

Countability in the Nominal and Verbal Domains

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Advanced Course

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Summary: Krifka's mereological approach to predicates of objects and eventualities

- Generally, the quantitative criterion of application for predicates ('what is ONE in their denotation') is represented by means of **extensive measure functions**, which are applied to cumulative predicates and yield quantized predicates specifying the measure of one entity. Various **extensive measure functions** are defined on a single domain, of objects or eventualities, each structured by a complete join semi-lattice which is undetermined with respect to atomicity.
- COUNT noun denotations: Extensive measure functions (*a bowl of, a pound of, 10 cm*) can be directly applied to the partial order of objects, because their part structure is monotonic to one of their measurable dimensions like volume, extent (see Schwarzschild 2002, 2006 for monotonicity).
- EVENT (or TELIC) denotations: Extensive measure functions (*for an hour, three miles*) cannot be directly applied to the partial order of eventualities, because they have no measurable dimensions.

Languages parametrically vary in the grammaticalization sources of extensive measure functions that derive the meanings of quantized predicated, or EVENT predicates (Bach's term):

- nominal arguments, often linked to the Incremental Theme role (both DO and subject);
 - verbs that are grammatically perfective, or conceptualized as 'momentaneous events'.
- ❖ CONSEQUENCE: The distinction between PROCESS and EVENT predicates (i.e., the categorization of verbal predicates into aspectual classes) concerns the ways in which the grammar allows us to individuate events (also Filip 2001 and elsewhere, Rothstein 2004)

Some challenges for a mereological approach to event individuation (Krifka 1986, 1992, 1998)

Quantization and its role in aspectual composition: Two quantization puzzles

- The puzzle of *fences, twigs, sequences, and quantities of milk* revisited: Non-quantized Incremental Theme arguments generate quantized VP's
- The puzzle of non-quantized perfective verbs

Quantization and its role in aspectual composition: Two quantization puzzles

QUANTIZATION PUZZLE 1: English aspectual composition

- The puzzle of *fences*, *twigs*, *sequences*, and *quantities of milk* (see also Rothstein 2010):
- They failed to be quantized, but when used as Incremental Theme arguments, they generate quantized VP's:

(1) John wrote a letter ?for ten minutes / in ten minutes. Zucchi&White 1996

(2) John wrote a sequence of numbers ?for ten minutes / in ten minutes.

- Suppose we have a sequence of numbers *1 2 3 4*, then $\llbracket a \text{ sequence of numbers} \rrbracket = \{ \langle 1, 2, 3 \rangle, \langle 2, 3, 4 \rangle, \langle 2, 3 \rangle, \dots \}$. I.e., the sequence *1 2 3 4* has the sequence *1 2 3*, the sequence *2 3 4* and *2 3* as its proper part.

1 2 3 4

Quantization and its role in aspectual composition: Two quantization puzzles

QUANTIZATION PUZZLE I: English aspectual composition

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| 2 3 4

Quantization and its role in aspectual composition: Two quantization puzzles

QUANTIZATION PUZZLE I: English aspectual composition

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Quantization and its role in aspectual composition: Two quantization puzzles

QUANTIZATION PUZZLE I: English aspectual composition

Non-quantized Incremental Theme arguments generate quantized (telic) VP's

- (1) John wrote a letter ?for ten minutes / in ten minutes. Zucchi&White 1996
- (2) John wrote a sequence of numbers ?for ten minutes / in ten minutes.

- Since there are members of the extension of *a sequence of numbers* having proper parts which are also members of the extension of *a sequence of numbers*, the predicate *is a sequence of numbers* cannot be quantized, according to Krifka's definition.
- Consequently, events of writing a sequence of numbers may have proper parts that are also events of writing a sequence of numbers.
- Yet, *a sequence of numbers* interacts with the interval *in*-adverbial *in ten minutes* in the same way as the uncontroversially quantized NP *a letter* does, which would suggest that it also ought to be quantized.

- (3) Mary ate only a small quantity of porridge ?for ten minutes / in ten minutes.

QUANTIZATION PUZZLE I: English aspectual composition

Problem: There are NPs/DPs that fail to be quantized, when analyzed in isolation as predicates, but behave like quantized predicates with respect to the diagnostic temporal adverbials that test for quantized (telic) predicates:

- singular count nouns like *a fence, a ribbon, a wall, a twig, a sequence, ...*
- nonstandard vague measures of amount like *a (large/small) quantity, a (large/small) piece, a (long/short) distance* (cf. Cartwright 1975, Lønning 1987)
- DP's with vague determiner quantifiers like *many, a lot, (a) few, some* and *most*
- NP's with cardinal numerals combined with *at least / at most*
- NP's with the possessive pronouns combined with mass and bare plural CN's: *my water, my books*; also to a certain extent NP's with the definite article *the* combined with mass and bare plural CN's: *the water, the books*.

See Partee p.c. to Krifka, L. Carlson 1981, Mittwoch 1988, Dahl 1991, Moltmann 1991, White 1994, Zucchi and White 1996, 2001.

QUANTIZATION PUZZLE I: English aspectual composition

Scope: Krifka (1998)

- (I) a. Mary wrote **something** in 10 minutes. [= (60a-c), Krifka 1998]
 b. Mary ate **more than three apples** in an hour.
 c. Mary ate **a quantity of porridge** in an hour.
- The **Incremental Theme arguments**, which are not quantized, are quantificational indefinite NPs.
 “quantificational indefinites must have wide scope over the verb phrase and its modifiers”: e.g., “x were more than three apples, Mary ate x in an hour”.
 - Why cannot the *in* α -time modifier take wide scope wrt a quantificational indefinite DO-NP?
 “[T]he sentence forces a wide-scope reading [for the quantificational indefinite] because only this meets the conditions for interval [*in* α -time, HF] adverbials” (Krifka 1998).
 - Why cannot the measure *for* α -time modifier take wide scope wrt a quantificational indefinite DO-NP? I.e., why cannot the sentence enforce a narrow-scope reading for the quantificational indefinite DO-NP in ?*Mary ate a quantity of porridge for an hour?*
 Pragmatic motivation: A competition between a quantificational indefinite like *a quantity of porridge* that may take a wide scope with respect to other scope taking expressions and a bare mass NP like *porridge*, which can only take the narrow scope with respect to all other scope taking expressions. The speaker could have chosen *porridge* to express more or less the same idea; the choice of *a quantity of porridge* means that the speaker wants to give it a wide scope.

QUANTIZATION PUZZLE I: English aspectual composition

Maximal participant: White & Zucchi (1996), Zucchi & White (2001)

- Rejection of Krifka's (1998) scope solution:
 - (1) a. Every guest ate some muffins. some muffins > every guest
 - b. Every guest ate muffins. every guest > muffins

Problem: According to Krifka (1998), *some muffins* in (1a) should take wide scope with respect to the universal quantifier, and the odd reading that every guest ate the same muffins. We should expect this, given that there is a bare plural term *muffins*, as in (1b), to convey the narrow scope reading: Every guest ate muffins, but not necessarily the same ones.

- **Maximal Participant:** $\forall x[\text{Max}(P, x) \leftrightarrow P(x) \wedge \neg \exists y[P(y) \wedge x < y]]$
 In words: an individual is a maximal P iff it is P and it is not a proper part of another P.

- (2) $\llbracket \text{write a sequence} \rrbracket =$
 $\lambda y \lambda e \exists x [\text{write}'(e) \wedge \text{Ag}(y, e) \wedge \text{Pat}(x, e) \wedge \text{Max}(\lambda z \exists e' [\text{write}'(e') \wedge \text{Ag}(y, e') \wedge \text{Pat}(z, e') \wedge \text{sequence}'(z) \wedge \tau(e') \leq \tau_R], x)]$

In words: an event of writing a sequence is a writing event whose patient is maximal among the individuals that are in the denotation of *sequence written at the time* τ_R . (Maximization built into a DP, treated as a generalized quantifier in so far as it takes the complex verbal predicate as an argument).

Assuming that the object role of *write* has the property of mapping to objects, a proper part of any such event cannot be an event of writing a maximal sequence written at τ_R .

QUANTIZATION PUZZLE I: English aspectual composition

Maximal participant: White & Zucchi (1996), Zucchi & White (2001)

Problem (see Rothstein 2004: 152-154):

- The Maximal Participant account overgeneralizes, because the maximization is built into the denotation of DPs.
- This incorrectly predicts that such DPs will enforce a quantized (telic) interpretation for predicates that are not quantized:

- (3) a. John has owned *more than half the houses* on this street for the last five years, and he is adding to his property every few months. [= (9), p.153]
- b. I carried *at least two children* around on this bicycle for ten years.
- c. The emperor has ruled *fewer than 5 countries* for the last ten years.

(3c) is true if there have been fewer than 5 countries ruled by the emperor at all points in the last ten years, but does not require that it be the same maximal set of fewer than 5 countries, which is what the Maximal Participant account requires.

QUANTIZATION PUZZLE I: English aspectual composition

Maximal event: Filip & Rothstein (2005), Filip (2008)

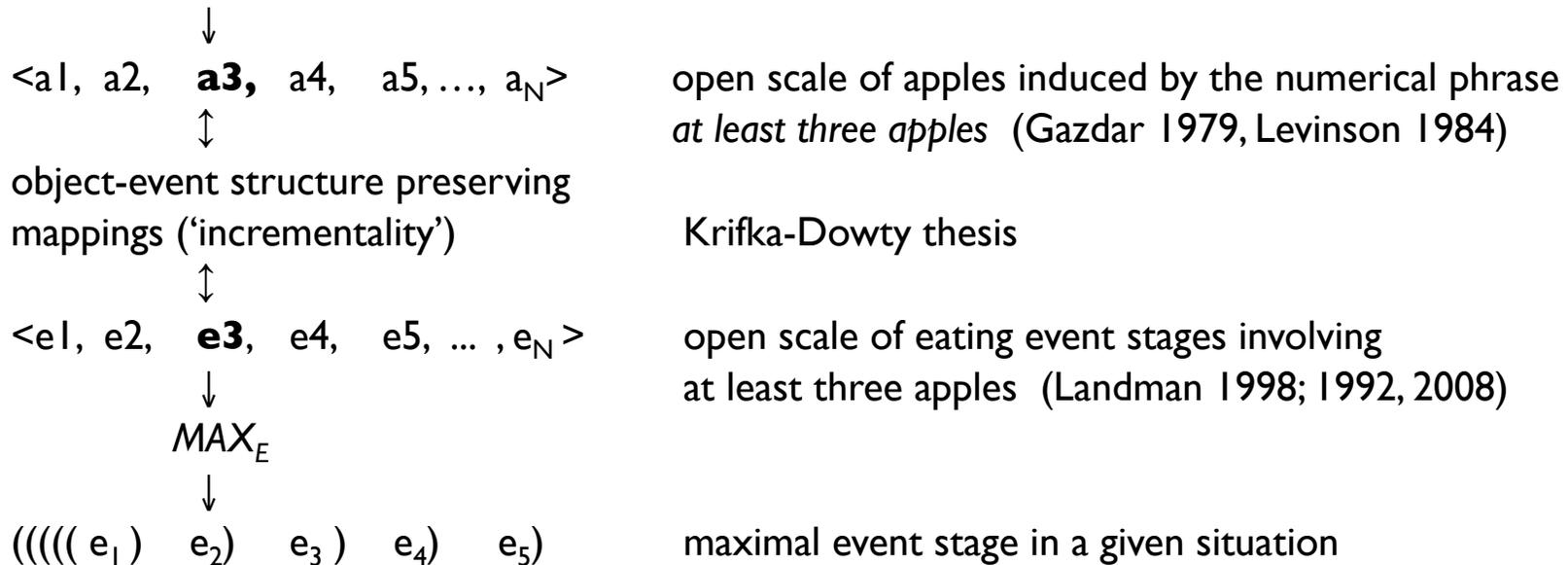
The maximization is not built into the denotation of a DP, contrary to Zucchi & White (2001). Instead, it is introduced at the VP (or IP) level by the Maximization Operator MAX_E over events.

- The *maximization operator* MAX_E is a monadic operator, such that $MAX_E(\Sigma) \subset \Sigma$, which maps sets of partially ordered events Σ onto sets of maximal events $MAX_E(\Sigma)$.

$MAX(P)(e)$, e is a maximal separated event of type P if $P(e)$, and for all e' with $P(e')$ and $e < e'$, it holds that every e'' (with $e'' < e'$ and $\neg e \otimes e''$) is not adjacent to e .

- MAX_E adds the requirement to pick (at a given situation) the most developed (unique) event stage of the various proper event stages in the denotation of the VP which leads to the most informative proposition among the alternatives in a given context.
- What counts as the most developed (unique) event stage of an event is determined relative to a contextually specified upper bound on a scale that measures the relevant dimension of an object related to that event.

John ate **at least three apples** in an hour / ?for an hour.



Landman (2008): If e_1 and e_2 are events and e_1 is a **stage** of e_2 ($e_1 \preceq e_2$) then:

'Part of': $e_1 \leq e_2$, e_1 is part of e_2 (and hence $\tau(e_1) \subseteq \tau(e_2)$).

Cross-temporal identity: e_1 and e_2 share the same essence: they count intuitively as the same event or process at different times.

Kinesis: e_1 and e_2 are qualitatively distinguishable, e_1 is an earlier version of e_2 , e_1 grows into e_2 .

- The maximal event represents a new entity in the domain of events, instead of being merely a (maximal) sum of events.
- If e_i falls under $MAX_E(P)$, then it cannot have a proper part e_{i-1} that also falls under the same $MAX_E(P)$, given that MAX_E picks out the maximal unique event at a given situation out of a set of events that satisfy the property described by P . But this means that $MAX_E(P)$ is quantized

- General theoretical background (independently motivated):
 - event semantics with lattice structures (Krifka 1986, 1992, 1998);
 - stage relation, used for the analysis of the PROG aspect (Landman 1992, 2008)
 - grammar of measurement (Krifka 1989, Schwarzschild 2002);
 - scalar semantics: scalar implicature (Gazdar 1979, Horn 1972), generally taken to be of pragmatic nature and related to Grice's first *Submaxim of Quantity* (Grice 1967/75).

- Specific assumptions:
 - Object-event mappings obtain between the part structure (lattice structure) of events and a part structure of a SCALE with respect to which events in the denotation of maximal predicates count as single maximal events in the relevant context.

 - The relevant scale can be introduced by (among others):
 - Incremental Theme argument: *eat **at least three / most / some apples***
 - for α -time measure adverbials: *walk **for an hour***
 - path measure phrases: *walk **three miles***
 - paths implied by Goal-PPs: *walk **to the store***

 - Consequently, object-event mappings are entailed by incremental verbs, as in Krifka (1986, 1992a) and Dowty (1989, 1991), but also they may be an entailment or implicature associated with certain grammatical constructions (Filip 1993/99).

QUANTIZATION PUZZLE 2: Slavic aspectual composition

- Krifka's (1986, 1992a and elsewhere):
 - PFV aspect presupposes that the verbal P is QUANTIZED: $\lambda P\lambda e[P(e) \wedge \text{QUANT}(P)]$
 - PFV aspect uniformly enforces a quantized, and therefore definite interpretation of the bare mass and plural Incremental Theme argument in its scope.
- Problem:
 - Perfective verbs do not uniformly express quantized predicates (Filip 1992, 2000)
 - Consequently, perfective verbs do not uniformly enforce the quantized and definite interpretation of their bare mass and plural Incremental Theme arguments (Filip 2005a,b)

- Perfective verbs do not uniformly enforce the quantized and definite interpretation of their bare mass and plural Incremental Theme arguments (Filip 2005a,b)

Russian

Quantized and definite interpretation of bare mass Incremental Theme NP

- (1) a. **VY**-pil^{PFV} konjačok.
COMPL-drank.3SG brandy.DIM.SG.ACC
 ‘He drank up (all) the brandy.’
- b. **DO**-pil^{PFV} konjačok.
TERM-drank.3SG brandy.DIM.SG.ACC
 ‘He finished (drinking) (all) the brandy.’

Cumulative and non-specific indefinite interpretation of bare mass Incremental Theme NP

- (2) a. **NA**-pilsja^{PFV} konjačka.
CM-drank.3SG brandy.DIM.SG.GEN
 ‘He drank a lot of brandy.’
 ‘He got drunk on brandy.’
- b. **PO**-pil^{PFV} konjačok/konjačka.
ATN-drank.3SG brandy.DIM.SG.ACC
 ‘He drank some/a little brandy.’

COMPL: completive; **TERM**: terminative; **CM**: cumulative; **ATN**: attenuative

(2a-b): Perfective verbs formed with prefixes that have vague measure or quantificational meanings present a parallel problem to that posed by count nouns like *fence* (see White and Zucchi 1996; Rothstein 2010):

- they fail to be quantized, because they have eventualities in their denotation that will have a proper part that can be described by the same perfective verb;
- they are cumulative, because they have events in their denotation whose sums can also be described by them.

- Prefixes with vague measure uses (Filip 1992, 2000, 2005a,b)

(1) $\text{PREFIX}_{\mu} \rightarrow \{\lambda x[\mu_C(x) = n_C]\} \wedge n_C r C_C$
 C_C : free variable over contextually determined standards of comparison

(2) a. $\text{PO}_{ATN} \rightarrow \{\lambda x[\mu_C(x) = n_C]\} \wedge n_C \leq C_C$
 Presupposition: C_C is considered to be a low estimate.
 b. $\text{NA}_{CM} \rightarrow \{\lambda x[\mu_C(x) = n_C]\} \wedge n_C \geq C_C$

Presupposition: C_C is considered to be a high estimate.

[a.-b.: sums of x to the amount of some contextually specified number n_C such that there are n_C of contextually specified measure units μ_C and n_C meets/exceeds (a) or meets/falls short of (b) the contextually specified standard of comparison C_C .]

- Slavic verbal prefixes, which are used to form perfective verbs, have a number of other quantity and weak quantificational uses, as well as distributive meanings and collective/universal meanings.

In this respect, Slavic verbal prefixes have functions resembling adverbial quantifiers (A-quantifiers) expressed by verbal prefixes, preverbs and the like in American or Australian native languages (e.g., Warlpiri), see Filip (1992, 1996, 2005a).

Slavic aspectual composition revised: Filip (1993/99, 2004)

Proposal: Homogeneous nominal predicates undergo a type shift from the predicative type $\langle e, t \rangle$ into the maximal (referentially specific) interpretation of the argumental type e via the σ -operator, when they function as Incremental Theme arguments of perfective verbs, provided they are not in the scope of measure, quantificational or modal operators introduced in the same clause (Filip 2004).

- NO definiteness effect predicted - weak indefinites (Russian)

- (1) a. **NA**-pilsja^{PFV} konjačka. b. **PO**-pil^{PFV} konjačok/konjačka.
 CM-drank.3SG brandy.DIM.SG.GEN **ATN**-drank.3SG brandy.DIM.SG.ACC
 ‘He drank a lot of brandy.’ ‘He drank some/a little brandy.’
 ‘He got drunk on brandy.’

- Definiteness effect predicted (Czech)

- (2) On **snědl**^{PFV} kaši.
 he.NOM ate porridge.SG.ACC
 ‘He ate (up) (all) the porridge.’ I.e., the whole quantity of porridge in the relevant situation.
 [[*On snědl kaši*]] = { e | EAT(e) \wedge INC-TH(e , σ x.PORRIDGE(x))} Filip 2005
 σ xPx denotes the maximal element in the extension of P .

The sigma term ‘ σ ’ here has a semantic effect similar to that of the definite article *the* in English. Definite descriptions in English are analyzed in terms of σ -terms, which is motivated by the observation that *the* does not assert universality or anything about particular quantity, and therefore, it is not an expression of quantification (Krifka 1992b, Partee 1995, p.581).

Pragmatic motivation for the definiteness effect

Filip (1993/99, 1997): The definiteness effect follows from the semantics of perfectivity interacting the inherent lexical meaning of strictly incremental verbs and general pragmatic principles of interpretation:

- PFV restricts the denotation of verbs to sets of 'whole' events.
- PFV incremental verbs require that their Incremental Theme arguments denote entities all of whose parts are affected by events they describe.
- Making an assertion about all the parts of an individual presupposes that that individual be well demarcated.
- Bare mass and plural terms inherently denote unbounded entities. One way to make sense of the 'totality' requirement imposed by incremental PFV verbs is to interpret them as referring to some *specific* portion of stuff or some *specific* set of individuals in the relevant situation.

Addendum

- Flier (1985, p.50, 55) compares the use of the prefix *po-* in *poxodít* ‘a bit (a while’s worth) of walking,’ *pošálit* ‘a bit of being mischievous,’ *porubít* ‘a bit of chopping’ to nominal measures like *čáška čaju* ‘a cup of tea,’ *kusok saxaru/saxara* ‘a piece of sugar,’ *buxanka xleba* ‘a loaf of bread.’ Just like a cup can be filled with tea, so can a short stretch of time be filled with walking.
- Some examples of prefixes with uses related to vague measurement:

ATTENUATIVE: <i>PO-prideržat</i> ^P	‘to hold on to lightly’
<i>PRI-glušit</i> ^P <i>radio</i>	‘to turn down the radio a little’
<i>POD-měrznut</i> ^P	‘to freeze slightly’
<i>POD-gnit</i> ^P	‘to rot slightly’, ‘to begin to rot’
<i>NAD-lomit</i> ^P	‘to break partly’, ‘to crack’
DELIMITATIVE: <i>PO-kurit</i> ^P	‘to smoke for a while’
PERDURATIVE: <i>PRO-spat</i> ^P <i>vsju noč</i>	‘to sleep through the whole night’
SATURATIVE: <i>NA-kurit</i> ^P	‘to smoke one’s fill’
<i>ZA-govorit</i> ^P	‘to get carried away by a conversation’, ‘to rave’, ‘to ramble’

The Aktionsart labels and examples are taken from Isačenko (1962 p.394, 408-412) and Forsyth (1970, p.21).

Traditional Russian grammar studies: Agrell (1908), Isačenko (1960:385-418, 1962), also Maslov (1959), Forsyth (1970), Bondarko (1995), Comrie (1976 and references cited therein), Paducheva (1996), and many others.

Filip 1993/99: Incremental event type and scales

- Incrementality (structure-preserving object-event mappings) is entailed by certain verbs, as in Krifka's (1986, 1992a) and Dowty's (1989, 1991) theories, but it is also an entailment or implicature associated with certain grammatical constructions.
- INCREMENTAL EVENT TYPE CONSTRUCTION: A part of its meaning is characterized by the homomorphism between the lattice structure (part-whole structure) associated with a SCALE (tracking the development of the described event) and the lattice structure associated with the denotation of its event argument.
- UNIFICATION-BASED APPROACH: verbal predicate and an Incremental Theme NP each provide partial information about a single linguistic object, a telic verbal predicate. The apparent "flow" of information in one direction (from the NP to the verbal predicate in English and from the verbal predicate to the NP in Slavic languages) is due to the imbalance in the encoding of the relevant telicity constraints in the surface structure.
- Emphasis on the role of context, world knowledge, cognitive and pragmatic principles of interpretation in determining the suitable incremental mapping.

Telicity “by precedence and adjacency” - Krifka (1998)

- Extension of the original theory of telicity “by sums and parts” (Krifka, 1986/89, 1992a) for aspectual composition to predicates that express changes or “movements” in a variety of domains.¹ Three main types distinguished:
 - (1) *Movement in physical space, delimited by a measure function 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).
- A uniform representation in terms of an incremental ‘motion’ along a GENERALIZED PATH STRUCTURE: i.e., convex, linear element in connectedness structures, defined by the properties of precedence and adjacency, in addition to the part relation and the sum operation.
- The incremental participant is here the Path and the structure-preserving mappings (homomorphism, incremental relations) are defined between its parts and the part structure associated with their eventuality argument.
- Syntactically, paths are expressed differently from ordinary Incremental Themes, are often implicit or partially specified (e.g. one end point may be specified by a Goal-PP like *to Chicago*.)

¹ Inspiration: The analysis of motion predicates describing motion of Themes in a physical space provides a basis for the modeling of changes in other domains (see the Localist Theory, Gruber 1965, and its offshoots in Conceptual Semantics, Jackendoff 1991, 1996).

Telicity as ‘temporal quantization’

- $\llbracket \textit{walk for an hour} \rrbracket = \lambda x, e [\textit{walk}'(e, x) \wedge \text{HOUR}(\tau(e)) = 1]$
is telic, but not quantized:
- Telicity recast as “the property of an event predicate X that applies to events e such that all parts of e that fall under X are initial and final parts of e .” (Krifka 1998, p.207)

$$\forall X \subseteq U_E [\text{TEL}_E(X) \leftrightarrow \forall e \forall e' \in U_E [X(e) \wedge X(e') \wedge e \leq_E e' \rightarrow \text{INI}_E(e', e) \wedge \text{FIN}_E(e', e)]]$$

Telicity amounts to ‘temporal quantization’, even though Krifka’s definition of telicity avoids any reference to time points.
- ‘Quantization’ is a stricter notion than ‘telicity’, because all quantized predicates are necessarily telic, but not every telic predicate is quantized (*walk for an hour*)
- Another type of P that is telic, but not quantized: Directed motion predicate.
walk to the store (the starting point is implicit)
Garey (1957) and Vendler (1957): telic predicates have a “set terminal point”. But if *walk to the store* applies to an event e , then it will also apply to the latter half of e (Krifka 1992a, p.36).