Paths*

Gillian Ramchand, UiTø/CASTL (gillian.ramchand@uit.no)

GLOW 36, University of Lund, April 3 2013

1 Introduction: The Semantics of Scalarity and Gradability

"This paper attempts to generalize the approach that was developed for cases like *eat the apple* to other cases, in particular, predicates that express movement in space, ... or predicates that express changes of properties..."
Krifka (1998)

"I want to claim that event structure follows from a more basic and more general property of events, *event shape*. The shape of an event is the trajectory of contour that is associated to that event in space or in a scalar or conceptual domain."
Zwarts (2006)

"Gradability is a fundamentally important semantic property, whose influence extends beyond adjectives to other lexical categories."
Kennedy and McNally (2005)

We can formalize the algebraic properties of paths, independent of the particular sortal domain (most relevantly, times, locations, properties.)

Terminology
A PATH can be modeled as a continuous function from a real interval [0,1] to temporal/spatial/property-scale points. If $\mathbf{p}$ is such a function, then $\mathbf{p}(0)$ is the starting point of the path, $\mathbf{p}(1)$ is its end point, and for every index i between 0 and 1, $\mathbf{p}(i)$ is an intermediate point. In this way, a PATH corresponds roughly to a sequence of positions.
(definition taken from Zwarts 2006)

Over the set of paths, we can define a sub-path relation $\leq$, a concatenation operation $+$ (which is partial), and a reversal operation $\neg$.
Cumulative PATHS are those which are closed under concatenation. In the temporal domain

---

this corresponds atelicity. It is fashionable to use cumulativity as a cross-categorial notion, defining mass quantities in the nominal domain, and atelicity in the verbal aktionsartal domain. Cumulativity also applies to spatial paths, distinguishing unbounded from bounded trajectories.
(Krifka 1992, Krifka 1998,)
Within the domain of property scales, open intervals are distinguished from closed intervals (Kennedy 1999, Kennedy and McNally 2005)

The abstract PATHS corresponding to different categories interact in semantically predictable and systematic ways when in close syntactic relationship, often via some kind of homomorphism: VP telicity is affected by the boundedness or quantizedness of the direct object for a certain class of verbs (Verkuyl 1972, Krifka 1992); VP telicity is affected by the cumulativity of the PP in complement position to the verb (Zwarts 2005); the telicity/boundedness of a deadjectival VP is determined by the boundedness of the scale of the underlying adjectival property (Hay et al. 1999).
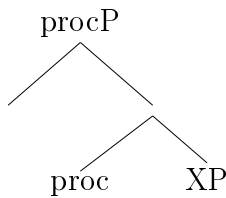
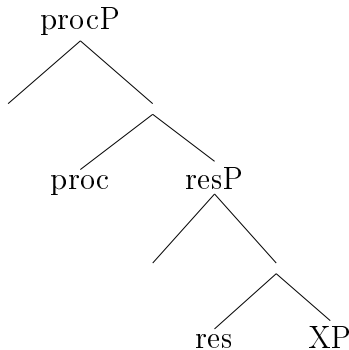# 2 The Mapping to Syntax

2.1 The Internal Structure of V

Hypothesis from Ramchand (2008)
VPs (ignoring the initiation component) can be decomposed into process and result portions, giving two types of dynamic event, and one pure stative possibility.
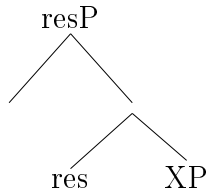
(1) *A. Activity Verb*

(2) *B. Accomplishment/Achievement Verb*

(3) *C. Stative Verb*

```
        resP
        /\
       /  \
      /\
     /  \
   res    XP
```

The way event shape is analyzed here, there is assumed to be a discrete break between process and result sub events. This is different from a more continuous notion, where telicity is aligned with the failure of closure under mereological sum formation. Actually, these notions are different. The *again* test of von Stechow (1996), Beck and Johnson (2002), is a test for small clause subevents.

(4) (a) Kayleigh danced again (repetitive)
(b) Kayleigh pushed the cart again (repetitive)
(c) Kayleigh read the book again (repetitive)
(d) Kayleigh walked the trail again (repetitive)
(e) Kayleigh opened the door again (repetitive/restitutive)
(f) Kayleigh broke the stick again (repetitive/restitutive)
(g) Kayleigh put the book down again. (repetitive/restitutive)

(5) John pushed the cart over again. (repetitive *and* restitutive)
Mary clawed the box open again. (repetitive and restitutive)

Notice that this notion of process-result complexity is a stronger notion than cumulatively. A verb phrase like *read the book* (on the 'read the whole book' reading) comes out as non-cumulative, but it does not seem to have resultative substructure.

## 2.2   The Internal Structure of P

From Zwarts (2005):

(6) *How directional prepositions relate paths to locations*:

		'at'	'in'	'on'	'above'
source prepositions	$\mathbf{p}(0)$	from	out of	off	
goal prepositions	$\mathbf{p}(1)$	to	into	onto	
route prepositions	$\mathbf{p}(i)$	via/past	through	across, over	over

For Zwarts prepositional path cumulativity cuts across the three categories of directional prepositions. In addition, for Zwarts, relating paths to locations reflects the logic of semantic composition, but does not correspond directly to a syntactic decomposition of path over place. Syntactic work on the decomposition of PP, however, uses the logic of semantic composition, combined with evidence from morphological typology to argue for a Path projection dominating a Place projection in the syntax (Koopman 2000, van Riemsdijk 1990, Svenonius 2010, Kracht 2002). In languages where distinctive morphology is found, the place morpheme is always closer to the root than path morphology (cf. Svenonius (2010), Kracht (2002)). Thus, we get decompositions such as the following.

(7) STANDARD DECOMPOSITION

P$_{path}$P

P$_{path}$
(TO/FROM/VIA)

P$_{loc}$P
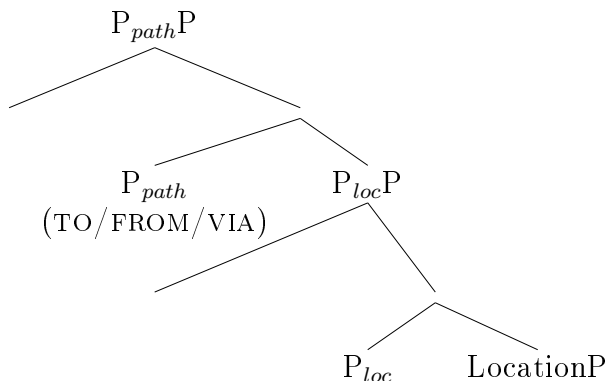
P$_{loc}$ LocationP

P$_{loc}$P expresses a spatial relationship to an atomic location. The construction of paths refers to the building up of a complex location consisting of an ordered set of atomic locations. P$_{path}$P: P$_{loc}$P can further now optionally combine with a P$_{path}$ head which constructs an ordered set of locations based on P$_{loc}$ and applies it to the FIGURE.

In this decomposition, having P$_{path}$ over P$_{loc}$ does not create quantizedness necessarily, it just reflects the logic of compositionality. So, in the P domain, quantizedness is defined holistically and mereologically and no independent distinction is made between the decompositions that build in a discrete transition to final location into the decomposition and those that do not.[1]

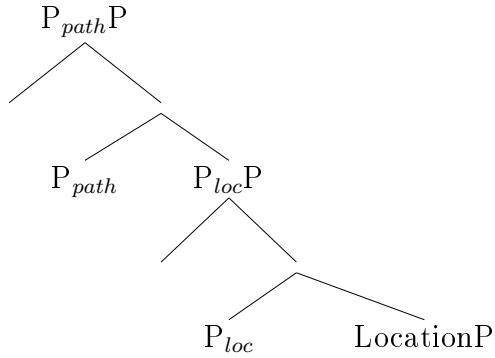# 3 P and V are Syntactically and Semantically Commensurable

There are some reasons to suspect that P and V are actually speaking the same language. In Zwarts (2006), it is proposed that all events have some kind of sequential 'location' . After Rothstein (2004), he assumes that if two events are spatiotemporally adjacent, then they can be concatenated into a 'singular' event. TRACE in the formula below is a homomorphism from events to paths that preserves concatenative structure.

(8) [[V PP]] = { e ∈ [[V]] : TRACE(e) ∈ [[PP]]

(9) (a) John ran. (atelic)
    (b) John ran through the woods (atelic V + cumulative PP = atelic VP)
    (c) John ran to the store/into the woods (atelic V + quantized PP = telic VP)

---

[1]In addition, the complement of P$_{loc}$ is also itself complex and must denote a locational sort ℓ rather than an entity e. I label this LocationP to distinguish it from DP which denotes in the domain of entities. It corresponds most closely to AxpartP in Svenonius's work, or PlaceP in Kayne's work). Crucially, the Loc head is a type-shifter in this decomposition and not a relator, like P$_{loc}$.

(10)   *B. Closed $P_{path}P$*   *B. Accomplishment/Achievement*

$P_{path}P$ procP

P_{path} $P_{loc}P$ proc   resP

P_{loc} LocationP   res   XP
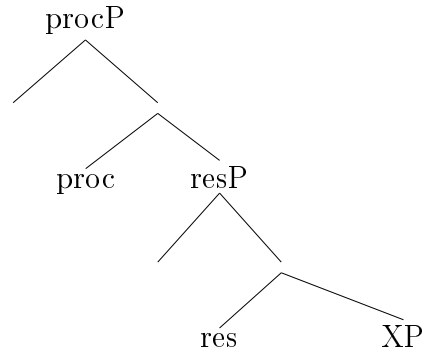
(11)   Acccomplishment PP   Accomplishment/Achievement VP
        . . . into the woods.   . . . enter the room
   . . . to the store.   write the dissertation.

As in the VP domain, the embedding relation is interpreted as 'leads-to', giving resultativity for the VP decomposition and TO-Path in the $P_{path}P$ decomposition.[2]

VIA-PATHS on the other hand would be the analogue of Activity verbs, which do not embed a result location, but construct the path directly from the Ground object.

(12)   *A. Open PathP*   *A. Activity Verb*

$P_{path}P$ procP

P_{path} LocationP   proc   XP
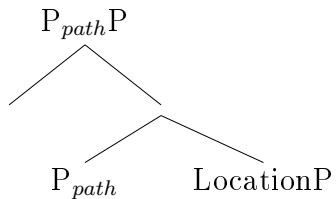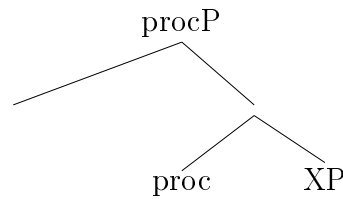
(13)   Activity PP   Activity VP
        . . . through the garden.   . . . dance a tango
        . . . along the river   . . . walk the streets

---

[2]Source Paths have a more complicated structure, and do not form a homogeneous class. In some cases, we would argue that they involve a simple GOAL-PATH structure embedded under a reversative head, as in Pantcheva (2011). In the case of *out*, the reversative head is probably more static, reversing the vectors defining an inner locational space to create the negative counterpart of that space. This in turn can be embedded under a GOAL-PATH in the accomplishment way. Still other so-called source paths might be simple P_{path} heads without $P_{loc}P$ substructure at all. It is well known that crosslinguistically Goal Paths are more salient and easier to acquire than Source Paths. I take this to be a result of the primacy of the leads-to combinatorics that creates them. Detailed discussion of Source vs. Goal is beyond the scope of this paper.

So which view is correct? Can we show that THROUGH-PATHS differ from GOAL-PATHS in not embedding $P_{loc}P$ substructure? Let us apply the *again* test from Beck and Johnson (2002) (from von Stechow 1996)

(14) (a) John pushed the cart into the woods again (repetitive/restitutive)
    (b) John pushed the cart through the garden again (repetitive)

Thus, in addition to the P_{path} combining with $P_{loc}P$ to create a derived Path based on a location, we also allow P_{path} to combine directly with a LocationP.

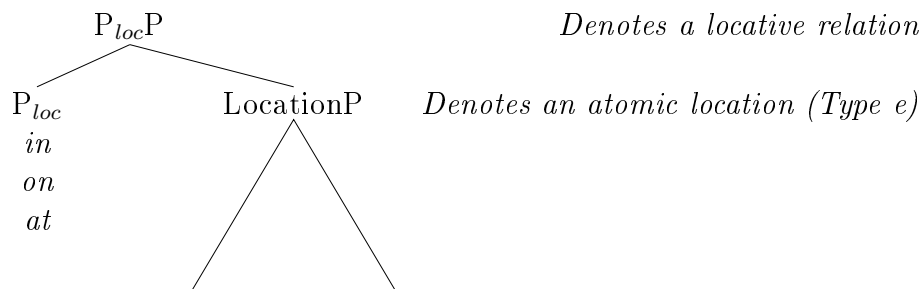## 3.1 Modified Typology of P in English

In what follows, I will assume that the best test for determining whether a PP is a $P_{path}P$ or $P_{loc}P$ in English is whether it gives rise to locational or directed motion interpretations under non-inherently directed verbs of motion such as *dance* (cf. Higginbotham 2001).

3.1.1 Simple Locations

(15) **Located Motion Reading**:
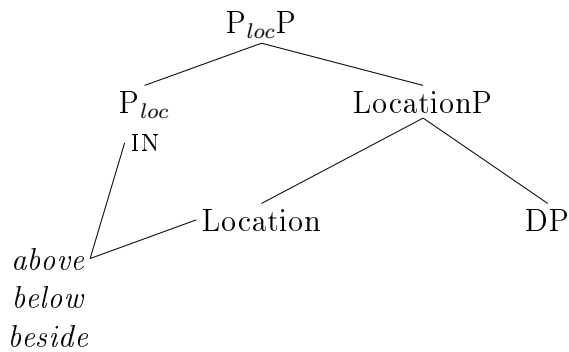   John danced   in the room
                  on the table.
                  at the party.
                  above the surface of the water.
                  below the table.
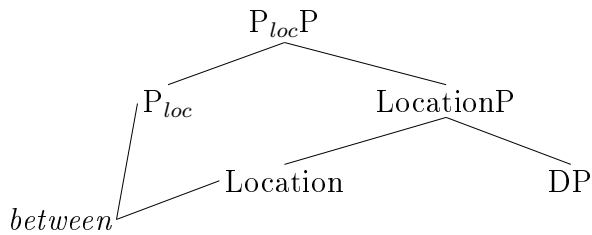   beside the table.
                  between the trees.

(16) SIMPLE ATOMIC LOCATIONS (A)

$$P_{loc}P$$

P_{loc} LocationP
in
on
at

Denotes a locative relation

Denotes an atomic location (Type e)

(17) Simple Atomic Locations (b)

P$_{loc}$P
P$_{loc}$ IN LocationP
above / below / beside Location DP

(18) Simple Atomic Locations (c)

P$_{loc}$P
P$_{loc}$ LocationP
between Location DP
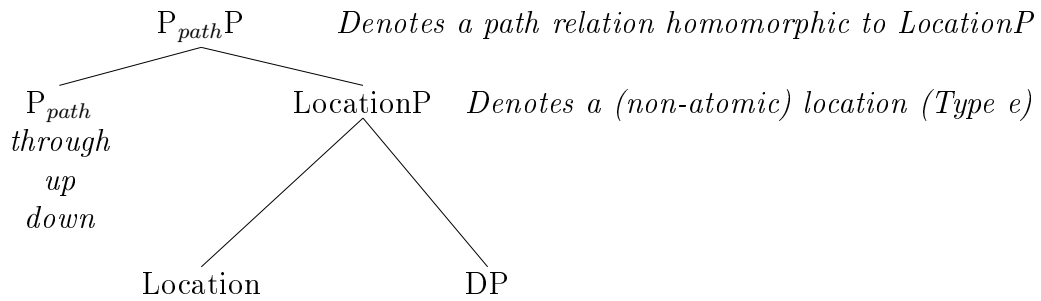
3.1.2 Simple Paths

(19) **Directed Motion Reading**:
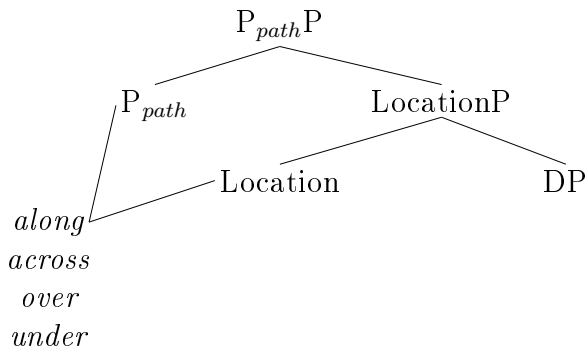
John danced through the streets
     along the river.
     across the field.
     up the street.
     down the street.
     over the bridge.
     under the bridge.[3]

In all of these cases, the sentences above with *again* modification only get the repetitive reading and not the restitutive reading.

(20) SIMPLE PATHS (A)

P$_{path}$P   *Denotes a path relation homomorphic to LocationP*

P$_{path}$ LocationP   *Denotes a (non-atomic) location (Type e)*
through
up
down

Location   DP

(21) SIMPLE PATHS (B)

P$_{path}$P

P$_{path}$ LocationP

Location   DP

along
across
over
under

3.1.3   Complex Paths

(22) **Directed Motion Reading**:
John danced   to the river
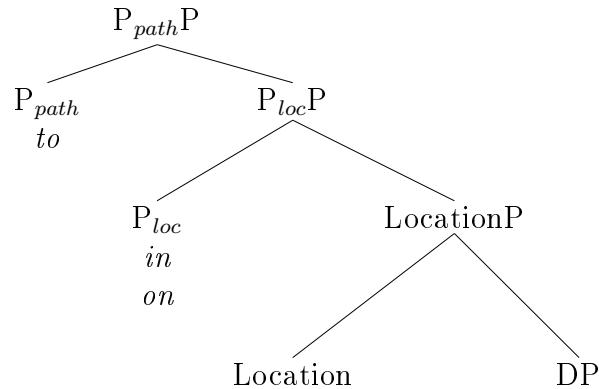   into the cave.
                   onto the platform.

Here the *again* test gives both a restitutive and a repetitive reading.

(23) COMPLEX PATHS (A)

P$_{path}$P   *Path relation leading to P$_{loc}$P relation*

P$_{path}$ P$_{loc}$P   *Locative relation*

P$_{loc}$ LocationP   *Denotes (atomic) location (type e)*
to   AT

Location   DP

8

(24) COMPLEX PATHS (B)

$$P_{path}P$$

P_{path} — P_{loc}P
to
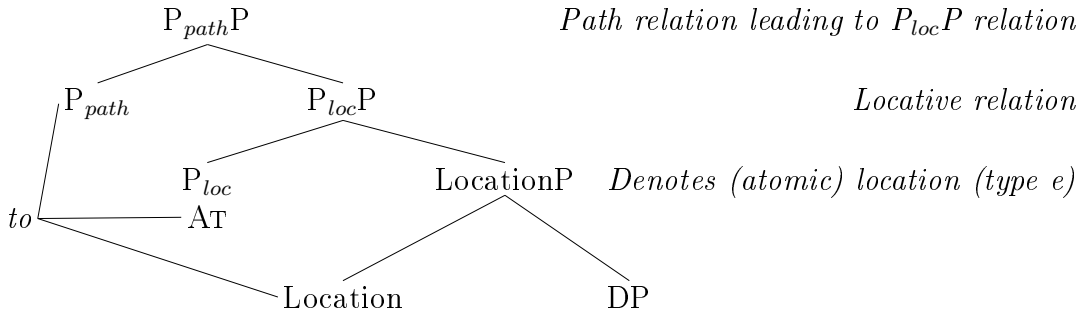
P_{loc} — LocationP
in
on

Location — DP

3.1.4 Another Type of Complex Path

Another important way of getting static locations out of pathPs is to create a Cresswellian location, as Svenonius has argued, via a G head which picks out the location 'at the end of an imagined journey along the path'. I assume with Svenonius that this is a P_{loc}, but that is it not simple in the sense that it is actually derived from P_{path} substructure.

(25) (a) The post office is just over the hill.
     (b) The band was playing across the field.

(26)

$$P_{loc}P$$

P_{loc} — P_{path}P
G
'end of a journey'
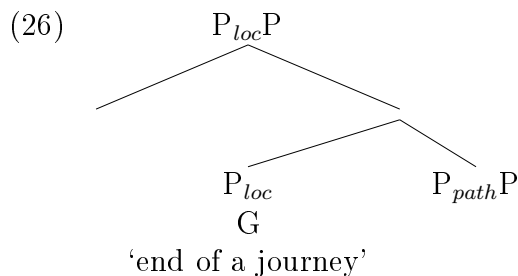
The Cresswellian paths can also then be added to result verbs, to specify a final location for the result.

In addition, many VIA-PATHS in English can also get a coerced GOAL-PATH reading, in cases where the end of the *via-path* is a conventionally salient location, and especially when the verb itself has resultative substructure. In these cases, I *would* assume that there is predicational substructure in the PP.

(27) (a) John walked through the tunnel again. (repetitive and restitutive of *final* location)

NB: The shift to a scale denoting in the domain of properties does not stop the PP so formed from combining reliably aspectually with a V to give a telic predication under homomorphism.

(28) John sank into despair again.

Further, the category of particles, gives another example of items which modify VPs and PPs equally, adding directional information to both kinds of path.

(29) (a) John pushed the cart over./John pushed over the cart.
     (b) John pushed the cart over into the hole.
     (c) Mary rode the bike down towards the sea.
     (d) May pressed the stickers down./Mary pressed down the stickers.

Taking Stock:
-The fact that crosslinguistically, Vs and Ps combine to jointly determine a VP path with fluid boundaries for division of labour also seems to indicate that V and P are lexicalizing the same kinds of Path notions.[4]

4   Adjectives and Scalar Structure

The Kamp (1975) and Klein (1980) version of adjective denotation has the normal property denotation, with scalar structure in the cognitive structuring of the domain of properties that allows the language user to partition the property into a positive extension and a negative extension, which are contextually variable.

(30) [['Expensive'(x)]] ^{c} = 1 iff x is in the positive extension of 'Expensive' in c.
     [['Expensive'(x)]] ^{c} = 0 iff x is in the negative extension of 'Expensive' in c.
     [['Expensive'(x)]] ^{c} is undefined otherwise.

The denotation in Kennedy (1999) however, reifies the notion of scale and in particular, a variable for *degrees* on a scale, and gives the following denotation for an adjective such as *expensive*.

(31) [[expensive]] = $\lambda d \lambda x$. [expensive(x) = d]

To be of the right type to predicate over an individual, an adjective must combine with an abstract head called *pos*, which determines the contextual value for the degree standard above which the entity qualifies as being 'expensive' in a context.

(32) [[pos]] = $\lambda G \lambda x \exists d$[standard(d)(G)(c) & G(d)(x)]

At least according to Kennedy (1999) and subsequent work, underlying scales are indeed part of the core meaning of all adjectives. In particular, Kennedy and McNally (2005) argue that the scales underlying adjectival denotations come in four main types (where R is an ordering relation and Δ is a dimension).

---

[4]Crosslinguistically, we also find differences in tendencies in division of labour between V and P: classic Verb framed vs. Satellite framed languages differ with respect to whether the verb usually lexicalizes PATH notions itself, or whether it relies on other satellites (often in the P domain) to do so.(Talmy 1985). The very possibility of this kind of variation is underwritten by the commensurability of the types of scales that P and V denote.

(33) (a) $< D_{(0,1)}$, R, $\Delta >$ TOTALLY OPEN
     (b) $< D_{[0,1)}$, R, $\Delta >$ LOWER CLOSED
     (c) $< D_{(0,1]}$, R, $\Delta >$ UPPER CLOSED
     (d) $< D_{[0,1]}$, R, $\Delta >$ TOTALLY CLOSED

K & McN use modificational diagnostics to distinguish the different types. Here are some examples of the classification. (NB: The diagnostics do not always give sharp results in all cases).

totally open: *short/long*
upper closed: *safe/dangerous*
lower closed: *loud/quiet*
totally closed: *empty/full*

Note that there are generalizations about the relative vs. absolute nature of the adjective and the nature of the scale. As well as generalizations about complementarity and the nature of the scale.

GeneralizationI: Closed scales give rise to absolute interpretations.
Generalization II: Open scales give rise to relative interpretations.
Generalization III: If two antonymic adjectives have relative standards, you never get perfect complementarity.

Kennedy and McNally take the underlying scale to be part of the core meaning of all positive adjectives (in addition to absolute vs. relative). They can explain generalizations II and III, but not generalization I.

In addiition, a distinction is often made between 'partial' and 'total' adjectives. (Cruse (1980), Yoon 1996 Rotstein and Winter 2004).

(34) (a) Are the toys dirty ? (yes, if some of them are dirty): *partial*
     (b) Are the toys clean? (yes means they are all clean) : *total*

Partial adjectives: 'minimum standard' (lower closed) according to Kennedy and McNally
Total adjectives: 'maximum standard' (upper closed)
Absolute vs. relative adjectives include lexical information that ensures that their standards are fixed appropriately in the positive form. Kennedy decomposes even the absolute standard adjectives because they *can* be compared via comparative morphology.

4.1 Commensurability of V and A?

For Kennedy (1999), scales are commensurable if they can be compared, indicating they inhabit the same 'dimension'. I will be using the term in a related but more specifically linguistic way: scales are commensurable if they can co-describe the same event.
We have already seen that PPs and Vs can co-describe the same motion event.

If APs behaved like PPs, then open scale adjectives would give rise to atelic property changes, and closed scale adjectives would give rise to relic property changes. However, according to Wechsler (2001) only closed scale adjectives (and non-gradable adjectives) form adjectival resultatives easily at all. And then the result is always telic. The *again* test with adjectival resultatives shows uniformly ambiguous behaviour.

(35) (a) Mary shot Bill dead.
  (b) The puddle froze solid/*slippery/*dangerous.
  (c) The coach trained his players *tired.
  (d) John wiped it clean/dry/smooth/*dirty/*wet/*stained.

In fact, adjectival resultatives denote a stative final property; they do not contribute a property scale of change.

(36) (a) John washed the table clean.
  Doesn't mean he washed it cleaner and cleaner
  (b) John showered clean.
  Doesn't mean he showered cleaner and cleaner
  (c) John danced warm.
  Doesn't mean that he danced himself warmer and warmer.

(37) **Testing AP Modification with** *again*
  (a) John washed his shirt for hours in the washing machine.
  (b) John washed his shirt again. (*repetitive only*)
  (c) John washed his shirt clean again. (*repetitive and restitutive*).

What this shows is that gradability is not required for adjectival secondary predication, with nongradable and absolute standard adjectives preferred, and the telicity of the result does not track the scale of the adjective.

The claim in Hay et al. (1999) is that open scale adjectives give rise to atelic predications and closed scale adjectives give rise to telic predications. Consider the data in (38)

(38) (a) John cleaned the house for hours/in two hours.
  (b) John cooled the pie for 10 min/in only 5 minutes.
  (c) The shortened the skirt in 3 hours.
  (d) The days shortened over the course of the holiday.
  (e) Mary shortened the baby's nap time gradually over 6 months.
  (f) John emptied the water from the tank for a bit, until the amount was manageable again.
  (g) John straightened the metal for a bit and then gave up.
  (h

The workers widened the road.

(i) The road widened a bit and then narrowed again.

In fact, the behaviour of these verbs seems better explained if the adjectival source is a comparative (which erases distinctions in the positive form) and is always ambiguous. In cases where we can see a stem difference, deadjectival verbs form from the comparative stem, not the positive one. (See Bobaljik 2012 for extensive discussion of this generalization)

Although both APs and PPs can be simple predications under *be*, in their properties as adjuncts, or traditional 'modifiers', the two categories very clearly divide.

> ...it is cross-linguistically typical of PPs that they form adjuncts (as well as complements) to projections of both verbs and nouns (cf. van Riemsdijk 1998). In this they contrast with DPs and VPs, which do not so freely form adjuncts. pg 15 Svenonius (2006).

Even when APs do seem to modify VPs they do not take the event as their external argument, but some individual argument participant in event.

(39) a. John flopped down on the sofa, dog-tired.
     b. Clean at last, Mary got out of the shower.

4.2 Evidence for Syntactically Represented Scales inside Positive As

Commensurability aside, the evidence for the lexical adjective denoting something measurable directly is actually airly weak. For example, following Zwarts and Winter (2000), we might expect that modification by a measure phrase would diagnose the 'vector' or scalar nature of an adjective denotation. In fact, while some open scale adjectives take measure phrases, many (most) do not.

(40) six foot tall/*five foot short.
     7 inches deep/*3 inches shallow.
     *3 lbs heavy/*3 lbs light.

All comparatives, on the other hand *can* combine with measure phrases. These clearly must denote SCALES/PATHS

(41) five inches shorter.
     3 inches shallower.
     3 pounds lighter.

To finesse this problem, Schwarzschild (2002)) divides modifiers into *degree* modifiers and *range* modifiers and claims that they actually apply to things of different type.

(42)   DEGREE OPERATORS   RANGE PREDICATES

very	*much*
too	*a lot*
so	*a little*
enough	*little*
-er, more, less	*a bit*
as	*enough*
that	measure phrases (*3lbs*)

Assuming scales to be basic for adjectives might be pleasing for some semantic reasons and find certain kinds of abstract motivation, but the comparison with the prepositional case is telling. Unlike the situation with P (and V), the decomposition into the equivalent of 'path' and 'place' (i) doesn't make sense of the natural classes within the category A, (ii) doesn't explain the external distribution of measure phrase or other modifiers, (iii) doesn't predict the behaviour of A in combination with other scalar structures (even under conflation) (iv) is not morphologically substantiated across languages. If scales *are* part of the internal semantics of adjectives then they are so in a way that is opaque to the syntax.

5   Conclusion

●Gradability across categories is a semantic reality that has to do with human cognition and the tracking of change and difference in the world. In and of it itself, it tells us nothing about how linguistic categories are organized.

●Understanding what is special to human language must involve distinguishing cognitive systems subserving the symbolic system, and the atoms of the symbolic system itself.

●When it comes to path structure, the evidence seems to be that aspects of it *are* linguistically represented in both V and P, and that these two linguistic categories are 'commensurable' in the sense of being able to co-define the same event shape.

●The explicit encoding of quantizedness comes clearly in the encoding of RESULTS. Result seems to be represented as a discrete independent structural component of paths.

References

Beck, Sigrid and Kyle Johnson. 2002. Double objects again. *Linguistic Inquiry* 35: 97–123.

Bobaljik, Jonathan David. 2012. *Universals in Comparative Morphology: Suppletion, superlatives, and the structure of words* .. MIT Press, Cambridge, MA.

Cruse, D. 1980. Antonyms and gradable complementarities. In *Perspectiven der Lexikalischen Semantik*, edited by D. Kastovsky. Bouvier, Bonn.

Hay, Jennifer, Christopher Kennedy, and Beth Levin. 1999. Scalar structure underlies telicity in "Degree Achievements". In *Proceedings of SALT IX*, edited by Tanya Matthews and Devon Strolovitch, pp. 127–144. CLC Publications, Ithaca, NY.

Higginbotham, James. 2001. Accomplishments. Ms., Oxford University.

Kamp, Hans. 1975. Two theories of adjectives. In *Formal Semantics of Natural Language*, edited by Ed Keenan, pp. 123–155. Cambridge University Press, Cambridge.

Kennedy, Chris. 1999. Gradable adjectives denote measure functions, not partial functions. *Studies in the Linguistic Sciences* 29.1.

Kennedy, Christopher and Louse McNally. 2005. Scale structure and the semantic typology of gradable predicates. *Language* 81:2.

Klein, E. 1980. A semantics for positive and comparative adjectives. *Linguistics and Philosophy* 4: 1–45.

Koopman, Hilda. 2000. Prepositions, postpositions, circumpositions, and particles. In *The Syntax of Specifiers and Heads*, edited by Hilda Koopman, pp. 204–260. Routledge, London.

Kracht, Marcus. 2002. On the semantics of locatives. *Linguistics and Philosophy* 25: 157–232.

Krifka, Manfred. 1992. Thematic relations and links between nominal reference and temporal constitution. In *Lexical Matters*, edited by Ivan A. Sag and Anna Szabolcsi, pp. 29–53. CSLI, Stanford, Ca.

Krifka, Manfred. 1998. The origins of telicity. In *Events and Grammar*, edited by Susan Rothstein, pp. 197–235. Kluwer, Dordrecht.

Pantcheva, Marina. 2011. *Decomposing Path*. Ph.D. thesis, Universitetet i Tromsø, Tromsø, Norway.

van Riemsdijk, Henk. 1990. Functional prepositions. In *Unity in Diversity*, edited by H. Pinkster and I. GenÈe, pp. 229–241. Foris, Dordrecht.

Rothstein, Susan. 2004. *Structuring Events: A Study in the Semantics of Aspect*. Blackwell, Oxford.

Rotstein, Carmen and Yoad Winter. 2004. Total adjectives vs. partial adjectives: Scale structure and higher-order modifiers. *Natural Language Semantics* 12: 259–288.

Schwarzschild, Roger. 2002. The grammar of measurement. In *Proceedings of SALT 12*, edited by Brendan Jackson. CLC Publications, Ithaca, NY.

von Stechow, Arnim. 1996. The different readings of *wieder* 'again': A structural account. *Journal of Semantics:13* pp. 87–138.

Svenonius, Peter. 2006. Adpositions, particles, and the arguments they introduce. In *Argument Structure*, edited by Tanmoy Bhattacharya, Eric Reuland, and KV Subbarao. John Benjamins, Amsterdam. Prepublication draft at http://ling.auf.net.

Svenonius, Peter. 2010. Spatial P in English. In *The Cartography of Syntactic Structures*, edited by Guglielmo Cinque and Luigi Rizzi, vol. 6, Mapping Spatial PPs. Oxford University Press.

Talmy, Leonard. 1985. Lexicalization patterns: Semantic structure in lexical forms. In *Language Typology and Syntactic Description, I: Clause Structure*, edited by Timothy Shopen, pp. 57–149. Cambridge University Press, Cambridge.

Verkuyl, Henk J. 1972. *On the Compositional Nature of the Aspects*. Reidel, Dordrecht.

Wechsler, Stephen. 2001. Resultatives under the 'event-argument homomorphism' model of telicity. *Proceedings of the 3rd Workshop on Text Structure* pp. 1–17.

Yoon, Y. 1996. Total and partial predicates and the weak and strong interpretations. *Natural Language Semantics* 4: 217–236.

Zwarts, Joost. 2005. Prepositional aspect and the algebra of paths. To appear, *Linguistics and Philosophy*.

Zwarts, Joost. 2006. Event shape: Paths in the semantics of verbs. Ms.

Zwarts, Joost and Yoad Winter. 2000. Vector space semantics: A model-theoretic analysis of locative prepositions. *Journal of Logic, Language, and Information* 9: 169–211.