

# Scale Closure and Telicity

Yoad Winter

Technion

winter@cs.technion.ac.il

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## 1 Introduction

### Cross-categorial effects on telicity

*Nouns and mereological structure:*

- (1) Mary was eating apples  $\Rightarrow$  Mary ate apples.  
Mary was eating meat  $\Rightarrow$  Mary ate meat.  
?Mary was eating an apple  $\not\Rightarrow$  Mary ate an apple.

Verkuyl (1971), Krifka (1989), among others.

*Adjectives and scale structure – deadjectival verbs:*

- (2) John was dirtying the room  $\Rightarrow$  John dirtied the room.  
John was cleaning the room  $\not\Rightarrow$  John cleaned the room.

Declerck (1979), Bertinetto and Squartini (1995), Hay (1998), Hay et al. (1999), Kearns (2005), among others.

*Prepositions and path structure (Zwarts 2004):*

- (3) Jane was walking toward the park  $\Rightarrow$  Jane walked toward the park.  
Jane was walking to the park  $\not\Rightarrow$  Jane walked to the park.

### The cross-categorial status of *almost*

*With NPs* – Hitzenman (1992), Rapp and von Stechow (1999), Morzycki (2001):

- (4) I graded almost every/no/thirteen/?some/?many/?few exam(s).

*With total and partial adjectives* – Cruse (1986), Rotstein and Winter (2004):

(5) *almost dry/?moist, almost clean/?dirty, almost straight/?bent, almost smooth/?rough, almost complete/?incomplete*

*With telic and atelic verbs* – Dowty (1979), Rapp and von Stechow (1999):

(6) a. Dan almost drew a circle.

*Scalar (S) interpretation:*

“Dan started to draw a circle and got close to finishing it”

*Counterfactual (C) interpretation:*

“Dan got close to starting a drawing of a circle but didn’t actually start”

b. Dan almost pushed a cart.

*Only counterfactual interpretation:*

S: ?“Dan started to push a cart and got close to finishing it”

C: “Dan got close to starting pushing a cart but didn’t actually start”

### **Closure and telicity across domains – main claims:**

1. The S-interpretation of *almost* with verbs results from the closure property of the temporal/eventual domain, parallel to Rotstein and Winter’s closure requirement with scale structures of adjectives (see also Amaral 2006).
2. Dowty’s generalization is not completely adequate: *almost* modification of prepositions reveals that closure entails telicity, but not vice versa.
3. Against the claims of Hay et al. (1999), scales of total adjectives (*clean, straight, dry*) are uniformly closed. Hence follows an observation (cf. Kearns 2005) about the context **independent** telicity of total deadjectival verbs (*to clean, to straighten, to dry*).
4. A newly observed correlation between *weak downward monotonicity* and atelicity – weakening the homogeneity account of telicity (Bennett & Partee 1972/2003, Reinhart 1986, Borik 2002).  
Weak downward monotonicity formally accounts for the correspondence between closed (open) structures and (a)telicity, and can perhaps be extended to cover other instances of potential Sorites-like “paradoxes”.

## Plan:

1. 'Almost' and prepositions: dissociating telicity from closure.
2. 'Almost' and deadjectival verbs: a closer look at total/partial scales and telicity.
3. Weak downward monotonicity: weakening the subinterval property of Bennett and Partee.
4. Remark on total adjectives and 'completely' modification.

## 2 Almost and prepositions: dissociating telicity from closure

### Zwarts (2005):

- (7) a. Alex drove *toward* the mountains/*along* the river \*in/for a day.  
b. Alex jumped *into* the water/*walked onto* the platform/*out of* the hotel in/\*for ten minutes.  
c. Alex ran *around* the lake/*through* the grass in/for one hour.

### Zwarts' classification:

- (8) **Atelic:** *toward, along*  
**Telic:** *to, into, onto, from, out of, off, away from, past, via*  
**Telic/atelic:** *around, across, down, over, through, up*

### Or using the progressive $\Rightarrow$ simple typology:

- (9) Dan was running *toward* the park  $\Rightarrow$  Dan ran toward the park.  
Dan was running *along* the river  $\Rightarrow$  Dan ran along the river.
- (10) Dan was running *to* the park  $\nRightarrow$  Dan ran to the park.  
Dan was jumping *into* the water  $\nRightarrow$  Dan jumped into the water.

Even if prepositions like *around*, *across* and *through* have an **atelic** reading in addition to a telic interpretation, their telic interpretation does not license such entailments:

- (11) Dan was running *around* the lake  $\nRightarrow$  Dan ran around the lake.  
Dan was running *across* the bridge  $\nRightarrow$  Dan ran across the bridge.  
Dan was running *through* the tunnel  $\nRightarrow$  Dan ran through the tunnel.

## ***Almost* with prepositions – expectations from Dowty’s generalization:**

1. *Almost* shows the S/C ambiguity with all telic prepositions.
2. *Almost P* is acceptable for all telic prepositions P.

### **English:**

(12) ?Dan ran almost to the park/around the lake/across the bridge/through the tunnel.

There may be some variation among speakers, but expectation 2 is not borne out: there are telic Ps that cannot be easily modified by *almost*, at least in certain dialects of English.

Moving on to expectation 1, there is a correlation between acceptability of *almost P* and availability of the S-interpretation for *almost VP*, where VP includes P:

(13) Dan almost ran to the lake.

C: “Dan almost started running to the lake/Dan moved to the lake by almost running”

S: ?“Dan ran and almost reached the lake”

(14) a. Dan almost ran around the lake. (C/?S)

b. Dan almost circled the lake. (C/S)

(15) a. Dan almost ran across the bridge. (C/?S)

b. Dan almost crossed the bridge. (C/S)

(16) Dan almost ran through the tunnel. (C/?S)

### **Hebrew:**

(17) a. ? dan rac kim@at la’agam.

Dan ran almost to-the-lake

“Dan ran almost to the lake” (?S)

b. dan rac kim@at @ad ha’agam.

Dan ran almost until the-lake

“Dan ran and almost reached the lake” (S)

(18) a. dan kim@at rac la’agam.

Dan almost ran to-the-lake

“Dan almost ran to the lake” (C/?S)

b. dan kim@at rac @ad ha'agam.

Dan almost ran until the-lake

Ambiguous (C/S) –

C: “Dan almost ran to the lake”

S: “Dan ran and almost reached the lake”

**Dutch** (Joost Zwarts, p.c.):

(19) a. Dan rende bijna naar het meer.

Dan ran almost to the lake

“Dan almost ran to the lake” (C)

b. Dan rende bijna tot (aan) het meer.

Dan ran almost until the lake

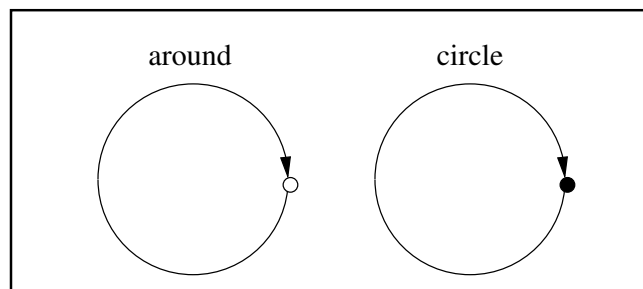
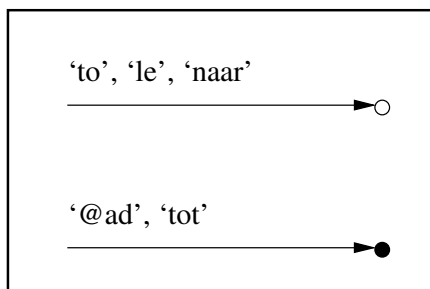
“Dan ran and almost reached the lake” (S)

**The basic proposal:** *‘Almost’ cross-categorially requires closed structures. Closed paths are telic, but not all telic paths are closed. Hence:*

1. *The unacceptability of almost P with a telic preposition P indicates an open spatial structure.*
2. *The unavailability of the S-interpretation with a telic/atelic predicate indicates an open aspectual structure.*

This follows Rotstein and Winter’s claim:

*The unacceptability of almost A with an adjective A indicates an open scalar structure.*



**Questions left to answer:**

1. Specify the mapping from scale/path structures to temporal-aspectual structures.
2. Formally characterize (a)telicity.
3. Establish that closure entails telicity.

### 3 *Almost*, adjectives and the telicity of deadjectival verbs

#### 3.1 *Almost* and the total/partial distinction

Cruse, Yoon (1996) and Rotstein & Winter (R&W) study pairs of *total-partial* adjectives:

(20) **Total-partial:** *dry-moist, clean-dirty, straight-bent/curved, smooth-rough, complete-incomplete*

Intuitively, partial adjectives indicate *some* amount of a relevant property (moisture, dirt, curvedness etc.), whereas the total adjectives indicate *no* amount of this property.

Other pairs of antonymous adjectives are called *relative*:

(21) **Relative:** *long-short, expensive-cheap, wide-narrow, high-low, big-small* etc.

Different out-of-the-blue behaviors with *almost* (Cruse and R&W):

(22) *almost dry/?moist, almost clean/?dirty, almost straight/?bent, almost smooth/?rough, almost complete/?incomplete*

(23) *almost ?long/?short, almost ?expensive/?cheap, etc.*

But Chris Kennedy (p.c. and 2005) points out that partial adjectives allow *almost* in contexts that specify a standard, similarly to relative adjectives:

(24) a. We need a rod that is bent in an angle of 90 degrees. Let's pick up that rod over there and bend it a little: it should be easy, as it's *almost bent* already.

b. We consider a glass dirty and wash it as soon as there are five spots on it. This glass is now *almost dirty* – it has four spots on it.

(25) a. We need a TALL basketball player – one whose height is at least 1.95 meters. But we cannot take John, who is 1.90 meters – he's just *almost tall*.

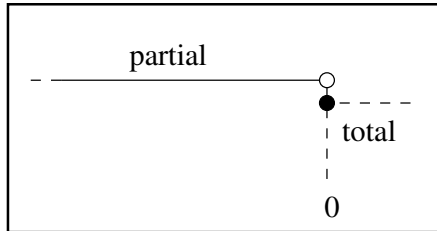
b. The publisher considers a book long if it's 300 pages or more. This book is *almost long* – it's 298 pages.

**R&W's three kinds of scale structures** (see also Kennedy and McNally 1999, Hay et al. 1999, Kennedy 2005):

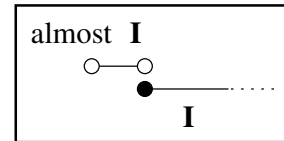
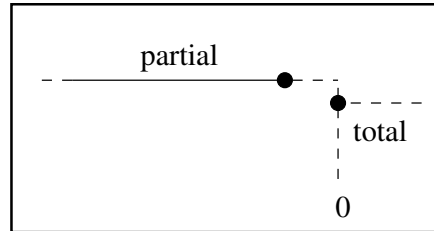
1. *Total scales*: the standard value is fixed on the zero degree and creates a *closed* interval.

2. *Partial scales*: the standard value's *default* is the zero degree, and creates an *open* interval. This default can be overridden by context, which can fix a standard and create a closed interval.
3. *Relative scales*: are like partial scales, but they lack a default standard. Without a context, their standard can be anywhere, and it creates an open interval.

default partial standard:



partial standard set by context:



**R&W's semantics of *almost***: The modifier *almost* requires that the interval *I* associated with an adjective *A* on the scale is closed from below. The interval associated with the adjectival phrase *almost A* is then a (short) open interval adjacent to *I*.

### 3.2 The telicity of deadjectival verbs

**Deadjectival (DA) verbs:**

- (26) **Total-partial DA verbs**: *dry-moisten, clean-dirty, straighten-bend/curve, smoothen-roughen*
- (27) **Relative DA verbs**: *lengthen-shorten, widen-narrow* etc.

Bertinetto and Squartini, Hay, Hay et al., among others, point out the relations between telicity and scale structure (at least in out-of-the-blue contexts).

**Telicity** ('*C*' denotes "entailment may be affected by context"):

- (28) a. Mary was drying the towel  $\not\Rightarrow$  Mary dried the towel  
 b. Mary was moistening the towel  $\stackrel{C}{\Rightarrow}$  Mary moistened the towel
- (29) a. John was cleaning the room  $\not\Rightarrow$  John cleaned the room  
 b. John was dirtying the room  $\stackrel{C}{\Rightarrow}$  John dirtied the room
- (30) a. Jane was lengthening the rope  $\stackrel{C}{\Rightarrow}$  Jane lengthened the rope  
 b. Jane was shortening the rope  $\stackrel{C}{\Rightarrow}$  Jane shortened the rope

### Entailment of adjective:

- (31) a. Mary has dried the towel  $\Rightarrow$  The towel is dry  
b. Mary has moistened the towel  $\stackrel{C?}{\Rightarrow}$  The towel is moist
- (32) a. John has cleaned the room  $\Rightarrow$  The room is clean  
b. John has dirtied the room  $\stackrel{C?}{\Rightarrow}$  The room is dirty
- (33) a. Jane has lengthened the rope  $\nrightarrow$  The rope is long  
b. Jane has shortened the rope  $\stackrel{C?}{\nrightarrow}$  The rope is short

### Contextual (C) effects – examples:

- (34) The tailor was lengthening my pants  $\nrightarrow$  The tailor lengthened my pants  
(Hay et al.)
- (35) We normally consider the room dirty only when the floor is already completely covered with papers:  
John was dirtying the room  $\nrightarrow$  John dirtied the room

### Summary of observations:

- (i) *Without contextual information, total DA verbs are telic whereas partial and relative DA verbs are atelic.*
- (ii) *Without contextual information, total and partial DA verbs entail the respective adjective, whereas relative DA verbs do not.*
- (iii) *Contextual information can override (i): the atelicity of partial and relative DA verbs, but not the telicity of total DA verbs.*

I hypothesize that context can also override (ii) for partial and relative adjectives/DA verbs, but I don't have clear-cut examples.

**Digression on *in/for* adverbials** – as Dowty noted, these adverbials can blur telicity distinctions:

- (36) a. Mary dried the towel *for two hours*  $\nrightarrow$  The towel became dry  
b. Mary moistened/lengthened the towel *in two hours*  $\Rightarrow$  Sometime before the end of the two hours, the towel was *almost moist/long*

This implies that:



- *for* adverbials can turn a telic predicate into an atelic predicate;
- *in* adverbials can turn an atelic predicate into a telic predicate.

Hence, we'll concentrate on the progressive  $\Rightarrow$  simple typology.

### 3.3 Mapping scales to temporal structures

**Informally:** a deadjectival verb is associated with intervals that describe:

- *progress* along the scale of the corresponding adjective;
- *culmination* – at the end of each such interval, the degree attained is within the set of degrees associated with the adjective, if a given standard value specifies such a set.

**For example** (without contextual information):

*straightening*: from a positive degree of curvedness to zero curvedness.

*bending*: from any degree  $d_1$  of curvedness to a higher and positive degree  $d_2 > d_1$ .

*lengthening*: from any degree  $d_1$  of length to a higher degree  $d_2 > d_1$ .

**Formally – the A-V mapping:**

Let  $S_{\leq}$  be a scale – an ordered set of degrees. Consider an adjective that is associated with  $S_{\leq}$ , with a function  $A$  and (optionally) with a set of degrees  $D \subseteq S$  such that:

$A : (E \times T) \rightarrow S$  is a function from pairs of entities and temporal instants to degrees in  $S$ ;

$d \in S$  is an optional standard value in  $S$ ;

$D = \{d' \in S : d \leq d'\}$  (a closed interval) or  $D = \{d' \in S : d < d'\}$  (an open interval).

Then the corresponding deadjectival verb denotes a function  $V_{A,D}$  from entities in  $E$  to sets of temporal intervals in  $T$ , s.t. for every entity  $x \in E$ , for every interval  $I$  in the set of intervals  $V_{A,D}(x)$ , the following two conditions hold:

**Progress:**  $A(x, \inf(I)) < A(x, \sup(I))$ ;

**Culmination:** *If a standard  $d$  is given, then  $A(x, \text{sup}(I)) \in D$ .*

**Remark:** something similar can probably be defined for aspectual-temporal structures using events.

**Account of observations (ii) and (iii):**

- (ii) *Without contextual information, total and partial DA verbs entail the respective adjective, whereas relative DA verbs do not.*
  - follows from ‘culmination’ and R&W’s assumption about the lack of default standard for relative adjectives – for such adjectives the standard value is arbitrary, and without contextual information it does not affect the interpretation of the DA verb.
- (iii) *Contextual information can override the atelicity of partial and relative DA verbs, but not the telicity of total DA verbs;*
  - follows from the account (below) of observation (i), and our assumption concerning closure properties of (relative/partial) adjectives with a non-default standard.

## 4 Weak downward monotonicity and telicity

### 4.1 Weak downward monotonicity

**Bennett and Partee’s subinterval definition of atelicity and the Sorites Paradox:**

*Let  $\mathcal{I}$  be the (open and closed) intervals over  $\mathbf{R}$ . A set  $\mathcal{J} \subseteq \mathcal{I}$  has the **subinterval property** iff it is downward monotone in  $\mathcal{I}$  – for every  $I' \subseteq I \in \mathcal{I}$ , if  $I \in \mathcal{J}$  then  $I' \in \mathcal{J}$ .*

(37) John walked between 2:00 and 4:00.

⇒ John walked between 2:01 and 3:59.

⇒<sup>?</sup> John walked between 2:38 and 2:39.

(38) A digital camera that costs \$4,000 is expensive.

⇒ A digital camera that costs \$3,999 is expensive.

⇒<sup>?</sup> A digital camera that costs \$39 is expensive.

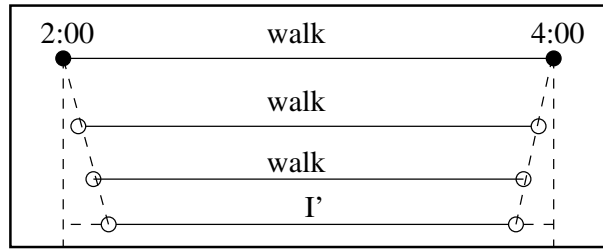
**Alternative characteristic of atelicity – weak downward monotonicity ( $WM\downarrow$ ):**

No downward monotonicity as in the subinterval property of Bennett and Partee. But atelic predicates do allow *approximation* while going downward:

(39) John walked between 2:00 and 4:00.

$\Rightarrow$  There is a proper subinterval  $I'$  of  $[2:00,4:00]$  such that John walked in all the subintervals  $I''$  that satisfy  $I' \subset I'' \subseteq [2:00,4:00]$ .

How much smaller than  $[2:00,4:00]$  the interval  $I'$  can be is determined by context.



### A possible approach to Sorites in general:

(40) A digital camera that costs \$4,000 is expensive.

$\Rightarrow$  There is a price  $p'$  lower than \$4,000 such that for all prices  $p''$  s.t.  $p' < p'' \leq \$4,000$ : a camera that costs  $p''$  is expensive.

How much lower than \$4,000 the price  $p'$  can be is determined by context.

**Formally:** Let  $\mathcal{I}$  be the (open and closed) intervals over  $\mathbf{R}$ . A set  $\mathcal{J} \subseteq \mathcal{I}$  is weakly downward monotone ( $WM\downarrow$ ) iff for every  $I \in \mathcal{J}$  there is  $I' \in \mathcal{I}$  s.t.  $I'$  is properly within<sup>1</sup>  $I$ , and for every  $I'' \in \mathcal{I}$ : if  $I' \subset I'' \subseteq I$  then  $I'' \in \mathcal{J}$ .

## 4.2 Scale closure and telicity

**Hypothesis (H):** Atelic predicates are  $WM\downarrow$ . Telic predicates are not  $WM\downarrow$ .

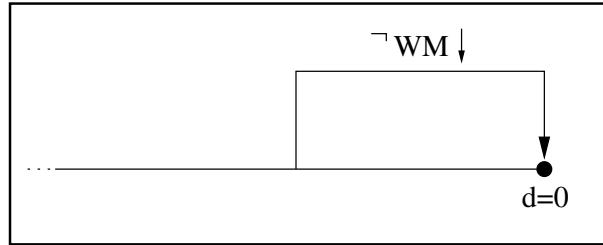
**Fact (F):** Let  $S_{\leq}$  be a scale, and let  $D \subseteq S$  be a set of degrees on  $S$ .

- If  $D$  is open then the predicate over intervals  $V_{A,D}(x)$  is  $WM\downarrow$  for any function  $A$  and entity  $x$ .
- If  $D$  is closed then there is a function  $A$  and entity  $x$  for which the predicate  $V_{A,D}(x)$  is not  $WM\downarrow$ .

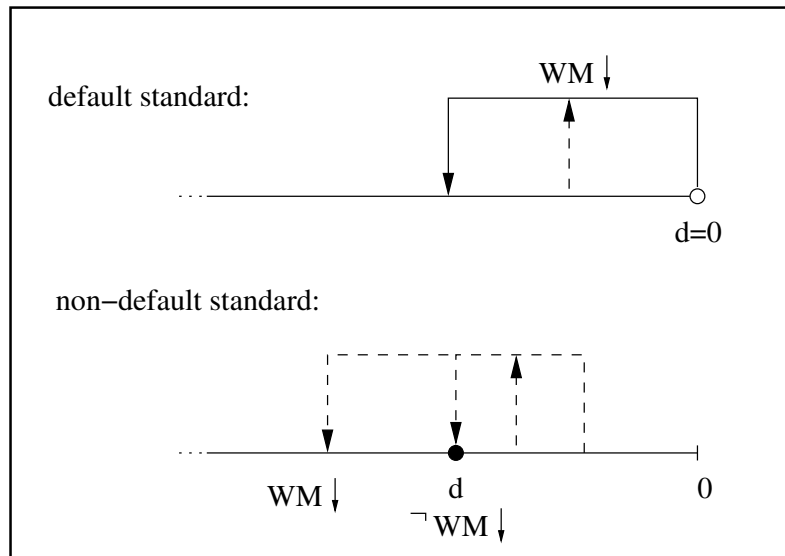
**H and F together account for observation (i) about the relations between closure and telicity.**

<sup>1</sup> $I'$  is properly within  $I$  iff  $\supremum(I') < \supremum(I)$  and  $\infimum(I') > \infimum(I)$ .

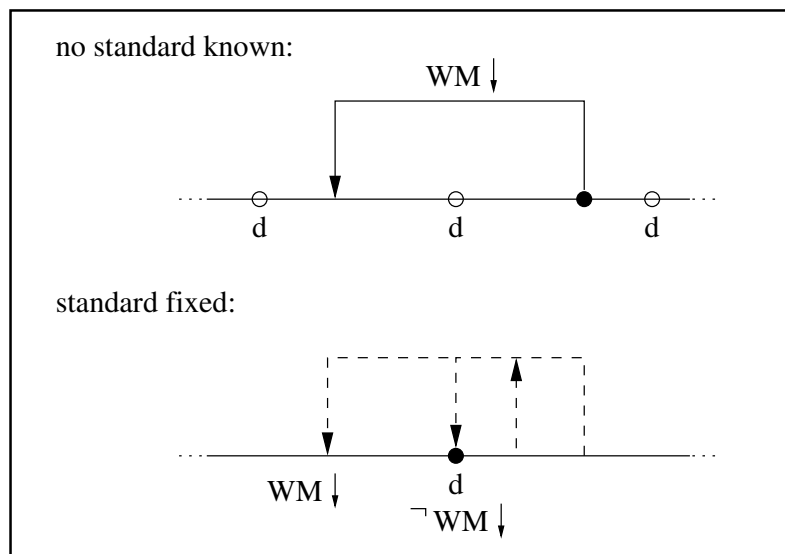
**Total** (e.g. *straighten*):



**Partial** (e.g. *bend*):



**Relative** (e.g. *lengthen*):



### 4.3 Path closure and telicity (informally)

*circled the lake*: associated with a *unique and closed* path.

closed path  $\Rightarrow$  S-interpretation of *almost*

uniqueness of path  $\Rightarrow \neg WM\downarrow \Rightarrow$  telic

*ran around the lake*: associated with a *unique and open* path.

open path  $\Rightarrow$  no S-interpretation of *almost*

uniqueness of path  $\Rightarrow \neg WM\downarrow \Rightarrow$  telic

#### By contrast:

*bent/lengthened the rope*: associated with a *continuous set* of open intervals.

open intervals  $\Rightarrow$  no S-interpretation of *almost*

continuity of the set of intervals  $\Rightarrow WM\downarrow \Rightarrow$  atelic

## 5 Summary

1. closure  $\Rightarrow$  acceptability of *almost* modification
2. closed structure  $\Rightarrow$  telicity; open structure  $\not\Rightarrow$  atelicity.
3. Mapping adjectives to verbs: progress, and, when a standard is given, also culmination.
4. Weak downward monotonicity as the relevant characteristic of atelicity.

## 6 Appendix: is total=pointal?

**Cruse 1986, Kennedy 2005**: Total adjectives – *dry, clean, straight* – are associated with only one degree on the scale – the minimum degree of moisture, dirtiness, curvedness, respectively.

**Rotstein and Winter**: Total adjectives are associated by default with the zero point on the scale, but also lower, negative, degrees for total adjectives are useful in some contexts.

- (41) This room is always very clean, but today they have decided to make it exceptionally clean for the fussy guests they have.
- (42) The sky was clear yesterday, but today it's completely clear.
- (43) Both rods are straight, but not equally straight.

- (44) Both towels are dry, but the blue towel is drier.
- (45) His opinions are extreme, but his wife's views are even more extreme.
- (46) Overall your explanation is clear, but it could become clearer with a few more examples.

This may show that Kennedy's assumption about the validity of the following entailment does not always hold:

- (47) A is more *total* than B  $\Rightarrow$  B is not *total*

**The controversy also bears on the adjective entailment of total DA verbs:**

- (48) a. The corn dried in the fields *for two days*, but it was not *completely* dry when a cloudburst soaked it again. (Declerck 1979)  
 b. ?The corn dried in the fields, but it was not dry when a cloudburst soaked it again.
- (49) a. I straightened the rope, but not completely. (Hay et al.)  
 b. ?I straightened the rope, but it isn't straight.
- (50) a. The room quietened in a few minutes but it wasn't completely quiet.  
 b. ?The room quietened in a few minutes but it wasn't quiet.  
 (Kearns)

If *total=completely total*, the contrasts are not accounted for.

**Two ways to go:**

1. Substantiate Kennedy's/Hay et al.'s assumptions about "totality" implicatures with total adjectives and *completely*.
2. Follow R&W's assumption that total adjectives do not need to be pointal.

Our explanation is consistent with option 2.

**References**

Amaral, P. (2006). On the semantics of *almost*. Paper presented at the LSA. January 2006.

Bennett, M. and Partee, B. (2003). Toward the logic of tense and aspect in English. In Partee, B., editor, *Compositionality in Formal Semantics: Selected Papers of Barbara Partee*. Blackwell, Oxford. reprinted from an unpublished 1972 article, distributed in 1978 by Indiana University Linguistics Club.

- Bertinetto, P. and Squartini, M. (1995). An attempt at defining the class of ‘gradual completion’ verbs. In Bertinetto, P., Bianchi, V., Higginbotham, J., and Squartini, M., editors, *Temporal Reference Aspect and Actionality I: Semantic and Syntactic Perspectives*. Rosenberg and Sellier, Torino.
- Borik, O. (2002). *Aspect and Reference Time*. PhD thesis, Utrecht University.
- Cruse, D. A. (1986). *Lexical Semantics*. Cambridge University Press, Cambridge.
- Declerck, R. (1979). Aspect and the bounded/unbounded (telic/atelic) distinction. *Linguistics*, 17:761–794.
- Dowty, D. (1979). *Word Meaning and Montague Grammar: the semantics of verbs and times in Generative Semantics and in Montague’s PTQ*. D. Reidel, Dordrecht.
- Hay, J. (1998). The non-uniformity of degree achievements. Paper presented at the LSA. January 1998.
- Hay, J., Kennedy, C., and Levin, B. (1999). Scalar structure underlies telicity in ‘degree achievements’. In *Proceedings of Semantics and Linguistic Theory, SALT9*.
- Hitzenman, J. (1992). The selectional properties and entailments of *almost*. In *Papers from the 28th regional meeting of the Chicago Linguistic Society, CLS25*.
- Kearns, K. (2005). Telic senses of deadjectival verbs. To appear in *Lingua*.
- Kennedy, C. (2005). Vagueness and grammar: the semantics of relative and absolute gradable predicates. Unpublished ms., University of Chicago. To appear in *Linguistics and Philosophy*.
- Kennedy, C. and McNally, L. (1999). From event structure to scale structure: degree modification in deverbal adjectives. In *Proceedings of Semantics and Linguistic Theory, SALT9*.
- Krifka, M. (1989). Nominal reference, temporal constitution and quantification in event semantics. In Bartsch, R., van Benthem, J., and van Emde Boas, P., editors, *Semantics and Contextual Expression*. Foris, Dordrecht.
- Morzycki, M. (2001). *Almost* and its kin, across categories. In *Proceedings of Semantics and Linguistic Theory, SALT11*.
- Rapp, I. and von Stechow, A. (1999). Fast ‘almost’ and the visibility parameter for functional adverbs. *Journal of Semantics*, 16.2:149–204.
- Reinhart, T. (1986). States, events and reference time. Unpublished handout of lecture given at the MIT lexicon project.
- Rotstein, C. and Winter, Y. (2004). Total adjectives vs. partial adjectives: scale structure and higher-order modification. *Natural Language Semantics*, 12:259–288.
- Verkuyl, H. (1971). *On the Compositional Nature of the Aspects*. PhD thesis, Utrecht University.
- Yoon, Y. (1996). Total and partial predicates and the weak and strong interpretations. *Natural Language Semantics*, 4:217–236.
- Zwarts, J. (2005). Prepositional aspect and the algebra of paths. *Linguistics and Philosophy*, 28.6:739–779.