1995, for example). Both types of verbs are process-denoting. Levin and Rappaport Hovav (1995:190) suggest that the latter class of verbs must denote sound that is an involuntary and necessary concomittant of some motion. They illustrate this point with contrasts like those in (72):

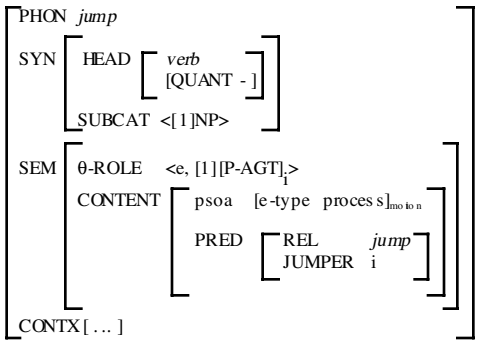
(72) a. The elevator wheezed to the seventh floor.
b. The frogs *croaked to the pond.

The construction has its own syntactic argument structure '<NP, PP>', and thematic argument structure '<e, Holistic Theme, INC-PATH-Th_j>', the latter contains the eventuality argument e. The specification '[Goal∨Source]' of the directional PP-adjunct indicates that either the Goal-PP, as in *John drove to Chicago*, or the Source-PP, as in *John drove from New York*, must be selected, or both, as in *John drove from New York to Chicago.* As in HPSG, disjunctive feature values are allowed in lexical entries and constructions/rules (see Karttunen, 1984, for motivation).

The syntactic and semantic constraints of a construction are matched against the constraints of its candidate lexical fillers. In order to fill a constituent slot of a construction, a candidate filler (possibly also some other construction) must satisfy the constraints imposed on that slot by the construction. This involves matching of partial syntactic and semantic feature structures, whereby compatible (sub)structures are linked by co-indexing a variable or by tags. The tags indicate sharing of a feature structure, the shared value of two (or more) structures. For example, let us consider a verb like *jump* in (71a) *The frogs jumped to the pond.* When the verb *jump* is integrated into the directed-motion

construction, its subject, which is entailed to have Proto-Agent properties '[P-AGT]', 'fuses' with the subject of the construction, which is linked to the Holistic Theme argument. (The mechanism of 'fusion' is here taken to work in a similar way in which Jackendoff's (1990) 'Argument Fusion' works.) This is possible, because the thematic properties of the subject of *jump* and the subject of a construction are compatible. The lexical entry for the verb *jump* is given in (73):

(73) The lexical sign for *jump*



Both the classes of verbs (manner of motion and sound emission) that are licensed by the directed-motion construction are process-denoting. Yet the whole construction denotes an incremental eventuality, marked in the feature structure 'psoa'. Neither the adjunct *to the pond* in *Frogs jumped to the pond*, for example, nor the verb *jumped* on its own entail the object-event homomorphism, nor can either of them be claimed to contribute the homomorphism to the meaning of a whole combination. (See also comments on examples in (65)). Rather, it is a specific combination of the directional adjunct with a manner of motion verb or a verb of sound emission that yields the homomorphic entailment of a construction, which is presupposed by the telic interpretation of such sentences as (71).

The computation of the telicity interpretation of a sentence is complicated by the fact that the 'object' in the event-object mappings is not realized by a single syntactic argument. The 'object' is a composite function of the denotations of the noun phrase linked to the Holistic Theme argument ('[QUANT [3]α]') and the PP-adjunct linked to the Incremental Path Theme ('[QUANT [4]β]'). This is indicated in (70)

with the feature specification 'QUANT <[3],[4]>'. The movement of the referent of the Holistic Theme along the Path indicated by the PP-adjunct determines a succession of positional changes and these are mapped onto the part structure of the incremental eventuality denoted by a given directed-motion sentence. A finite succession of positional changes yields a quantized (or telic) sentence, while an indefinite succession a cumulative (or atelic) sentence. (See also examples (32) and (33) in section 3.5 above.) Applying such a strategy has the advantage that the seemingly non-compositional data, such as (71a) *John drove from Chicago to New York*, can be given a compositional analysis. This proposal is flexible enough to accommodate those cases in which the syntactic head of a construction does not entail the object-event homomorphism on its own.

It is important to emphasize that the directional PP-adjunct is not a telic marker, that is, on its own it does not determine the telic interpretation of a directed-motion sentence. If either the Incremental Path Theme is cumulative, as in *Last year, John drove to high schools to deliver inspirational speeches, this year he gives talks at colleges*, or the Holistic Theme is cumulative (or atelic), as in *Frogs jumped to the pond*, the directed-motion sentence will be cumulative.

This proposal has the advantage that it does not require separate lexical entries or senses for verbs (that is, verbs of motion and sound emission here), and no underspecification at the lexical level. The relations of the lexical constituents of a construction are preserved under the constructional meaning. That is, both the adjunct and the verb here carry their ordinary lexical meanings. For example, the lexical entry for *rattle* does not specify a potential reading of a directed motion verb. The verb *rattled* has the same lexical semantic properties regardless whether it occurs in a telic or an atelic sentence[33]. In *The old car rattled down the street to the university*, the verb *rattled* retains its inherent lexical semantic properties, which it shares with *rattled* in *The old car rattled.* This is supported by the observation that the telic sentence *The old car rattled down the street to the university* entails the atelic sentence *The old car rattled.* Hence, there is no 'shift' or 'overriding' of the verb's meaning. The inherent meanings of verbs are part of the meaning of a construction, but the construction as a whole in addition contributes its own meaning. The meaning of a construction can be thought of as being superimposed on the meanings of an input verb, in terms of the subsumption of the verb's meaning into the meaning of a construction or an entailment relation between the constructional meaning and the verb's meaning (see also Dowty, 1979).

It could be argued that any meaning contributed by the construction can also be associated with the verb or class of verbs derived by lexical rule. However, it has been argued in section 3.8.2 that there does not seem to be empirical evidence for the outputs of such rules. One of the reasons is that they would yield verb meanings that are probably not lexicalized as simple monomorphemic words in any language. Moreover, we would miss the observation that the resultant "sense" of a verb is in fact systematically associated with the verb as much as it is with constraints coming from the adjunct.

Whenever the syntactic and semantic constraints of a construction disagree with inherent lexical properties of its constituting lexical items, we have (i) a 'shift' in the inherent meaning of its constituting lexical items or (ii) anomaly/uninterpretable combination. Examples of the latter case are *Willy *joked into Harriet's arms* or (72b) *The frogs *croaked to the pond*, where the verb of sound emission denotes a sound not causally related to the implied motion. Verbs like *croak* and *joke* cannot be 'fitted into' the directed-motion construction.

Unification clashes between incompatible specifications of constructions and their constituting lexical items may trigger shifts in the meaning of the lexical items that enter into the construction. Examples are shifts in eventuality types of predicates that do not fit the argument requirements of temporal adverbials, as in (74):

(74) a. John drove to work by bus for three years.
b. Today John swam in an hour.

In (74a) *drove to work by bus* has an iterative interpretation, and in (74b) *swam* in the scope of the time-span adverbial is interpreted as *swam a certain distance* or inchoatively as *started to swim*. The lexical entry for a process verb *walk* contains the feature specification '[QUANT -]'. In (74b) this feature specification '[QUANT -]' is inherited by the verb phrase constituent and it clashes with the time-frame adverbials *in an hour* that require that the verb phrase with which they are combined carries the feature specification '[QUANT +]'. In cases of such unification clashes one of the operands is given precedence and overwrites the value of the other operand, which must make some accommodation to it[34]. In the case of 'overwriting' or 'priority union' we need to find some suitable criterion for choosing which of two incompatible substructures takes precedence (see Shieber, 1986:63). In general, whenever the syntactic and semantic constraints of a construction disagree with inherent lexical properties of its constituting lexical items, the constraints associated with the construction take

precedence (see Talmy, 1986; Fillmore, 1988). Given the above observations, it may be proposed that we treat durative and time-span temporal phrases as being introduced by independent constructional templates into which verbal predicates must fit. That is, a whole construction with a temporal adverbial can be thought of as a functor, syntactically and semantically.

In some cases, unification must be sensitive to the scopal properties of the unified constituents. Consider (75a) with nested temporal adverbials:

(75) a. He walked to school in ten minutes every day for three years.
b. For three years, he walked to school in ten minutes every day.
c. *In ten minutes, he walked to school every day for three years.
d. *Every day, he walked to school in ten minutes for three years.

In ten minutes specifies the duration of each individual event of walking to school, whose frequency in turn is specified by *every day*. The frequency is a property of a complex situation whose overall duration is specified by *for three years*. *For three years* takes wider scope relative to both *every day* and *in ten minutes*. Notice that only *for three years* can be preposed, but not *in ten minutes* or *every day*, as (75b) - (75d) shows.

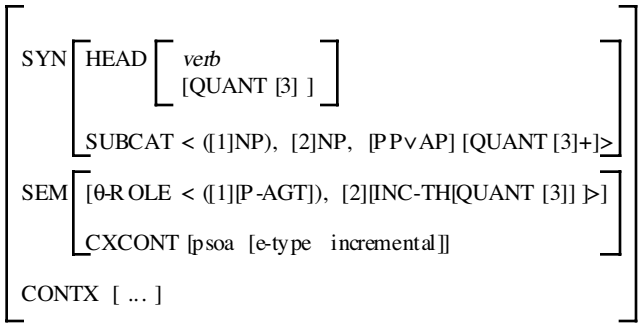
3.9.5 The Resultative Construction

The resultative construction has been discussed by many, for example, in Dowty (1979), Rothstein (1983), Simpson (1983), Hoekstra (1987, 1988), Hale and Keyser (1987), Tenny (1987, 1992, 1993, 1994), Jackendoff (1990), Bresnan and Zaenen (1990), Van Valin (1990), Rappaport and Levin (1991), Goldberg (1992/1995), Napoli (1992), Carrier and Randall (1992). Rather than trying to give a comprehensive account of it, here I will focus on several points that are relevant to the domain of telicity.

A resultative construction is a template, schematically represented in (76), into which we can project certain well-defined classes of verbs (along with their arguments) and adjuncts. The resultative construction minimally takes the resultative adjunct, an adjectival (AP) or a prepositional phrase (PP), and one noun phrase as its two obligatory syntactic arguments. The construction links the noun phrase to the Incremental Theme argument. The input verb can be either telic, such as *broke* in *John broke the vase to pieces*, or atelic, such as *dragged* in *The horses dragged the logs smooth*. This contradicts both Van Valin

(1990:255) who claims that the input verb is telic, and also Dowty (1979:219) and Jackendoff (1990:240) who claim that it is atelic[35].

(76) resultative construction



One of the most problematic and controversial issues related to the resultative construction regards the syntactic and semantic status of the direct object argument in those cases in which it is not a subcategorized argument of the main lexical predicate. Such "fake" objects (Simpson, 1983) are direct objects in (77).

(77) a. He laughed himself silly.
b. Amy walked her feet off.
c. Tom ran the soles off his shoes.

Goldberg (1992/1995:181ff.) argues that such objects behave like direct objects even though they are not licensed directly by the verb: they can appear as subjects of passive sentences, as in *The baby was barked awake every morning by the neighbor's noisy dog*, and they must occur directly after the verb. Such direct objects and other constituents that are not licensed by the main lexical verb are integrated into a clause by means of 'argument structure (clause-level) constructions'. Specifically, she proposes that the postverbal noun phrase and resultative adjunct in the resultative construction function as semantic arguments directly sanctioned by a construction (p.220). Argument structure constructions have a role similar to Jackendoff's (1990) "constructional idioms", a subtype of correspondence rules (see p.220). Similarly, I propose that the noun phrase linked to the Incremental Theme argument and the adjunct are syntactic and semantic arguments of the resultative construction.

The resultative adjunct functions as a telic marker of a construction. Its '[QUANT +]' feature specification percolates up to the syntactic head of the construction. In this respect the resultative adjunct differs from the directional PP-adjunct in a directed-motion construction, which is not a telic marker. (Recall that sentences with directional adjuncts can be atelic.) The observation that the resultative construction is telic (or quantized) can be supported by its compatibility with time-span adverbials, as is shown in (78a), and by its requirement that the Incremental Theme argument be quantized (provided that the particular resultative sentence has a single event interpretation). To illustrate the latter point, consider the contrasts among (78b), (79) and (80):

(78) a. He painted a / the / one wall blue in an hour / ??for an hour.
b. He painted three / several walls blue.

(79) a. ??He painted walls blue. / ?He was painting walls blue.
b. He painted the walls blue. / He was painting the walls blue.

(80) a. He painted / was painting walls.
b. He painted / was painting the walls.

In (79a), '??' indicates that the sentence is well-formed under a habitual reading, as in *He painted walls blue for a living*. ?*He was painting walls blue* indicates that the sentence is acceptable, if it is used, for example, in a contrastive context: *He was painting walls blue, and she was painting ceilings red*. It must be emphasized that in habitual sentences the Incremental Theme argument need not be quantized: *Blood stains white cloth brown, Yeast turns milk sour*. If the main head verb is in the simple (non-progressive) form the resultative construction also has a completive entailment: namely, that the relevant end state indicated by the resultative phrase was reached. The completive entailment is absent when the resultative construction is combined with the progressive, as in: *He was painting the wall blue*.

The main head verb, the resultative adjunct and the Incremental Theme noun phrase are mutually constraining, match in their specification '[QUANT +]', and they jointly contribute to the meaning of the whole resultative construction. This motivates the claim that the relevant constraints are stated over all three of them in the resultative construction. The resultative adjunct is a telic marker that semantically expresses a predicate that attributes a property to the Incremental Theme argument. It is the property that the Incremental Theme has as a result of the gradual changes brought about by the event denoted by the base

verb: e.g., 'Somebody hammered on the metal and as a result it became flat'. The adjunct must denote an outcome that is causally related to the event denoted by the base verb. This also means that the inherent lexical semantic properties of the input verb are preserved in the resultative construction. What counts as a 'causal relation' between the denotation of the main verb and the resultant adjunct may be determined by our common world knowledge about the natural or prototypical course of events and their typical outcomes. For example, the activity of wiping is such that it makes sense to use the resultative adjuncts like *dry*, *clean* with *wipe*, but not *damp*, *dirty*.

In so far as the result states denoted by resultative adjuncts and the eventualities denoted by input verbs are causally related, a given input verb and a resultative adjunct may be thought of as a kind of complex resultative predicate (see also Dowty, 1979:221). For example, in *John hammered the metal flat*, we can think of 'flat-hammer' as a complex resultative predicate that is both homomorphic and telic. Just like derivational processes on the level of word structure, such combinations are not fully productive and involve some degree of conventionalization. Some examples from Green (1972) cited in Dowty (1979:303) are given in (81). Such examples are not well-formed, despite the fact that they are perfectly intelligible and semantically close to acceptable examples like those in (82):

(81) a. ?John hammered the metal shiny.
b. ?She shot him lame.
c. ?Bill blasted Al dead.
d. ??She wept herself to sleep.

(82) a. John hammered the metal flat.
b. Bill shot Al dead.
c. She cried herself to sleep.

The resultative construction involves a change in some property of the referent of the Incremental Theme argument, rather than in its spatial extent or volume. Typically, we have here a change degree by degree along some relevant property scale. That is, the incremental eventuality involved in the resultative construction corresponds to the second canonical type, isolated in section 3.6. Notice that the predicates that represent the best examples of the first canonical incremental eventuality type, namely those in which the 'object' comes into being or disappears part by part are odd or unacceptable in the resultative construction:

(83) a. ??She knitted the sweater thick.
b. ?He drank the cup of coffee empty[36].
c. *He destroyed the results to pieces.
d. *He copied the book yellow.

The thematic structure of the resultative construction has the subject argument associated with a high number of Proto-Agent properties. Two-place predicates with a very 'good' Agent argument and a good Patient argument fit best the resultative construction, as is shown by the contrast between (84a,b) and (84c):

(84) a. The gardener watered the tulips flat. (Jackendoff, 1990:226)
b. Harry hammered/pounded the metal flat.
c. *Amy and Beth watched TV into a torpor / broken.

However, the construction also sanctions transitive verbs whose subjects are not sentient, volitional participants, but rather are only entail the Proto-Agent property of 'causing an event or change of state in another participant', as in:

(85) a. The jackhammer pounded us deaf. (Randall, 1983)
b. The alarm clock ticked the baby awake.
c. The sleeping pills made me sick.

The argument for which the input verb entails a high number of Proto-Patient properties, independently of the resultative construction into which it is integrated, is fused with the Incremental Theme argument of the construction. It may be either one of the arguments of a two-place predicate (such as *water* in *The gardener watered the tulips flat*) or the only argument of an unaccusative verb (such as *freeze* in *The river froze solid*, or *burn* in *The toast burned black/to a cinder*). In such cases the resultative construction only supplies the resultative adjunct that predicates the resultant state of the Inchremental Theme argument. Given that unaccusative verbs are already telic, the resultative adjunct does not add the telicity or quantization condition to the meaning of a base predicate. Rather, it provides a further specification to the resultant state inherent in the semantics of a verb.

The integration of unergative verbs into the resultative construction represents the most complicated case. The reason is that the Incremental Theme argument of the resultative construction cannot be fused with any argument of the unergative verb. The only argument of unergative verbs has a high number of Proto-Agent properties, and it is

fused with the subject of the construction, which is also required to be Agent-like. In this case, the Incremental Theme argument requirement of the construction can be satisfied in two ways. It is a reflexive pronoun co-referential with the Agent-like subject argument of the resultative construction, which fuses with the Agent-like argument of the input verb (77a) *He laughed himself silly*. Or, it can be satisfied by a noun phrase that denotes an inalienable part of the referent of the Agent-like subject argument of the resultative construction, as (Simpson, 1983) observes: e.g., (77b) *Amy walked her feet off*. Or, it could be some alienable part (a piece of clothing, for example) of the referent of the subject argument (77c) *Tom ran the soles off his shoes*.

Notes

1. Garey (1957), Gruber (1965), Allen (1966:192-204), Leech (1969:125-126, 134-137), Verkuyl (1972:54-97, 1989, 1993), Dowty (1972, 1979), Gabbay and Moravcsik (1980:523), Bolinger (1975:147, see Table 6-2, and 152-153), Mourelatos (1978), Platzack (1979), Hoepelman and Rohrer (1980), Hinrichs (1985), Krifka (1986, 1989, 1992), Tenny (1987, 1994), Jackendoff (1987, 1996).

2. The asymmetry of the external argument and internal argument(s) can be also found in Verkuyl's (1988, 1989) compositional account of telicity. Verkuyl argues that the relation of the external argument (subject) to the eventuality type of a sentence is not as close as that of the internal argument (object), because the subject relates to the verb phrase as a whole rather than directly to the V. This difference creates "aspectual asymmetry". Therefore, Verkuyl distinguishes between "S-aspect" and "verb phrase-aspect".

3. The verb's direct internal argument may be thought of as being converted into a function of time at some level of semantic representation. This is an aspectual property, because aspect refers to the internal temporal organization of an event" (Tenny, 1989:7).

4. Homomorphism' is here understood in terms of the standard mathematical function, as "a correspondence between algebras with all the properties of an isomorphism except that the mapping from A to B may be *many-to-one* " (Partee, ter Meulen and Wall, 1990/1993:251). " ... A and B are *isomorphic* if and only if there is a one-to-one correspondence between their operations (we will assume for simplicity that the correspondence is $f_i \leftrightarrow g_i$) and a one-to-one and onto function φ mapping A onto B such that for all $x, y, z, ...$ in A and all $i \leq n$, $g_i(\varphi(x), \varphi(y), \varphi(z), ...) = \varphi(f_i(x, y, z, ...))$" (Partee, ter Meulen and Wall, 1990/1993:251).

5. See here chapter 2, sections 2.5.1 and 2.5.2 for more details.

6. Krifka (1992:45) observes that this mapping condition is problematic in the case of predicates that evoke a complex scenario consisting of a number of subevents. For example, with *build the house* there are parts of the event of building a house which cannot be mapped to parts of the house.

7. The uniqueness of objects corresponds to "thematic uniqueness" in Carlson (1984) and "uniqueness of role bearers" in Dowty (1988). It is also a requirement on the thematic relations understood as functions (Link, 1987). Carlson (1984) also suggests that thematic roles may discriminate events from one another on the basis of this property (see Krifka, 1992:44).

8. It is not clear whether the homomorphism is to be defined in terms of a 'proper part' or 'part' relation. According to Krifka (1986, 1989), both the mapping to objects and to events are necessary in order to define the homomorphism property with *proper parts*. Krifka (personal communication) argues that the 'part' relation would allow for the cases that need to be excluded. For example, it would allow for a universe with only one event *e*. If we further assume that we have an entity *x* that is part of an entity *y* and both x and y stand in the appropriate relation to the event *e*, then we would still have a homomorphic relation, according to Dowty's definition. If we followed Krifka, the last part of Dowty's (1991:567) quote should contain "proper part" instead of "part" so that it would read "If x is A PROPER PART of y, then if a homomorphic predicate maps y (as Theme) onto event e, it must map x onto an event e' which IS A PROPER PART of e." However, Dowty (1991:567, fn. 14) insists that "the part-of relation is not understood as 'is a proper subpart of', but rather is to be understood so as to allow a thing to count as a part of itself". The 'part' relation would then account for the vagueness in the interpretation of such sentences as *Max ate a sandwich*. Such a sentence can be appropriately uttered in a eventuality in which Max ate a whole sandwich at one gulp, (all parts of the sandwich mapped onto the same event) or in the more usual eventuality "in which different parts of the sandwich are mapped by the eating event into the distinct subevents of eating the respective parts" (Dowty, 1991:567, fn. 14). While on Dowty's view a sandwich counts as an Incremental Theme in both these pragmatically determined interpretations, on Krifka's view a sandwich is an Incremental Theme only in the gradual interpretation.

9. Within a moment-based semantics (standard propositional logic), the notion of change is defined as a change from $\neg\phi$ at one moment to ϕ at the next (see, for example, von Wright's (1963, 1968) formal calculus). Such a definition can be easily applied only to verbs involving instantaneous changes of state (e.g., *to recognize that S*). Hoepelman (1981) uses the operator Δ to analyse the semantics of accomplishment and of some achievement sentences expressing gradual change within model-

theoretic semantics. The operator Δ was introduced by Pott (1969) in order to describe the truth conditions of such sentences as *The door closed*, for example. Hoepelman (1981) also tries to represent the idea of a gradual change by means of a graph in which the *x*-axis represents moments of time and the *y*-axis represents the fluctuation of the truth values of a sentence during an interval of time. Where the graph goes up, the sentence becomes more true, where it goes down, the sentence becomes less true. The graph represents a "step function" which is a subcategory of "piecewise continuous functions" (Lang, 1969:188). The "step function" allows one to represent telic events which do not involve a monotonous approximation towards the resultant state, even though on the average they involve a gradual approximation towards the resultant state, such as, for example *John went to London*, where John starts out in Paris, but has to go via Berlin, because of the strike of airline pilots. Various approaches within interval-based semantics are more promising in representing the notion of 'gradual change'. For example, Dowty (1979) suggests that the change-of-state entailments of accomplishments be represented in their logical structure by means of the atomic predicate BECOME. He also discusses a number of problems related to the representation of 'gradual change' by means of this predicate, and suggests possible refinements in terms of truth value gaps or Gricean pragmatic entailments.

10. One can interpret certain results reported from the first language acquisition as providing support for this view. See, for example, Clark (1978), Slobin (1985) and Bowerman (1989).

11. The distinction between static and dynamic states is subsumed in Carlson's (1977) distinction between *object*-level and *stage*-level predicates.

12. In Pustejovsky's subeventual structure this is encoded in such a way that "there is no semantic expression associated with event constituent P [that is, "preparatory stage", HF] for the adverb to modify" (Pustejovsky, 1988:33). In order to motivate the difference between culminations and protracted events, Pustejovsky (1988:30ff.) uses the scalar modifier *almost*. Recall that this modifier is used by Morgan (1969) to show that it is ambiguous with Vendler's accomplishments, but not with activities (see chapter 2, section 2.2).

13. Such point adverbials are to be kept apart from interval adverbials like *on Tuesday* or *tomorrow* that indicate a certain interval of time, that is, they have an internal structure and can be further subdivided into smaller intervals, although they can also be conceived of as a point of time. Point adverbials, on the other hand, indicate moments of time that are trivially indivisible and cannot be further 'compressed' into smaller moments of time.

14. Culmination predicates that denote non-resettable events, like *die*, only allow for a single-event interpretation in the progressive construction. Mittwoch (1988:76) observes that many verbal predicates that are synonymous with *die* cannot occur in the progressive*: *He is passing away / popping off / kicking the bucket.* However, it is possible to say *He is slipping away.*

15. Given that the adverb and verbal predicate are mutually constraining, it is not convincing, to encode their dependency directly in the meaning of the adverbial only, as Moltmann (1991:637-8), for example, suggests. She represents the semantics of durative adverbials by means of the universal quantifier that quantifies over all "relevant or contextually determined parts" of the interval. In her account, a sentence like *For two hours John drank wine* is represented as follows: ∃t(two hours(t) ∧ ∀t'(t'Pt → ∃ex(wine(x) ∧ drink(e,[John],x) ∧ at(e,t')))). Here, the relation P stands for such a contextually determined part. Nevertheless, Moltmann's proposal is an improvement on the earlier analysis of Dowty, which also involves a universal quantifier. Dowty (1979:79) translates *for six weeks* as (∀t: t∈six weeks) AT(t,p), which means "for all times t such that t is a member of the period six weeks, it was true at t that p".

16. Krifka et al. (1995) emphasize the semantic similarity between these two kinds of predicates and propose to represent both with the generic operator GEN: *speak French*: - λxGEN[x;s] (x in s; x speaks French in s); *know French*: - λxGEN[x;s] (x in s; x shows knowledge of French in s). Hence, both the derived habitual verbs like *speaks* and lexical stative verbs like *knows* are given the same quantificational analysis. With lexical stative verbs the GEN operator is provided in the lexicon, while with derived habitual predicates it is introduced in the syntactic derivation.

17. The *Unaccusative Hypothesis* was formulated by Perlmutter within the general *Universal Alignment Hypothesis* (Rosen, 1984; Perlmutter and Postal, 1984) in Relational Grammar.

18. See Dowty (1979:207ff.), Jackendoff (1975), Bresnan (1982) and Marantz (1984), for example.

19. Talmy (1975, 1985, 1991) proposes that Germanic languages lexicalize 'motion' and 'manner' with independent marking of path, and Romance (cp. Spanish: bajar 'to descend', salir 'to exit', subir 'to ascend') and Semitic languages 'motion' and 'path' in a simple verb with independent marking of manner. The following simple example illustrate this point: (i) [motion + manner] + [path] (English): run/jump/float in/out/across; (ii) [motion + path] + [manner] (Spanish): entrar/salir/pasar corriendo/saltando/flotando 'to enter/exit/pass running/jumping/floating'.

20. The treatment of adjuncts is one of the phenomena where Sag and Pollard (1994) try to integrate insights from Categorial Grammar into their

Head-Driven Phrase Structure grammar. One of the crucial differences between HPSG and Categorial Grammar is that HPSG relies on the syntactic notion of 'head', which presupposes constituent structure and phrase structure grammar. Traditional categorial grammar does not use the notion 'head' at all.

21. In Categorial Grammar, in complementation structures, the main predicate is syntactically and semantically a function. For example, *runs* in *John runs* has the syntactic category T/t (something that takes a term and yields a sentence), while semantically it is a function from individuals to truth values: *<e,t>*. The asymmetric relations that are established on the syntactic level correspond to the asymmetric functor-argument relations on the semantic level. The mismatch between what counts syntactically as head and semantically as head in modification head-adjunct structures in HPSG does not arise in Categorial Grammar. Of course, there are many interesting mismatches between syntactic and semantic types in classical Montague Grammar: for example, adverbs of quantification ('always', 'often', 'usually') are syntactically of the same modifier type as other adverbials, however, semantically they behave like quantifiers, and hence must be of a different type. (See De Swart, 1993, for an extensive treatment of this puzzle.)

22. Although it may be argued that there is a metaphoric Path involved in (65b). In that case, we would still need some mechanism to distinguish the spatial and metaphoric Path involved in the uses of the *into*-phrase in the telic and atelic predicates.

23. Another argument against the proliferation of special-purpose homonymous adjuncts can be made with respect to adjective phrases in the resultative construction. It would be counterintuitive to claim that there is a special adjunct *silly* in *John laughed himself silly*, for example, which would mean something like 'gone over the edge' specifying the final stage of the incremental change that John undergoes.

24. Dowty, for instance, suggests that "a grammatical construction (or some morpheme serving as head of the construction) can be analyzed as having a meaning and/or conventional implicature of its own but it is a feature of compositional semantic theories since Montague 1974 that they permit constructional as well as lexical meaning" (Dowty, 1991:609). (See also section 3.5 on Dowty's approach.)

25. Following ideas of Davidson (1967), this was proposed by Parsons (1986), Kratzer (1989), and also by Rothstein (1983), Higginbotham (1985) and Schein (1985).

26. Each feature structure is sort-resolved, that is, labelled with a sort symbol that indicates the type of the linguistic entity represented by the feature structure, and well-typed, that is, provided with attribute/feature

labels that are determined by the sort of the feature structure (see Pollard and Sag, 1994:57-8).

27. Functional Unification Grammar (M. Kay, 1979, 1983), Generalized Phrase Structure Grammar (Gazdar et al., 1985), Lexical Functional Grammar (Bresnan, 1982; Fenstad et al., 1985), Head Driven Phrase Structure Grammar (Pollard and Sag, 1987, 1994) and Construction Grammar (Fillmore and Kay, 1994, in press). (See also Shieber, 1986.)

28. Through the CONTENT part of lexical entries lexical items access a knowledge base that includes a hierarchy of frames. For example, *eat* shares the general consumption frame with other lexemes that have the same frame specific roles (EATER, EATEE), such as *devour, consume, gobble, munch, snack, feast (on).*

29. That is, as in Dowty (1989), one argument is semantically distinguished from another in so far as "it permits (real-world, non-linguistic) objects to be distinguished from one another by virtue of the distinctive properties they have as they participate in an event named by a verb, properties that can be identified ('in the real world') independently of a language or its 'semantic representations'" (p.73).

30. This reflects the assumption that noun phrases are determinate with respect to quantization. However, as has been observed in chapter 2, there are certain quantified noun phrases, such as those with *some*, *many, most*, definite noun phrases, such as *the water*, and noun phrases with common noun heads like *a string*, which fail to be quantized according to the definition by Krifka (1986), given in (39) (chapter 2). Nevertheless, they do behave like quantized noun phrases with respect to aspectual composition, for example. See chapter 2, examples (41) and (42).

31. Notice that with such 'tags' we may simultaneously indicate a feature identity and the value of the feature (Sag and Wasow, 1997:49).

32. See Sag and Wasow (1997). In Construction Grammar word-structure and phrase-structure are often assumed to be governed by the same principles and represented in terms of a uniform mechanism that consists of rooted trees whose nodes are feature structures. Fillmore, Kay, O'Connor (1988) observe that "lexical items, being mentionable in syntactic constructions, may be viewed, in many cases at least, as constructions themselves; ..." (p.501). Some proponents of Construction Grammar reject the assumption that grammar can be divided into separate lexical and syntactic components (see Goldberg, 1992/1995:23, for example).

33. A closely related caused-motion construction, as instantiated in *The critics laughed the show out of town* can contain a verb that is used metaphorically, such as here *laugh* meaning 'ridiculed', 'made fun of', 'derided'. This metaphoric meaning is independent of the caused-motion construction, as in *The critics laughed at the show*, and it is also preserved

in the caused-motion construction: 'The critics ridiculed the show and as a result it left town'.

34. According to Shieber (1986:60), "[o]verwriting is a noncommutative operation akin to destructive unification except that, in the case of unification 'clashes', one of the operands (say, the rightmost) is given precedence. Thus, unlike unification, overwriting never fails".

35. Van Valin (1990:255) states, "[a]ctivity verbs, which are inherently atelic and therefore cannot in principle code a result state or have an undergoer argument, do not take resultative phrases". Dowty (1979:219) suggests that a resultative construction consists of "an activity verb followed by an object and then an adjective expressing the result-state that the object comes to be in as a result of the activity".

36. But notice that *The horses drank the river dry* is acceptable. (Example due to Gregory Carlson.)