Weak and Strong Telicity via Maximization

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Outline

Introduction
- The grammatical complexity and semantics of telicity
- Previous semantic theories of telicity
- Hypothesis: unified semantics of telicity by means of the MAX_E operator

Two main models of telicity
- 'Event-object' and 'event-path/scale' models
- Outstanding issue: Theme argument and "weak"/"strong" telicity

Main new proposal
- Monotonicity of measurement systems interacting with MAX_E
- Redefining 'Strictly Incremental Theme' in terms of
  - (i) monotonicity, and
  - (ii) uniqueness presupposition on the Davidsonian event argument

Conclusion

The grammatical complexity and semantics of telicity

- Telic interpretations of sentences are not attributable to the morphological marking on any of their *single* constituents:
  - No language appears to have an overt general marker dedicated to signaling the telic interpretation of sentences.
  - No language seems to have a formal system of grammatical distinctions that would systematically coincide with the telic/atelic distinction in semantics, in a way in which, for instance, the count/mass distinction, which is covert in basic lexical nouns in English, is systematically manifested in the distribution of plural versus singular morphology in the nominal system.

- Telic interpretations of sentences appear to have a number of different sources: they are derived from the properties of aspectual classes of verbs interacting with the properties of temporal modifiers, phasal verbs, morphological operators on verbs, adverbs of quantification, tense operators, grammatical aspect operators (e.g., progressive, perfective and imperfective) as well as quantificational and referential properties of nominal arguments.

Previous semantic theories of telicity

The views on how telic interpretations are derived may be divided into two groups, depending on what is taken to be the primary model of telicity:

(i) The '**event-object**' model:
- Relation between events and THE EXTENT/VOLUME OF OBJECTS
- Main data: predicates of consumption, creation and destruction: e.g., *eat two apples*
- individuation of events relative to individuated objects to which they are related (here: each single eating event individuated by two apples)

(ii) The '**event-path/scale**' model:
Relation between events and A LINEAR DIRECTED STRUCTURE. Two variants:
- PATH-based.
- Main data: predicates of motion in space: e.g., *walk to the bus stop*
- individuation of events relative to a PATH and its overtly expressed end-point (here: *the bus stop*) in the physical space along which an object moves during the course of an event, the starting point may remain implicit.
- SCALE-based.
- Main data: predicates of property changes*: cool the water to 20 C°*
- individuation of events relative to a SCALE and its maximal degree that measures a change that an object undergoes by the end of an event.

QUESTION: Is it possible to provide a unified semantic analysis of telicity?

HYPOTHESIS

- A unified analysis of telic sentences is possible, and desirable.

- Strategy:
  - The question about the nature of telicity is really a question about how events in the denotation of telic sentences are individuated, i.e., what constitutes a single indivisible and hence countable event in their denotation (see related observations in Mourelatos 1978/81, Vlach 1981); culminated events constitute a special case of events individuated by a well-defined result or an end-point.

  - The semantics of telicity is uniformly represented by means of the MAX_E operator (Filip and Rothstein 2005, Filip 2008).

Review of the two main models of telicity

The 'event-object' model of telicity

- Main data to be explained: (a)telicity with predicates of creation, consumption and destruction.
- Individuation of events relative to individuated objects to which they are related. Consequently, the focus is on the influence of the referential and quantificational properties of the Theme DP/NP on (a)telic interpretations of sentences (1), and also on why no such influence is observed in sentences like (2):

(1)	**ASPECTUAL COMPOSITION**	TELIC: in ten minutes	ATELIC: for ten minutes
a.	Kim ate two/all the apples	√	*
b.	Kim ate a bowl of ice cream	√	*
c.	Kim ate apples/ice cream	*	√

(2)	no aspectual composition		
a.	Kim watched two/all the alligators	*	√
b.	Kim watched a pod of alligators	*	√
c.	Kim watched alligators	*	√

Note: The relevant readings of *in ten minutes* are those that measure the extent of eventualities, rather than their onset 'after ten minutes'.

The 'event-object' model of telicity

- The 'event-object' model of telicity is developed based on sentences that entail a one-to-one relation between parts of events and parts of objects related to them. It presupposes independently motivated structural parallels between the domains of objects and eventualities.
- Example: *Kim ate two apples in ten minutes / ??for ten minutes.*
  - there is a one-to-one mapping between every proper part of eating of two apples and every corresponding proper part of the two apples being eaten; the progress of an eating event can be monitored by the gradual decrease in the extent of the two apples as they are being eaten and culminates in the state when both the apples have been eaten;
  - has a set of single events in its denotation, each of which is an event of eating of two *apples,* i.e., *two apples* provides a criterion of individuation and for counting of events in the denotation of *eat two apples.*
- Foundational studies: Garey 1957; Verkuyl 1971/1972; Dowty 1972, 1979, 1991; Platzack 1979; Taylor 1977; Mourelatos 1978/81; Krifka 1986, 1989, 1992.

The 'event-object' model of telicity

- One implementation: the mereological approach to aspectual composition (Krifka 1986, 1992, 1998, and elsewhere):
  - the source of aspectual composition is a lexical entailment of a subclass of episodic verbs (e.g., *eat*): They entail *structure-preserving mappings* (aka *incremental relations* or a *homomorphism)* between the part structure (modeled as a lattice structure) associated with the Incremental Theme argument and the part structure (lattice structure) associated with the eventuality argument.
  - the *structure-preserving mappings* motivate the correlations of 'aspectual composition', as illustrated in (1a-c):

    'non-bounded' Incremental Theme arg ≈ atelic predicate

    'bounded' Incremental Theme arg ≈ telic predicate

- Theoretical background: formal (truth-conditional) semantics, event semantics enriched with mereological part structures modeled by means of join semi-lattices (Link 1983, 1986; Bach 1981, 1986).

The 'event-object' model of telicity

- Generalization to 'motion predicates' in Krifka (1998)

  Additional data to be accounted for: the (a)telic interpretations of sentences with three main types of 'motion predicates':

(1) Movement in physical space, delimited by a measure phrase or by (source and) goal

Mary drove eight hundred miles / from New York to Chicago (in two days).

(2) Movement in quality space

Mary heated the water by 40 degrees / from 30° to 70° (in an hour).

(3) Movement in quality space with explicit or implicit resultant state

Mary whipped the cream stiff (in an hour).

Mary baked the lobster (in an hour).

- The static model of telicity based on THE EXTENT/VOLUME of objects, "telicity by sums and parts" (Krifka, 1986/89, 1992), is generalized to a model of telicity based on a generalized PATH structure, "telicity by precedence and adjacency".

The 'event-object' model of telicity

- Generalization to 'motion predicates' in Krifka (1998)
  - The incremental participant is the Path (i.e., a convex, linear element in connectedness structures), and
  - the structure-preserving mappings (aka a homomorphism, incremental relations) are defined between the parts of the Path and the part structure associated with the eventuality argument.
- Syntactically, paths are expressed differently from ordinary Incremental Themes, and are often left implicit or only partially specified (e.g. one end point may be specified by a Goal-PP such as *to Chicago*).

A variant of the 'event-object' model of telicity

- INCREMENTAL 'BECOME' EVENT: Rothstein (2004), Landman and Rothstein (2012)

(1) John wrote a letter.

  - A telic (accomplishment) verb like *write*, as in (1), denotes an event which is the sum of two events, an activity and an incremental 'BECOME' event (a non-instantaneous incremental change of state + scalar unit of measure), related by an incremental relation.
  - This relation maps parts of the BECOME event onto co-temporaneous parts of the activity, thus imposing its incremental structure onto the activity and also providing the 'unit' or individuation structure for described events.

- Additional notion of INCREMENTAL HOMOGENEITY (see Landman and Rothstein 2012) needed to account for the atelic interpretation of VPs with cumulative Incremental Theme arguments, as in

(2) Kim ate ice cream for an hour.

The 'event-path/scale' model of telicity

PATH-based

- The model is based on (a)telic interpretations of sentences headed by motion verbs "for which the intuitions are clearest" (Jackendoff 1996, p.315).

(1) a. John swam for ten minutes / (*) in ten minutes.
b. John swam along the shore for ten minutes / (*) in ten minutes.

- (1a) is atelic, because it lacks any expression from which a bounded path could be recovered;
- (1b) is atelic, because the expressed path is unbounded.

(2) a. John swam to the shore ?? for ten minutes / in ten minutes.
b. John swam a mile ?? for ten minutes / in ten minutes.

- (2a) is telic, because the implied path is bounded by the **overt Goal PP** *to the shore*: *swim to the shore* denotes a set of single events, each of which is an event of reaching the shore on the linear directed path structure '[implicit Source] → *shore* [Goal]'.
- (2b) is telic, because the **measure phrase** implies a bounded path: *swim a mile* denotes a set of single events, each of which is an event of swimming a mile.

The 'event-path/scale' model of telicity

PATH-based

- Primary telicity model:
  - the general features of a linear directed path structure along which the motion of Themes in the physical space takes place, and
  - the interaction between the (a)telic interpretations and the properties of the path (transversed by the Theme participant):
    - an unbounded or omitted path expression ≈ atelic predicate
    - a bounded path expression ≈ telic predicate
  - Telic interpretations enforced just in case the end-point of a path is expressed, and the Holistic Theme is 'bounded', the starting point may remain implicit.
  - Individuation of events relative to a PATH with an explicit upper bound in the physical space along which a 'bounded' object (Holistic Theme participant) moves during the course of an event.

The 'event-path/scale' model of telicity

PATH-based

- In the tradition of the Localist Theory (Gruber 1965), and its offshoots in Conceptual Semantics (1983, 1990), also Talmy (1985): the motion of Themes along a PATH in the physical space provides a basis for the modeling of changes in other domains, via some analogical or metaphorical extension mechanism: namely,
  - coming to be in/at a state is viewed in analogy to
  - coming to be in/at a location.
- The telicity PATH-model based on sentences with motion verbs is generalized to sentences headed by other classes of episodic verbs: e.g.,
  - creation (*build*), consumption (*eat*), destruction (*burn*);
  - performance (*sing, play*);
  - change in some property of an object: degree achievements derived; from gradable adjectives *(cool, darken, flatten, redden);*
  - change of possession (*give, lend, borrow, sell, take*);
  - extending, covering, filling.

The 'event-path/scale' model of telicity

PATH-based

- One recent implementation: Beavers 2008, 2011a, 2011b, 2012
  - The notion of a SCALE is assimilated to the notion of a PATH, defined within a mereological model based on Krifka (1998).
  - All dynamic verbs are scalar, their meaning involves 'some Theme argument transitioning along some scale that describes the change it undergoes in the event'.
  - Non-gradable scales are simplex (two point) paths and gradable scales are complex (multi-point) paths, and can be either bounded or unbounded. Straightforward correlations:
    - a bounded path expression ≈ telic predicate
    - an unbounded or omitted path expression ≈ atelic predicate

The 'event-path/scale' model of telicity

PATH-based

- Data to be explained (among others): Filip 1999

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

- Motion predicates are inherently three-place relations between a Figure *x*, a Path *p*, and a motion event *e*, where *e* can be decomposed into a series of motion subevents, each of which corresponds to some part of *x* moving on some part of *p*.
- The homomorphic relations preserve quantity and endpoints between the event and the two incremental themes, *x* and *p*, respectively.
- Main innovation: A class of ternary-relations (as opposed to the more standard binary thematic relations assumed by Parsons 1990, inter alia) is proposed to allow for such double, interdependent Incremental Themes.
- Given that motion predicates describe situations in which incremental progress of Figures/Themes along Paths occurs, the only way for a motion predicate to be telic is iff the Theme is quantized and the Path bounded.
- Many, if not all, dynamic predicates have 'double Incremental Themes'.

The 'event-path/scale' model of telicity

SCALE-based

- Main data to be explained: variable telicity of sentences with "degree achievements" (DA) (in the sense of Dowty 1979, p.88ff.).
- Nearly all degree achievements head sentences that allow for telic or atelic interpretations, depending on the context, but independently of the quantificational and referential properties of their Theme argument.

(1) The soup cooled for ten minutes / in ten minutes.
(2) The ship sank for an hour (before going under completely) / in an hour.
(3) John aged forty years during that experience. Dowty 1979, p.88

- (1): verbs derived from gradable adjectives: *cool, empty, darken, lengthen, widen, ripen, …*
- (2): verbs of directed motion: *sink, raise, …*
- (3): verbs of 'directed property change': *age, freeze, melt, grow, …*

First observed by Dowty (1979); among recent studies, see Kearns 2007, Kennedy and Levin 2008, Piñón 2008, Kennedy 2012.

The 'event-path/scale' model of telicity

SCALE-based

- Theoretical background: scalar semantics of gradable adjectives (see references in Kennedy and Levin 2008)
- Some implementations: Kennedy and Levin 2008, based on Hay et al 1999; Kearns (2007)
  - Primary telicity model: 'scalar change', see Hay at al (1999).

    The model is based on the (a)telic interpretations of sentences that are headed by 'degree achievements' (DAs) derived from gradable adjectives: *cool, darken, widen, …*
  - A key semantic feature comes from gradable adjective meanings from which DAs are derived: namely, the structure of the scale relative to which gradable adjectives order the objects in their domain.
  - In a nutshell: The derivation of a telic interpretation amounts to deriving an event description that is true of an object and an event just in case the object undergoes a maximal change relative to the scalar dimension encoded by the DA, otherwise atelic interpretations.

The 'event-path/scale' model of telicity

SCALE-based

- DAs based on adjectives that use scales with maximum values (**closed scales**) head sentences that have default telic interpretations.

(1) a. The sink emptied (??but it didn't become empty).
b. The sink emptied for 15 seconds (but we closed the drain before it became empty).

- DAs based on adjectives that use scales without maximum values (**open scales**) typically have only atelic interpretations, in the absence of explicit information about the maximum value/telos.

(2) a. The canyon widened for/??in one million years.
b. The canyon widened 30 kilometers in/??for one million years.

The 'event-path/scale' model of telicity

SCALE-based

- The main focus is on the general features of a scale viewed as an abstract representation of measurement and formalized as a set of objects (degrees) ordered with respect to some dimension (length, hue, weight, etc.).

- The core function of a DA is to measure the difference between the degree to which an object possesses some scalar property at the beginning and end of an event. Telicity is a function of a differential degree *d*, or alternately, a 'measure of change' function, i.e., a special kind of difference function) that measures the degree to which an object changes as a result of its participation in an event.

- The comparison between the degree to which an object possesses some scalar property at the beginning and end of an event is viewed in analogy to the semantics of comparatives like *The shadow is 10 cm longer than the carpet* that measure the difference between the degree to which two objects possess a scalar property.

The 'event-path/scale' model of telicity

SCALE-based

- Kennedy 2012: extension of the scalar analysis of telicity to aspectual composition with incremental verbs.

- Two sources of the ‘measure (of change) function':
  - adjectival meanings that underlie degree achievement verbs;
  - Incremental Theme argument, i.e., the scalar component of the meaning of verb phrases headed by incremental verbs comes from a scalar element inherent to the semantics of their Incremental Theme argument, "which can either be part of the meaning of a noun or a separate partitive head".

- A similar proposal in Filip 2008 (see below): Telic predicates headed by incremental verbs denote sets of events that are maximal with respect to a scale introduced by their Incremental Theme argument.

Comparison and general evaluation of the two models:

- Both the 'event-object' model and the 'event-path/scale' model have as their explicit goal to provide a comprehensive theory of telicity.

- Each model focuses on a different subset of data in the domain of telicity, and succeeds in capturing valid intuitions about a part of the domain of telicity.

- They are best viewed as complementary, rather than competing, approaches to telicity, since each analyzes with apparent ease what the other analyzes with obvious difficulty.

… a few illustrative examples next

Problem for the 'event-object' model of telicity

- The derivation of telic and atelic interpretations is based on uniform incremental relations holding between an event argument and a particular participant in an event, which exploit algebraic structures for parts of objects of an ordinary sort, paths, times and events.

  The incremental relations straightforwardly predict the following absolute correlations:
  - 'quantized P of objects/paths ≈ quantized (telic) P of events'
  - 'cumulative P of objects/paths ≈ cumulative (atelic) P of events'

- unclear how the variable telicity of degree achievements, Krifka's predicates of 'movement in quality space', can be accounted for:

(1) The sky darkened for ten minutes / in ten minutes.

(2) The soup cooled for ten minutes / in ten minutes.

- The best account of the variable telicity of DAs derived from gradable adjectives, as in (1) and (2), is provided by the 'event-scale' model, see e.g., Kennedy and Levin (2008) and references therein.

Problem for the 'event-path' model of telicity

- The derivation of telic and atelic interpretations is based on uniform correlations:

  i. a bounded path expression ≈ telic predicate
  ii. an unbounded or omitted path expression ≈ atelic predicate

- (ii) would seem to wrongly predict that all sentences headed by DA verbs derived from gradable adjectives should be uniformly atelic if there is no overt expression of the maximal degree of the lexicalized scale, and regardless whether the scale/path lexicalized by their adjectival core is CLOSED or OPEN:

(1) The sky darkened. atelic, because implicit CLOSED SCALE
(2) The soup cooled. atelic, because implicit OPEN SCALE

- (1) and (2) are unproblematic for the 'event-scale' model, see e.g., Kennedy and Levin (2008) and references therein.

Problems for the 'event-scale' model of telicity

- unclear how a scalar account of motion predicates can be provided based on the analysis of deadjectival verbs, despite the analogies between property scales and paths (see e.g. Zwarts & Winter 1997; Faller 2000; Zwarts 2000; Winter 2005); motion predicates do not always pattern like deadjectival verbs:

(1) a. The bedroom brightened a lot / more than the hallway.
b. ? On that occasion, John ran toward the beach more than Sue.

- unclear how a scalar account of predicates entailing a definite change of state (COS) can be provided based on the analysis of deadjectival verbs, given that a closed scale lexically associated with a definite COS verb (e.g., *die, arrive*), but not with a deadjectival verb (e.g., *darken*), enforces a telic interpretation of a sentence in the simple past tense:

(2) a. John died in an hour, ??but he was not completely dead.
b. The sky darkened in an hour, but it wasn't completely dark. [37a]
[example number in Kearns 2007]

… and vice versa

Problems for the 'event-path' and 'event-scale' models of telicity

- Aspectual composition:
  Atelic interpretations of sentences with bare mass and plural Incremental Themes.

(1)	Kim ate soup	for ten minutes /??in ten minutes.	atelic
(2)	Kim ate dumplings	for ten minutes /??in ten minutes.	atelic
(3)	Kim ate ten dumplings	??for ten minutes /in ten minutes.	telic

- 'Event-object' model of telicity (Krifka's mereological approach):
  correct predictions for (1)-(3)
- 'Event-scale' model of telicity (Kennedy 2012):
  correct predictions for (2) and (3)
- 'Event-path' model of telicity:
  correct predictions for (3)

Problem for the 'event-path' model of telicity

- Aspectual composition: Atelic interpretations of sentences with bare mass and plural Incremental Themes.

(1)	Kim ate soup	for ten minutes /??in ten minutes.	atelic
(2)	Kim ate dumplings	for ten minutes /??in ten minutes.	atelic
(3)	Kim ate ten dumplings	??for ten minutes /in ten minutes.	telic

- 'Event-path' model of telicity: Generally,
  - the derivation of the telic and atelic interpretations presupposes the presence of a path;
  - A telic interpretation requires the presence of an explicit upper bound of a path, and its absence leads to an atelic interpretation (all else being equal).
- **The key issue is the presence of an overt path expression.**

Problem for the 'event-path' model of telicity

(3) Kim ate ten dumplings ??for ten minutes /in ten minutes. telic

Correct prediction:

- assuming that *ten dumplings* introduces a scale/path "of consumption" due to the lexical meaning of *ten* and the lexical meaning of *eat,* and given the correlation 'a bounded path expression ≈ telic predicate'

(1) Kim ate soup for ten minutes /??in ten minutes. atelic

(2) Kim ate dumplings for ten minutes /??in ten minutes. atelic

Problem:

- unclear by what mechanism the atelic interpretations can be derived:
  - given that generally bare mass and plural common nouns fail to introduce any total order (i.e., a scale, path)'
  - given that no scale/path introduced by the lexical material in (1) and (2), their interpretation cannot rely on the correlation

    'an unbounded or omitted path expression ≈ atelic predicate'

Problem for the 'event-scale' model of telicity

- Aspectual composition: Atelic interpretations of sentences with bare mass Incremental Themes.

(1)	Kim ate soup	for ten minutes /??in ten minutes.	atelic
(2)	Kim ate dumplings	for ten minutes /??in ten minutes.	atelic
(3)	Kim ate ten dumplings	??for ten minutes /in ten minutes.	telic

- 'Event-scale' model of telicity: Generally,
  - the derivation of the telic and atelic interpretations requires the presence of a scale (or a measure function and the corresponding 'measure of change' function);
  - the explicit maximal degree of a scale enforces the telic interpretation of predicates, and its lack allows for an atelic or a telic interpretation, depending on context and pragmatic (Gricean) rules of interpretation.
- **The key issue is the source of the requisite scale (or measure (of change) function).**

Problem for the 'event-scale' model of telicity

- Aspectual composition in Kennedy (2012) builds on Krifka's idea (1989, 1992) that the relevant measure function, namely the 'natural unit' (NU) measure function, is incorporated in the semantic structure of nouns. Krifka's example:

  $[\![BOY]\!] = \lambda n \lambda x[\text{BOY}(x) \wedge \text{NU}(\text{BOY})(x) = n](1) = \lambda x[\text{BOY}(x) \wedge \text{NU}(\text{BOY})(x) = 1]$

- Correct predictions: NU is a part of the meaning of inherent count nouns only, mass nouns lack it (see Krifka 1989, 1992). This means that count nouns, both singular and plural, introduce expressions of amounts of objects necessary for the calculation of TELIC and ATELIC interpretations of predicates:

(2) a. *eat ten dumplings* Kennedy (2012)

b. $\lambda e.\exists x[\text{eat}(e) \wedge \text{dumpling}(x) \wedge \text{NU}_{\Delta}(\text{dumpling})(x)(e) = 10]$

TELIC: true of events of dumpling eating in which the total amount of dumplings changes by the amount of ten (**CLOSED SCALE**).

(3) a. *eat dumplings* Kennedy (2012)

b. $\lambda e.\exists x\,[\text{eat}(e) \wedge \text{dumpling}(x) \wedge \text{NU}_{\Delta}(\text{dumpling})(x)(e) > 0]$

ATELIC: true of events of dumpling eating in which some quantity of dumplings decreases by some amount (**OPEN SCALE**).

Problem for the 'event-scale' model of telicity

- Problem: It is unclear by what mechanism the ATELIC interpretation of (1) is derived, given that mass nouns introduce no measure function, i.e., no measure function indicating an unspecified quantity of soup that could be correlated with an 'unspecified measure of change' implicated in atelic interpretations:

(1) a. *eat soup*
b. λe.∃x [eat(e) ∧ soup(x) ∧ **?**]

Problem for the 'event-object' and event-path/scale' models of telicity

- Aspectual composition: Obligatory telicity of sentences with Incremental Themes that are not quantized, i.e., introduce OPEN SCALES or UNBOUNDED PATH EXPRESSIONS.

(1) John wrote a letter ??for an hour / in an hour.

(2) a. John wrote a sequence of numbers ??for ten seconds / in ten seconds.
b. John wrote at least three letters ??for ten minutes / in ten minutes.

- (2a,b) are obligatorily telic, despite the fact that
  - their Incremental Theme argument is not quantized ('event-object' model);
  - their Incremental Theme argument introduces a scale that lacks an explicit maximal degree ('event-scale' model);
  - their Incremental Theme argument corresponds to an unbounded path expression, by an analogical extension
- No model can successfully account for (1) and (2).

Problem for the 'event-object' and event-path/scale' models of telicity

- The nature of the problem from the point of view of the 'event-object' model of telicity (see Zucchi and White 1996, 2001, and references therein):

(1) John wrote a letter ??for an hour / in an hour.

(2) a. John wrote a sequence of numbers ??for ten seconds / in ten seconds.
b. John wrote at least three letters ??for ten minutes / in ten minutes.

– A nominal predicate like *a sequence of numbers* or *at least three letters* fails to be quantized, when analyzed in isolation, and yet it behaves like an uncontroversial quantized predicate such as *a letter* with respect to aspectual composition, when it saturates the Incremental Theme argument of a strictly incremental verb (see Krifka 1986, 1992 and elsewhere): namely, it yields a complex verbal predicate that is compatible with the time-span *in*-NP adverbial, a standard diagnostic for quantized (telic) verbal predicates.

Problem for the 'event-object' and event-path/scale' models of telicity

- There are many NP's/DP's that behave like *a sequence of numbers* with respect to aspectual composition:

  (i) singular count nouns like *a fence*, *a ribbon*, *a sequence;*

  (ii) nonstandard vague measures of amount like *a long/short distance*, *a large/small quantity*, *a large/small piece* (cf. Cartwright 1975, Lønning 1987);

  (iii) vague determiner quantifiers like *many*, *a lot* and *(a) few*, *some* and *most;*

  (iv) numerical phrases like *at least/at most three;*

  (v) the definite article *the* and possessive pronouns with unmodified mass and plural CNs.

- Solution to this problem by means of the MAX_E operator on events: see Filip and Rothstein 2005, Filip 2008 (and also below).

Key outstanding questions (there are others, of course)

Neither the 'event-object' model nor the 'event-path/scale' model of telicity addresses the following fundamental questions:

- Why should the quantificational and referential properties of the Theme DP/NP argument crucially matter for telic interpretations of sentences in the core cases of aspectual composition with (strictly) incremental verbs?
- Why do they not matter for telic interpretations of sentences with degree achievements? I.e., the quantificational and referential properties of the Theme DP/NP argument are never sufficient on their own to enforce a telic or an atelic interpretation of sentences.

Related to these questions is …

The difference in the "strength" of telicity tied to the quantificational and measurement properties of the Theme DP/NP argument:

- "strong" telicity: A Theme NP/DP that introduces a scale and its upper bound enforces a telic interpretation of a sentence headed by strictly incremental verbs (via aspectual composition), in sentences denoting singular situations (Filip 2008).

(1) a. John drank two bottles of water in an hour/*for an hour. **telic** /*atelic
b. John drank all the water in an hour/*for an hour.

- "weak" telicity: A Theme NP/DP that introduces a scale and its upper bound merely allows for a telic interpretation of a sentence headed by degree achievement verbs (Filip 2008).

(2) a. John cooled two bottles of water in an hour/for an hour. **telic / atelic**
b. John cooled all the water in an hour/for an hour

"Strong" telicity

- Negating the attainment of the final stage of desribed events, which corresponds to the upper bound of the scale introduced by the Strictly Incremental Theme argument, leads to a contradiction or is very odd, which suggests that telicity of (1)-(3) is to be viewed as an **entailed** part of their meaning, rather than implicature.

(1) Mary ate three sandwiches, ?? /*but only finished two.
(2) I ate the whole slice of pizza, ??but didn't finish eating it.
(3) John composed the symphony, ?but died before he could finish it.

"Weak" telicity

(1) a. **The ((whole) bowl of) soup** COOLED in ten minutes **TELIC**

(i) … so we had to reheat it.

cool: 'too cool to eat'

(ii) … so we started eating it (before it cooled too much).

cool: 'cool enough to eat'

b. **The ((whole) bowl of) soup** COOLED for ten minutes. **ATELIC**

(2) a. John COOLED **the whole cake** in the fridge in ten minutes **TELIC**

… when it became sturdy enough to cut.

b. John COOLED **the whole cake** in the fridge for ten minutes. **ATELIC**

Caveat: differences in acceptability judgements

- Tenny (1992:7, ex. (9)), cited and adopted in Beavers (2012, ex. (6a,b)): a 'bounded' Theme is correlated with a telic interpretation of the sentence

(3) a. The heater melted **the candle** in / ?for five minutes. **TELIC**
b. Heat melted **the candle** in / ?for five minutes.

- Kennedy and Levin (2008), Piñón (2008), Kennedy (2010), among others claim that DA's exhibit variable telicity independently of the properties of their arguments. In support of this judgement, it could be adduced that atelic uses of *melt* with a 'bounded' Theme argument are easy to find:

(4) I melted **the candle** for several hours to get to the ring, **ATELIC**
the candles burn smooth and evenly.
http://frugaldivafrenzy.com/diamond-candles-find-treasure-candle-review-giveaway-exp-55/

"Weak" telicity

- Negating the attainment of the final stage of desribed events, which corresponds to the upper bound of the scale introduced by the Theme argument, does not lead to a contradiction, it is perfectly acceptable, which suggests that telicity is merely a matter of defeasible **implicature**, rather than of an entailment.

(1) I melted **three candles**, but only one of them melted evenly and completely after about 10 minutes.

GOALS

- Motivate the difference between "strong" and "weak" telicity.
- Provide a unified model of telicity that combines the best features of the 'event-object' model and 'event-path/scale' model.
- Integrate the unified model of telicity with a previously proposed semantic analysis of telicity based on the maximization MAX_E operator (Filip and Rothstein 2005, Filip 2008).

THEORETICAL BACKGROUND

MAX_E (Filip and Rothstein 2005, Filip 2008)

- Intuitively, telic predicates denote events that are maximal with respect to an abstract representation of measurement, i.e., a scale.

> The maximization operator on events MAX_E is a monadic operator, such that $MAX_E(\Sigma) \subset \Sigma$.

  - MAX_E is applied to (a partially ordered set of) stages of events (see Landman 1992, 2008) and maps them onto sets of maximal events MAX_E.

  - The application of MAX_E presupposes that we can identify (i) a suitable scale that provides an ordering criterion on events, and (ii) an object-event homomorphism which induces an ordering on sets of unordered events with respect to that ordering criterion.

- Consequence: The sources of telicity are directly related to the grammar of measurement and closely related scalar semantics.

THEORETICAL BACKGROUND

- ***MAX$_E$*** yields a set of maximal (hence also culminated) events ***MAX$_E$(P)*** (interpreted at the type of predicates <e,t>), and excludes all proper stages of such events--all partial events in the denotation of ***P***.
- In a given context, ***MAX$_E$*** singles out the maximal event, i.e., the largest unique event in a poset of stages of events, which leads to the most informative proposition among the relevant alternatives at a given world-time pair.
- The maximal event requirement of ***MAX$_E$*** is satisfied when event stages either 'culminate' or 'cease to develop' in the actual world (Altshuler and Filip, in prep.)
- ***MAX$_E$*** is an operator whose workings rely on a SCALAR IMPLICATURE, on the assumption that such scalar implicatures can also be computed within grammar (see e.g., Landman 2004, Chierchia 2004, 2006, and others). ***MAX$_E$*** operates on asserted and also on implicated meaning components.

THEORETICAL BACKGROUND

- Two independent strands of research

(i) General framework of event semantics that presupposes an ontology with individuals, times and eventualities as basic entities ('eventualities' in the sense of Bach 1981, 1986)
  - Each ontological domain has the structure of a complete join semilattice, and is (partially) ordered by the mereological 'part-of' ≤ relation (see proposals in Link 1983, 1987; Bach 1981, 1986);
  - Verb meanings:
    - the meaning of a verb has as a part of its interpretation some eventuality type, i.e., some member of the set Σ = {E1, E2, . . . En}.
    - So ⟦*V*⟧ includes Ei, where 'Ei' is an eventuality type (a set of eventualities), whereby eventualitytypes are classified into STATE, PROCESS and EVENT types.

(ii) The grammar of measurement: mereological approach to the count/mass and process/event distinction that relies on the notion of an extensive measure function defined over a mereological part structure (see Krifka 1986, 1989, 1992, 1998).

THEORETICAL BACKGROUND

- What is new:

(i) The members of Σ (the set of all eventualities) form a complete join semilattice (or an upper lattice), ordered by the standard mereological **'part-of'** ≤ relation and also by the **'stage-of'** ε relation (Landman 1992, 2008):

For events: e1 is a stage of e2: e1 $\preceq$ e2.

Iff e1 and e2 are events, and *e1 is a stage of e2*, then:

a. Part of: e1 ≤ e2, e1 is part of e2 (and hence τ(e1) ⊆ τ (e2)).

b. Cross-temporal identity: e1 and e2 have the same temporal starting point (and share the same essence: they count intuitively as the same event or process at different times).

c. e2 is a development of e1, e1 is a earlier version of e2, e1 grows into e2, e1 and e2 are qualitatively distinguishable.

(ii) In departure to Krifka's theory, no use of 'quantization' and 'Incremental Theme relation' as an entailment of a group of verbs for one of their arguments, the two notions that have been subject to much criticism.

(iii) Integration of the notion of 'dimension', originally used by Schwarzschild (2002, 2006) to motivate the syntax of noun phrases.

MAIN NEW PROPOSAL

(1) a. John drank two bottles of water in /*for an hour. **telic** /*atelic
b. John drank all the three bottles of water in /*for an hour.

(2) a. John cooled two bottles of water in /for an hour. **telic / atelic**
b. John cooled all the three bottles of water in /for an hour.

- The difference between "strong" (1) and "weak" (2) telicity has to do with a particular feature of the dimension in which an object changes in the course of events to which it is related: namely, monotonicity.

- "Strong" telic interpretations are generated under very specific conditions:
  (i) the main lexical verb entails a change in the **monotonic** dimension of objects denoted by its Theme argument;
  (ii) the Theme argument is saturated by a quantified DP (*all the three bottles*) or a nominal measure NP (*two bottles*), i.e., such nominal measure phrases and quantifiers are **monotonic** on the part structure of the denotation of their head noun; therefore, the scale introduced by the measure phrase and/or the quantifier orders events in the denotation of the main lexical verb, hence is key to (a)telicity of a sentence.

MAIN NEW PROPOSAL

(1) a. John drank two bottles of water in /*for an hour. **telic** /*atelic
b. John drank all the three bottles of water in /*for an hour.

(2) a. John cooled two bottles of water in /for an hour. **telic / atelic**
b. John cooled all the three bottles of water in /for an hour.

- Intuitively, the progress of drinking events is tracked based on the quantity of liquid drunk: larger (temporally longer) stages of some drinking event are necessarily correlated with more liquid drunk, smaller stages with less liquid consumed. In this sense, the change of state entailed by verbs like *eat* is monotonic on the part structure of the referent of its Theme argument.
- Such a monotonic relation does not hold between parts of cooling events and parts of the cooled matter. The change of state entailed by verbs like *cool* is non-monotonic on the part structure of the referent of its Theme argument. Therefore, the scale introduced by the measure phrase and/or the quantifier *does not* orders events in the denotation of the main lexical verb; or put differently, is not relevant to the (a)telicity of a sentence.

CONSEQUENCE

- New proposal regarding the meaning components of episodic verbs that interact with telic and atelic interpretations of sentences:
  - The lexical meanings of episodic verbs must be classified according to the way in which they constrain the DIMENSION in which the change entailed by them occurs.
  - A dimension is a property like extent, volume, temperature or weight, which can be measured in standard units of measure like OUNCE or DEGREE CELSIUS and 'multiples' of that standard.
  - The particular feature of the dimension that is relevant to the calculation of telic and atelic interpretations of sentences is MONOTONICITY, and its lack.

DIMENSIONS, MEASURE FUNCTIONS AND ADDITIVITY

- Background: Extensive measure functions are used to derive quantized (telic) predicates from cumulative predicates (Krifka 1989, 1992, 1998)

  This idea presupposes the measurement research that focuses on the relationship between measures and mereological part structures: see e.g., Krantz et al, 1971; Cartwright, 1975; ter Meulen, 1980; Lønning, 1987.

- The key property of extensive measure functions is the property of **additivity**, defined by Krifka (1989) as follows:

  μ is an **EXTENSIVE MEASURE FUNCTION** for a given part structure iff:
  μ is **additive**: If $\neg x \oplus y$, then $\mu(x \oplus y) = \mu(x) + \mu(y)$

  In words: The sum of the measure of non-overlapping elements is the measure of their sum.

  '$\otimes$': mereological overlap relation
  '$\oplus$': mereological sum operation
  '+': arithmetical addition

… which is based on the following intuitions …

- An **extensive measure function** like **POUND** **is additive**, when it measures weight: If one pile of apples weighs 10 pounds and another 10 pounds, they make up a quantity of apples that weighs 20 pounds.

  We can measure objects based on their weight dimension in standard units of measure like **POUND** and 'multiples' of that standard.

10 pounds 10 pounds = 20 pounds

- A measure function like **DEGREE CELSIUS** that measures temperature **is not additive**: If a quantity of water has sixty degree Celsius and another quantity of water has twenty degree Celsius, they do not add up to a quantity of water that has eighty degree Celsius. Measure functions like **DEGREE CELSIUS** are called **intensive.**

Grammatical relevance of the distinction between extensive versus intensive measure functions:

Interaction with the internal syntax and semantics of noun phrases (Krifka 1989; Schwarzschild 2002, 2006; Braseovanu 2009, among others):

- NOMINAL MEASURE PHRASES (or pseudopartitives) are formed with extensive measure functions (here POUND): (a) and (c).
- COMPOUNDS are formed with intensive measure functions (here DEGREE CELSIUS): (b) and (d).

NOMINAL MEASURE PHRASE	COMPOUND
EXTENSIVE measure function	**INTENSIVE** measure function
a. two **pound**s of cherries	c. *two pound cherries
b. *forty degrees Celsius of water	d. forty **degree Celsius** water

- In order to classify episodic predicates according to the kind of **dimension** in which the change entailed by them occurs (at least under the most natural circumstances), the notion of an EXTENSIVE MEASURE FUNCTION is recast in terms of the property of MONOTONICITY, instead of ADDITIVITY:

  Lønning (1987): **Monotonicity and extensive measure functions**

  An extensive measure function μ is monotonic relative to domain I iff for individuals x, y in I, if x is a proper subpart of y, then $\mu(x) < \mu(y)$.

- DIMENSIONS: MONOTONIC AND NON-MONOTONIC (Schwarzschild 2002, 2006):

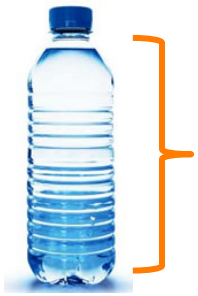
  "A dimension is monotonic on a part structure, if the extent to which something has that dimension is necessarily greater than the extent to which its proper subparts have it; otherwise, it is non-monotonic"
  (Schwarzschild 2006).

- The feature "monotonic relative to a part structure" (or "monotonic on a part structure") is a defining feature of dimensions like weight, length, or extent on which EXTENSIVE MEASURE FUNCTIONS are based. E.g.,:
  - The dimension of weight is monotonic on the part structure of a quantity of apples.
  - The dimension of temperature is non-monotonic on the part structure of a quantity of water.

- An **extensive** measure function like **POUND** is monotonic relative to some quantity of apples. For instance, proper parts of 2 pounds of apples have a lower weight, and its superparts higher weight.

3 pounds
↑
2 pounds
↓
1 pound

- An **intensive** measure function like **DEGREE CELSIUS** is non-monotonic to some quantity of water. For instance, if a quantity of water has a certain temperature, there is no reason to expect that proper parts of it will have lower temperatures and its superparts higher temperatures.



10 Degree Celsius

- Terminology:

  - "Monotonic verb" and "monotonic construction" will be used as shorthand for a "verb/construction whose interpretation uses a dimension that is monotonic relative to the relevant part structure" (adopted from Schwarzschild 2006)

  - Verbs and constructions that require a non-monotonic dimension for their interpretation are called "non-monotonic."

Individuation of events by physical objects relate to them
Strawson 1959, Davidson 1969

(1) John **drank** a bottle of water in an hour / *for an hour. telic /*atelic
(2) John **cooled** a bottle of water in an hour / for an hour. telic / atelic

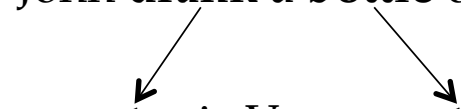
- The most straighforward way of individuating events is with respect to physical objects related to them (see related observations in Davidson's 1969 discussion of Strawson 1959).
- Physical objects have different dimensions along which they may be measured and provide different 'object induced measures on events' (see earlier related proposal in Krifka 1990).
- Volume and temperature are different dimensions of physical objects that can be measured. A quantity of water may be measured with respect to its volume (1) or its temperature (2). A quantity of water may undergo a change in its volume (1) or in its temperature (2), depending on what kind of event it is subjected to.

(1) John **drank** a bottle of water in an hour / *for an hour. telic /*atelic

(2) John **cooled** a bottle of water in an hour / for an hour. telic / atelic

- An object may be measured along different dimensions (e.g. length, width, volume, weight). Water can be ordered by volume (1), and also by temperature (2).
- For material objects the most obvious dimension in which their changes in the course of events can be immediately observed and measured is their extent or volume. The physical extent or volume provide clear spatio-temporal criteria for the individuation of events.
- Extent and volume are dimensions that are **monotonic** on the relevant part-structure of the domain given by the noun (Schwarzschild 2006).
- Temperature is a dimension that is **non-monotonic** on the relevant part structure of objects (Schwarzschild 2006).

(1) John **drank** a **bottle** of water in an hour / *for an hour. telic /*atelic



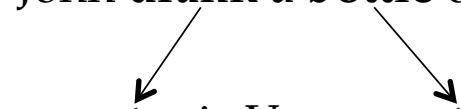
"Strong" telicity (cont.):

- Verbs like *eat* entail a change in an extent or a volume dimension of the referents of their Theme argument, i.e., in dimensions that are **monotonic** on the part structure of the referents of their Theme argument.

  Intuitively, the progress of drinking events is tracked by the quantity of liquid drunk: larger (temporally longer) stages of some drinking event are necessarily correlated with more liquid drunk, smaller stages with less liquid consumed.

- The Theme argument in (1) contains the nominal measure NP *a bottle*. Generally, nominal measure phrases are formed with **monotonic** measure functions, here BOTTLE (see above, Krifka 1989 and Schwarzschild 2006). In (1), the nominal measure NP *a bottle* measures water along the dimension in which it changes in the course of drinking events; this ordering (scale of objects) is therefore directly relevant for the ordering of the drinking events according to their sizes—the INPUT of MAX_E. The measure NP *a bottle* in (1) also provides the upper bound with respect to which the unique largest event is determined--the OUTPUT of MAX_E.

(1) John **drank** a **bottle** of water in an hour / *for an hour. telic /*atelic



"Strong" telicity (cont.):

- The quantificational and measurement properties of the Theme argument directly matter for the telic interpretation of sentences with incremental verbs, because they provide information about the quantity of objects measured in the same dimension with respect to which a verb like *eat* entails a change of the objects referred to by their Theme arguments.

- The clearest individuation criteria for events and "strong" telicity require 'monotonic verb + monotonic measure NP/Theme'.

(2) John **cooled** a **bottle** of water in an hour / for an hour. telic / atelic

non-monotonic V monotonic measure function

"Weak" telicity

- Degree achievement verbs like *cool* entail a change in the temperature dimension of the referents of their Theme argument, i.e., in a dimension that is **non-monotonic** on the part structure of the referents of their Theme argument. Intuitively, the progress of cooling events is tracked by the decrease in the temperature of objects that are cooled, and it is characterizable by a decrease in the degrees on a temperature scale. Therefore, larger (temporally longer) stages of some cooling event are ***not*** necessarily correlated with more of the object having been cooled, and smaller stages with less of it having been cooled.

- The Theme argument in (2) contains an explicit measure NP *a bottle*, but this provides a measure over a dimension in which the quantity of water does not change in cooling events. The nominal measure NP *a bottle* is not relevant for generating the ordering of cooling events, so it does ***not*** contribute to the ordering of events needed as the INPUT of *MAX*$_E$.

(2) John **cooled** a **bottle** of water in an hour / for an hour. telic / atelic

non-monotonic V monotonic measure function

"Weak" telicity (cont.):

- The quantificational and measurement properties of the Theme argument do not matter for the (a)telic interpretation of sentences with degree achievement verbs, because they provide information about the quantity of objects in a monotonic dimension; this is irrelevant for tracking the changes entailed by non-monotonic verbs like *cool* with respect to objects referred to by their Theme argument, which change in their non-monotonic dimension.
- The combination of 'non-monotonic verb + monotonic measure NP' fails to provide an ordering criterion for events —required by *MAX*$_E$**--**and lead to "weak" telicity.
- (2) may receive a telic interpretation, but since *cooled a bottle of water* on its own does not provide the requisite ordering of events that *MAX*$_E$ requires as its input, the application of *MAX*$_E$ is possible (i.e., telic interpretation available), just in case the requisite ordering is recoverable from the context of *cooled a bottle of water*.

MONOTONIC VERBS correspond to the class of verbs that Krifka (1998) identified as **'strictly incremental'**, e.g.,

- Verbs of consumption: *eat, drink, devour, …*
- Verbs of destruction: *burn, destroy, …*
- Verbs of creation: *write, build, compose, create, fabricate, invent, develop, …*
- Verbs of 'problem solving': *solve, prove, …*

- Monotonic verbs describe events that entail changes in dimensions of the referent of their Theme argument that is monotonic on their part structure.
- Therefore, proper parts of the objects referred to by their Theme argument are correlated with the corresponding proper parts/stages of events in their denotation, and vice versa.

The role of structure-preserving mappings

The ordering of event stages according to their size follows from the way in which events of various types are related to their Theme participants and the way in which events normally evolve in the world. E.g., the ordering of event stages of eating events according to their size follows from the way in which we normally eat some quantity of food.

Hence, it follows from the external facts about the world (as also informally suggested in Krifka 1992), and not from the lattice structures of objects and events and the structure-preserving mappings between them. The structure-preserving mappings are a useful representation of such world-based knowledge.

Degree achievements are **NON-MONOTONIC** (most)*: their interpretation uses a dimension that is non-monotonic relative to the part structure of their Theme argument, e.g.,

—verbs derived from gradable adjectives:

cool, empty, darken, lengthen, widen, ripen, …

—verbs of directed motion:

- along some path in space like *sink*, *raise, ascend/descend*;
- along some property scale like *freeze, melt, grow* (see e.g., Kennedy and Levin 2008; Kennedy 2010)

Intuitively, if you lengthen a skirt, larger (temporally longer) stages of this event are not necessarily correlated with a longer skirt, and smaller stages with a shorter skirt (see also Rothstein 2004 for similar examples and discussion).

*Some exceptions: *empty, fill*

APPARENT PROBLEM

- Verbs like *read, sing, examine, iron, bathe, massage, wash, comb, brush, polish, pollute, cover, insulate, decorate, describe, drain, mop, survey, check, …* (a large class)

- These are traditional 'incremental' verbs: they may be viewed as describing changes in a dimension that is **MONOTONIC** on the part structure of the referents of their Incremental Theme argument, and yet they seem to pattern with degree achievements in so far as they can easily head telic or atelic sentences, depending on the context, even if their Incremental Theme argument is quantized:

(1) He read a book in an hour / for an hour. Fillmore 1971 (in Dowty 1979, p.61)

(2) Pat read the newspaper in an hour / for an hour. Rappaport Hovav and Levin 2002

REFINEMENT of the class of monotonic verbs

- Only **monotonic verbs** (as understood here, aka 'strictly incremental' verbs), but not non-monotonic verbs (including 'incremental' verbs), are required to satisfy **the uniqueness presupposition on their Davidsonian argument**:

  > The set of spatio-temporal locations that is associated with a monotonic verb is a singleton set for all models and each assignment of individuals to the arguments of the predicate.

- Intuitively, monotonic verbs, aka 'strictly incremental' verbs (e.g., *drink, build, write, compose, construct, draw, destroy, demolish, burn …*) can be felicitously applied to a given individual only once, since they describe a gradual coming into existence or ceasing of existence of objects, which are 'once in a lifetime' occurrences for any particular individual.

- Incremental verbs (e.g., *read, sing, examine, iron, bathe, massage, wash, comb, brush, polish, …*) are non-monotonic and they can be felicitously applied to a given individual more than once. Obviously, we may read one book many times, we may sing one song many times.

- The uniqueness presupposition on the Davidsonian argument was originally proposed to distinguish two lexical classes of predicates:

  - individual-level predicates: e.g., *intelligent, tall*
  - 'once-only' stage-level predicates: e.g., *be born, die, kill*

  See de Swart 1991, p.59; 1993, p.65; also de Hoop and de Swart 1989, 1990.

- The uniqueness presupposition on the Davidsonian argument was originally intended to handle the interactions of lexical semantics of verbs with the plurality condition on quantification that requires that the cardinality of the domain of quantification be greater than one.

Quantification and the uniqueness presupposition on the Davidsonian argument

(1) ?When a farmer kills Fido, he kills him quickly. 'once-only'
(2) ?When Bill burns this letter from his girlfriend, monotonic
he burns it in an ashtray.
(3) Whenever Bill reads this letter, he smiles. non-monotonic

- (1) and (2): odd, because the *when* adjunct, which functions as a restrictor of the implicit generic operator GEN, describes an event that can happen at most once with a single individual.
- (3): perfectly acceptable, since *read* behaves like other stage level predicates that lack the uniqueness presupposition on the Davidsonian argument in so far as they can contribute a restriction of the quantifier even when they are combined with the definite Theme argument that is referentially specific.

- In Krifka's (1992, 1998 and elsewhere) mereological approach to aspectual composition, ***eat*-type strictly incremental** verbs are distinguished from ***read*-type incremental** verbs by two mapping properties between the event and the Theme argument: namely,

  - **mapping to (sub)objects** iff $\theta(x, e) \wedge e < e' \rightarrow \exists x'[x' < x \wedge \theta(x', e')]$
  - **uniqueness for (sub)events** iff $\theta(x, e) \wedge \theta(x, e') \rightarrow e = e'$

Krifka (1992, 1998 and elsewhere): Criteria for the classification of thematic roles

Example	Uniqueness for objects	Mapping to subevents	Mapping to subobjects	Uniqueness of subevents	
eat an apple	+	+	+	+	STRICTLY INCREMENTAL
write a letter	+	+	+	+	
read a book	+	+	—	—	INCREMENTAL
see a cat	+	—	—	—	NON-INCREMENTAL
push a cart	+	—	—	—	

- The **mapping to (sub)objects** is related to the property of **monotonicity** of measurement systems (Lønning 1987; Schwarzschild 2002, 2006).

  Example: *eat an apple* - the mapping to (sub)objects says that every proper part of an eating of an apple corresponds to a proper part of that apple; it excludes a proper part of the event of an eating of an apple from being mapped to that whole apple.

- The property of **uniqueness of (sub)events** is closely related to the **uniqueness presupposition on the Davidsonian event argument** (de Hoop & de Swart 1989, 1990; de Swart 1991/1993).

  Example: *eat an apple* - one and the same apple can be eaten at most once (under the most normal circumstances), so there can be at most one event related to that apple.

CONSEQUENCE: the notion of 'Strictly Incremental Theme' relation is here recast in terms of two properties that are independently motivated for other areas of grammar, outside of aspectual composition and argument linking theory: namely

- monotonicity (of measurement systems)
- uniqueness presupposition on the Davidsonian event argument

MAX_E and "strong" telicity with monotonic verbs

- In English (and other Germanic languages) MAX_E operates at the *VP* level (Filip and Rothstein 2005, Filip 2008), where the ordering criterion for events (scale) is introduced.
- In the simplest case, it is introduced by nominal measure phrases or determiner quantifiers in the Theme NP/DP (Filip 2008), as in

(1) Mary ate at least two apples in ten minutes /??for ten minutes.
* ... but finished eating only one.

- If such an Incremental Theme NP/DP saturates an argument of a **MONOTONIC VERB** in the scope of $\boldsymbol{MAX_E}$, as in (1), $\boldsymbol{MAX_E}$ adds the requirement to pick (at a given world-time pair) the largest unique event e_i, which leads to the most informative proposition among the alternatives in a given context: the largest unique event e_i is one that is determined with respect to the maximal degree on the scale introduced by the nominal measure phrase and/or determiner quantifier in the Theme NP/DP.

MAX$_E$ and "weak" telicity

In all the other cases (discussed here), *MAX$_E$* leads to "weak" telicity, i.e., the attainment of the endpoint of their scales is defeasible, hence telicity is a matter of *implicature*, rather than an entailed part of their meaning.

(1) a. She ate the sandwich but as usual she left a few bites. Hay et al 1999
b. Bill ate the apple bit by bit for ten minutes (and still didn't finish it). Jackendoff 1996:308, fn.6

(2) The sky darkened in an hour, but it wasn't completely dark. Kearns 2007

CONCLUSION

- The two main models that underlie the derivation of (a)telic interpretations of sentences can be unified under one model that relies on the workings of the MAX_E operator, and with recourse to ingredients that are independently needed and motivated in the grammar of measurement (monotonicity) and quantification (the uniqueness requirement on the Davidsonian event argument) in natural languages.

- Consequence:
  - Revised classification of verbs into aspectually relevant classes
  - The need for Krifka's (Strictly) Incremental Theme is obviated, there is no need for defining particular thematic relations that are dedicated to the derivation of (a)telic interpretations.

Supporting evidence from Slavic languages

- Interaction between grammatical aspect and NP semantics:
  Definiteness effects (Wierzbicka 1967, Krifka 1989, Filip 1990 and elsewhere)

Bare mass nouns and plurals are obligatorily interpreted as definite, just in case they function as arguments of perfective verbs that are monotonic, in sentences describing particular situations.

(1) Vypil[PERF] kávu. monotonic Czech
pref.drank.3SG coffee
'He drank up (all) the coffee.'

(2) Ohřál[PERF] mléko. non-monotonic
warmed.up.3SG milk
'He warmed up (some/the) milk.'

Thank you

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