

## A Scalar Approach to Aspectual Classes

### 1 Introduction

- Aspectual classes have been an important part of modern work in lexical semantics since Vendler (1957), with most researchers analyzing (or arguing against) the following four:
  - (1) a. States: *love someone, know the answer, hear music*
  - b. Activities: *run (around), play in the garden, push a cart*
  - c. Achievements: *notice a painting, recognize a friend, die*
  - d. Accomplishments: *build a house, eat a pizza, paint a barn red*
- I propose an analysis of (1) based on recent work on change as **change along a scale** (Hay et al. 1999, Beavers 2006, 2008a,b, Kennedy and Levin 2008, Rappaport Hovav 2008) — an affected argument transitions to some new value on a separate property scale argument.
- Aspectual classes are defined by cross-classifying two independently-motivated properties:
  - (2) a. The complexity of the scale  $\approx$  gradability/non-gradability
  - b. The specificity of the endpoint of the scale  $\approx$  degree of affectedness
- Furthermore, the central role of change predicts that aspectual classes should interact significantly with argument realization, which I show indeed to be the case, examining the English conative alternation.

### 2 Modeling Aspectual Classes - A Quick Recap

- Aspectual classes are defined on VPs, and involve temporal properties, especially telicity (*for/in*) and having stages (subevents that lead to others; progressive; Landman 1992):
    - (3) a. John knew the answer *for/??in* an hour. (States are atelic)
    - b. John ran around *for/??in* an hour. (Activities are atelic)
    - c. John noticed the painting *in/?for* five minutes. (Achievements are telic)
    - d. John assembled his new shelves *in/?for* two hours. (Accomplishments are telic)
  - (4) a. #John is knowing the answer. (States have no stages)
  - b. John is running around. (Activities have stages)
  - c. #John is noticing the painting. (Achievements have no stages)
  - d. John is assembling his new shelves. (Accomplishments have stages)
- Featural approaches are common;  $[\pm\text{stages}, \pm\text{telic}]$  produces (1) (Rothstein 2004). However, there are other, less often discussed classes, that raise problems for featural approaches:
  - (5) a. Degree achievements: *John cooled the soup.* (Dowty 1979)
  - b. Semelfactive: *John kicked the car (once/repeatedly).* (Smith 1991)
  - c. Iterative achievements: *John chopped the meat.* (Beavers 2006)
- Positing  $n$  binary features produces  $2^n$  classes; 6 or 7 classes would involve additional constraints. If we introduce non-binary features, the values require extra motivation.

- Another common treatment of aspectual classes is via decompositions (Dowty 1979, Foley and Van Valin 1984; in particular Rappaport Hovav and Levin 1998: 108).
  - (6) a. States: [  $x < STATE >$  ]
  - b. Activities: [  $x ACT_{<MANNER>}$  ]
  - c. Achievements: [ BECOME [  $x < STATE >$  ] ]
  - d. Accomplishments: [ [  $x ACT_{<MANNER>}$  ] CAUSE [ BECOME [  $x < STATE >$  ] ] ]
- This captures important properties of such events: achievements embed states, and many accomplishments consist of an activity and an achievement (Moens and Steedman 1988).
- However, there is no one-to-one correspondence between templates and aspectual class. For example, BECOME (qua change) can *in toto* be associated with any temporal properties:
  - (7) a. The vase broke in an instant. (Punctual BECOME)
  - b. The water evaporated slowly over an hour. (Durative BECOME)
  - (8) a. The vase broke in/?for five minutes. (Telic BECOME)
  - b. The vase cooled for/in five minutes. (Atelic BECOME)
- Thus subevents types per se do not define aspectual classes, since they do not inherently tie into the relevant aspectual properties (see also Rappaport Hovav 2008). But what does?

### 3 Telicity and Scales of Change

- Telicity is tied to the expression of “incremental themes” arguments that “measure out” the event: the event progresses incrementally through parts of the theme, culminating at the theme’s end — if known (Verkuyl 1972, Dowty 1991, Tenny 1994, Krifka 1989, 1998)
- A recent implementation of measuring out is as “motion” of a **theme** along a **property scale** (Beavers 2006, 2008a,b, following Krifka 1998, Hay et al. 1999, Kennedy and Levin 2008).
  - (9) a. John walked from the market to the coffeeshop. (John’s *position* on path  $s_p$ )  
 $\exists e \exists s_p [walk'(j, s_p, e) \wedge SOURCE(x, s_p, \mathbf{m}, e) \wedge GOAL(x, s_p, \mathbf{c}, e)]$
  - b. John wiped the table clean (scale  $s_c$  of *cleanliness* of the table)  
 $\exists e \exists s_c [wipe'(j, t, s_c, e) \wedge SOURCE(x, s_c, \mathbf{dirty}, e) \wedge GOAL(x, s_c, \mathbf{clean}, e)]$
  - c. John ate the apple. (scale  $s_v$  of *volume/existence* of the apple)  
 $\exists e \exists s_v [eat'(j, a, s_v, e) \wedge SOURCE(x, s_v, \mathbf{complete}, e) \wedge GOAL(x, s_v, \mathbf{gone}, e)]$
- Thus the scale is the incremental theme, measuring out the event by a **movement relation**  $\theta$ :
  - (10) Every unique part of  $e$  is  $\theta$ -related to a unique part of  $s$  and vice versa, where temporal adjacency in  $e$  corresponds to scalar adjacency in  $s$  and vice versa.
- This defines a homomorphism explaining telicity: the specificity of final point on the scale corresponds to the specificity of final point of the event (see Hay et al. 1999, Krifka 1998).
  - (11) a. John wiped the table for/?in an hour.
  - b. John wiped the table clean in/?for an hour.
- I show how this model allows us to generate a complete set of aspectual classes, focusing on dynamic predicates (and thus reducing stages to durativity).

#### 4 Degree of Affectedness as The Specificity of the Endpoint

- Although we can analyze change via a scale argument, changes come in many varieties or “degrees” (Hopper and Thompson 1980, Tsunoda 1981, Næss 2003).

- (12) a. peel the apple (Apple is completely de-skinned)  
 b. cut the apple (Apple cut, not necessarily to a particular degree)  
 c. hit the apple (Apple impinged, not necessarily affected)  
 d. see the apple (Apple a participant, not necessarily impinged)

- These degrees of affectedness are not just intuitionistic; they are distinguished linguistically.

#1 Together (12a-c) are “force recipients” which take the brunt of the force and satisfy the *What happened to X is Y* diagnostic of Cruse (1973) (Rappaport Hovav and Levin 2001: 786-787).

- (13) a. What happened to the apple is that John peeled/cut/hit it.  
 b. #What happened to the apple is that John saw it.

#2 Only (12a,b) entail an actual result; the other two do not.

- (14) a. #John peeled/cut the apple, but nothing changed about it.  
 b. John hit/saw the apple, but nothing changed about it.

#3 Only (12a) satisfies telicity (assuming a quantized patient; see Beavers 2008a, 2009):

- (15) a. John peeled the apple in/?for five minutes.  
 b. John cut/hit/saw the apple for/#in five minutes. (on intended reading)

- Thus each predicate in (12) is distinct linguistically, forming a subset relation in terms of these three diagnostics:

(16) <b>Diagnostics</b>	<i>peel</i>	<i>cut</i>	<i>hit</i>	<i>see</i>
Telic	✓	×	×	×
Change entailed	✓	✓	×	×
<i>Happened to</i>	✓	✓	✓	×

- We can model the degree of affectedness in the scalar approach as how **specific**  $\phi$  is about  $x$ 's progress on  $s$  (Beavers 2006, 2008a,c, building on Hay et al. 1999).

- (17) a.  $x$  undergoes a **quantized** change iff  $\phi \rightarrow \exists e \exists s [GOAL(x, s, \mathbf{g}_\phi, e)]$   
 (e.g. *peel, break, shatter, destroy, devour x*)  
 b.  $x$  undergoes a **non-quantized** change iff  $\phi \rightarrow \exists e \exists s \exists g [GOAL(x, s, g, e)]$   
 (e.g. *cut, widen, lengthen, slice x*)  
 c.  $x$  has **potential** for change iff  $\phi \rightarrow \exists e \diamond \exists s \exists g [GOAL(x, s, g, e)]$   
 (e.g. *hit, wipe, scrub, rub, punch, kick, slap x*)  
 d.  $x$  is **unspecified** for change iff  $\phi \rightarrow \exists e \exists \theta [\theta(x, e)]$   
 (e.g. *see, smell, follow, play (as children), ponder x*)

- These degrees of affectedness are related implicationally along an **Affectedness Hierarchy**:

(18) For all  $x, \phi, e$ , *quantized*  $\rightarrow$  *non-quantized*  $\rightarrow$  *potential*  $\rightarrow$  *unspecified*

- We can define the diagnostics simply, building on the weakening entailments (the correlation of quantized change to telicity follows as in Hay et al. 1999, Kennedy and Levin 2008):

(19) a.  $\phi$  is telic iff  $x$  undergoes a a quantized change in  $\phi$ .  
 b.  $\phi$  thus *s.t. changed about*  $x$  is true iff  $x$  undergoes non-quantized change in  $\phi$ .  
 c. *What happened to*  $x$  is  $\phi$  is true iff  $x$  undergoes potential change in  $\phi$ .

- Thus we can model affectedness as how specific a predicate is about the result on the scale; high degrees of specificity lead to telicity, the rest lead to atelicity.

## 5 Durativity/Punctuality

- Durativity is about the length of the event (Engelberg 1999, 2000). Punctual predicates with *in* have only *after* readings; durative predicates also have durational readings (Kearns 2000):

(20) a. The settler will cross the border in ten days. (*after*)  
 b. The settler will cross the desert in ten days. (*after/during*)

- Thus linguistically we seem to have two types of events in terms of mereological complexity. As also shown in (20), durativity depends in turn on the **complexity** of the scale (Beavers 2008b):

(21) a. punctual event (just two points in time)  $\approx$  simplex scale (just two values)  
 b. durative event (>two points in time)  $\approx$  complex scale (>two values)

- These two types of scales correspond to the gradable/non-gradable scalar distinction (Kennedy and McNally 2005):

(22) a. Non-gradable (binary): *dead, #more dead, pregnant, #more pregnant*  
 b. Gradable (>binary): *clean, cleaner/more clean, polished, more polished*

- If we assume there are just two linguistically relevant mereological types for all entities — two subparts or >two subparts — (21) follows from the homomorphism of  $e$  and  $s$  (Beavers 2008b): informally, less change takes less time, more change takes more time (see also Jackendoff 1996, Wechsler 2005)

- Indeed, unlike telicity, the correlation of scalar complexity to event complexity *requires* a homomorphic model (cp. Rothstein 2004, Kennedy and Levin 2008): the notion of preservation of simplex/complex mereology is by definition homomorphic.

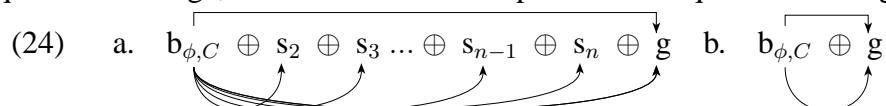
## 6 The Interaction of Affectedness and Durativity/Punctuality

- Thus we have 4 types of affectedness and 2 types of complexity, defined in terms of the scale. Cross-classifying these factors generates the Vendler (1957) aspectual classes, plus more:

(23)

	<i>Simplex event/scale</i>	<i>Complex event/scale</i>
<i>quantized</i>	ACHIEVEMENTS <i>break/shatter a vase, kill Bill</i>	ACCOMPLISHMENTS <i>load the wagon, eat the apple</i>
<i>non-quantized</i>	N/A	DEGREE/ITERATIVE ACHIEVEMENTS <i>slash a tire (repeatedly), cool the soup</i>
<i>potential</i>	SEMELFACTIVES <i>hit (once), slap (once)</i>	ACTIVITIES <i>beat, batter, pummel</i>
<i>unspecified</i>	SEMELFACTIVES <i>blink/cough (once)</i>	ACTIVITIES <i>rub the lamp (slowly)</i>

- The associated properties of telicity and durativity follow from affectedness and complexity. Furthermore, in addition to the traditional Vendler classes, we also have two more:
  - Semelfactives: punctual events that do not entail a change; they split into two types, those with potential for change and those without (as with activities).
  - Degree/iterative achievements: ongoing with change but no specific result.
    - \* Degree achievements are homogenous, a continuous smooth change (*cool*).
    - \* Iterative achievements are heterogeneous, several repeated achievements (*slash*).
- These classes are not all or nothing: some predicates may be telic or atelic depending on context (e.g. *cool the soup*), or durative or punctual (e.g. *blink*).
- Here we can say that predicate are *vague* or *unspecified* as to scalar complexity or degree of affectedness, with context filling in. No type-shifting is necessary.
- Interestingly, one class is ruled out. Simplex, non-quantized changes are a vacuous class.
  - These scales are simple and thus involve just two states.
  - Unlike complex scales, there is no potential for indeterminacy about the initial/final states: the patient always transitions between states  $b_{\phi,C}$  and  $g$  (upper arrows indicate quantized change, lower arrows indicate possible non-quantized changes).



- Non-quantized non-gradable change is equivalent to quantized non-gradable change, thus lexicalization into this class is blocked.

- We can also understand why some achievements do and some do not allow progressive as the difference between lexicalizing a simplex scale versus a very, very short complex scale:

- (25) a. #John is noticing his friend in the corner. (Inherently simplex)  
 b. John is arriving at the station just now. (Complex, but very short)

- Thus two independent factors give us aspectual classes; predicates may fit into several.

## 7 Aspectual Classes and Argument Realization

- The theory of affectedness outlined above was developed to deal with argument realization. However, the aspectual properties suggest that there may be a significant interaction.
- Consider the conative alternation (Guerssel et al. 1985, Laughren 1988, Levin 1993, Frense and Bennett 1996, van der Leek 1996, Broccias 2003, Rosales Sequeiros 2005, Beavers 2006), which appears to come in three types:

- (26) a. Marie ate her cake.    b. Marie ate at her cake.    (quantized/non-quantized)  
       c. Marie cut her cake.    d. John cut at her cake.    (non-quantized/potential)  
       e. Marie hit DeFarge.    f. Marie hit at DeFarge.    (potential/unspecified)

(27) What happened to DeFarge is Marie hit #(at) her.

- It appears that the conative lowers the degree of affectedness by 1 (Beavers 2008c):

- (28)    **Contrast** : *quantized* → *non-quantized* → *potential* → *unspecified*  
       *eat* conative :    DO    ⇔    OBL  
       *cut* conative :                    DO            ⇔    OBL  
       *hit* conative :    DO            ⇔    OBL

- We can alternatively reconceptualize this in terms of an aspectual operation that takes a predicate of one aspectual class in (23) and outputs the next one “down”.

- (29)    **Contrast** : *accomp.* → *deg/itr. ach.* → *pot. act/sem.* → *unsp. act/sem.*  
       *eat* conative :    DO    ⇔    OBL  
       *cut* conative :                    DO            ⇔    OBL  
       *hit* conative :    DO            ⇔    OBL

- Crucially, virtually unnoticed is that the conative does not apply to achievements (punctual change-of-state predicates) (Rosales Sequeiros 2005, Beavers 2006, 2007):

- (30) a. John pierced/punctured/pricked/splintered/shattered/cracked/broke/split the tire.  
       b. \*John pierced/punctured/pricked/splintered/shattered/cracked/broke/split at the tire.

- However, recall that the spot in (23) below achievements is ruled out. I suggest the conative is blocked for achievements because it would produce an anomalous semantic predicate type.
- Thus the analysis of aspectual classes predicts the possibility of significant interaction of aspectual class and argument realization, and this is indeed borne out.

## 8 Conclusion

- I have argued here that a scalar model of change provides us with a way to generate a full suite of aspectual classes, including the traditional Vendler classes plus others.
- The relevant properties of the approach are two independently-motivated factors:

- (31) a. The complexity of the scale ≈ gradability/non-gradability  
       b. The specificity of the endpoint of the scale ≈ degree of affectedness

- Cross-classifying these properties produces 7 valid types, predicting their relevant aspectual properties (telicity/durativity), as well as making predictions about argument realization.

- However, there are two puzzles I have not discussed here. First, some predicates seem to be accomplishments without change:

(32) The troupe performed the play in/?for exactly five hours.

- However, in Beavers (2008a), following Tenny (1994), I have suggested that we can apply a scalar model to these as well — the performer is a “theme” and the piece is the “scale”. The difference is that no lasting result is entailed.
- Second, patients are also incremental themes even with a specific result (see Dowty 1979: 63, Jackendoff 1996: 340-1, Filip 1999: 100-1, Rothstein 2004: 99):

(33) 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.

- Beavers (2008a, 2009) argues that we can accommodate this fact by expanding the homomorphism to be relevant to mereological complexity of both incremental themes:

(34) Every unique part of  $e$  is related to a unique part of  $x$  traversing a unique part of  $s$ ; temporal adjacency in  $e$  corresponds to adjacent traversal of  $s$  by that part of  $x$ .

- Future work will determine what effect this will have on how we define each aspectual class.

## References

- Beavers, John. 2006. *Argument/Oblique Alternations and the Structure of Lexical Meaning*. Ph.D. thesis, Stanford University.
- Beavers, John. 2007. The role of durativity in argument realization. Talk given at the 81st Annual Meeting of the LSA, Anaheim, CA.
- Beavers, John. 2008a. On affectedness. Unpublished ms., The University of Texas at Austin.
- Beavers, John. 2008b. Scalar complexity and the structure of events. In J. Dölling, T. Heyde-Zybatow, and M. Schäfer, eds., *Event Structures in Linguistic Form and Interpretation*, pages 245–265. Berlin: Mouton de Gruyter.
- Beavers, John. 2008c. The structure of lexical meaning: Why semantics really matters. Unpublished ms., The University of Texas at Austin.
- Beavers, John. 2009. Multiple incremental themes and figure/path relations. In *Proceedings of SALT XVIII*.
- Broccias, Cristiano. 2003. *The English Change Network: Focusing Changes into Schemas*. Berlin: Mouton de Gruyter.
- Cruse, D.A. 1973. Some thoughts on agentivity. *Journal of Linguistics* 9:11–23.
- Dowty, David. 1979. *Word Meaning and Montague Grammar*. Dordrecht: Reidel.
- Dowty, David. 1991. Thematic proto-roles and argument selection. *Language* 67:547–619.
- Engelberg, Stefan. 1999. ‘Punctuality’ and verb semantics. *Proceedings of the 23rd Annual Penn Linguistics Colloquium*, University of Pennsylvania Working Papers in Linguistics.
- Engelberg, Stefan. 2000. The magic of the moment: What it means to be a punctual predicate. In *Proceedings of BLS 25*, pages 109–121.
- Filip, Hana. 1999. *Aspect, Eventuality Types, and Nominal Reference*. New York: Garland.
- Foley, William and Robert D. Van Valin. 1984. *Functional syntax and universal grammar*. Cambridge: Cambridge University Press.
- Frense, Jutta and Paul Bennett. 1996. Verb alternations and semantic classes in English and German. *Language Sciences* 18:305–317.

- Guerssel, Mohamed, Kenneth Hale, Mary Laughren, Beth Levin, and Josie White Eagle. 1985. A cross-linguistic study of transitivity alternations. In W. H. Eilfort, P. D. Kroeber, and K. L. Peterson, eds., *CLS 21, Part 2: Papers from the Parasession on Causatives and Agentivity*, pages 48–63. Chicago Linguistic Society.
- Hay, Jennifer, Christopher Kennedy, and Beth Levin. 1999. Scalar structure underlies telicity in degree achievements. In *The Proceedings of SALT IX*, pages 127–144.
- Hopper, Paul J. and Sandra A. Thompson. 1980. Transitivity in grammar and discourse. *Language* 56:251–299.
- Jackendoff, Ray. 1996. The proper treatment of measuring out, telicity, and perhaps event quantification in English. *Natural Language and Linguistic Theory* 14:305–354.
- Kearns, Kate. 2000. *Semantics*. New York, NY: St. Martin's Press.
- Kennedy, Chris and Beth Levin. 2008. Measure of change: The adjectival core of degree achievements. In L. McNalley and C. Kennedy, eds., *Adjectives and Adverbs: Syntax, Semantics, and Discourse*, pages 156–182. Oxford, UK: Oxford University Press.
- Kennedy, Christopher and Louise McNally. 2005. Scale structure, degree modification, and the semantics of gradable predicates. *Language* 81.
- Krifka, Manfred. 1989. Nominal reference, temporal constitution and quantification in event semantics. In R. Bartsch, J. van Benthem, and P. van Emde Boas, eds., *Semantics and Contextual Expressions*, pages 75–115. Dordrecht: Foris Publications.
- Krifka, Manfred. 1998. The origins of telicity. In S. Rothstein, ed., *Events and Grammar*, pages 197–235. Dordrecht: Kluwer.
- Landman, Fred. 1992. The progressive. *Natural Language Semantics* 1:1–32.
- Laughren, Mary. 1988. Toward a lexical representation of Warlpiri verbs. In W. Wilkins, ed., *Thematic Relations*. San Diego, CA: Academic Press.
- Levin, Beth. 1993. *English Verb Classes and Alternations: A Preliminary Investigation*. Chicago, IL: University of Chicago Press.
- Moens, Marc and Mark Steedman. 1988. Temporal ontology and temporal reference. *Computational Linguistics* 14(2):15–28.
- Næss, Åshild. 2003. What markedness marks: The markedness problem with direct objects. *Lingua* 114:1186–1212.
- Rappaport Hovav, Malka. 2008. Lexicalized meaning and the internal structure of events. In S. Rothstein, ed., *Theoretical and Crosslinguistic Approaches to the Semantics of Aspect*. Amsterdam: John Benjamins.
- Rappaport Hovav, Malka and Beth Levin. 1998. Building verb meanings. In M. Butt and W. Geuder, eds., *The Projection of Arguments: Lexical and Compositional Factors*, pages 97–133. Stanford: CSLI Publications.
- Rappaport Hovav, Malka and Beth Levin. 2001. An event structure account of English resultatives. *Language* 77:766–797.
- Rosales Sequeiros, Xosé. 2005. *Current Issues in Galician Semantics and Pragmatics*. Munich: Lincom Europa.
- Rothstein, Susan. 2004. *Structuring Events*. Oxford: Blackwell.
- Smith, Carlotta. 1991. *The Parameter of Aspect*. Dordrecht: Kluwer.
- Tenny, Carol. 1994. *Aspectual Roles and the Syntax-Semantic Interface*. Dordrecht: Kluwer.
- Tsunoda, Tasaku. 1981. Split case-marking in verb-types and tense/aspect/mood. *Linguistics* 19:389–438.
- van der Leek, Frederike. 1996. The English conative construction: A compositional account. In *Proceedings of CLS 32*, pages 363–378.
- Vendler, Zeno. 1957. Verbs and times. *The Philosophical Review* 66:143–160.
- Verkuyl, Henk J. 1972. *On the Compositional Nature of the Aspects*. Dordrecht: Reidel.
- Wechsler, Stephen. 2005. Resultatives under the 'event-argument homomorphism' model of telicity. In N. Erteschik-Shir and T. Rapoport, eds., *The Syntax of Aspect*, pages 255–273. Oxford: Oxford University Press.