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Scalar meaning in the roots of verbs and adjectives

(Joint work with Andrew Koontz-Garboden, U. Manchester, and Scott Spicer, UT Austin)

1 Introduction

- One of the key questions I mentioned last time are what the basic building blocks of verb meaning are, and how those building blocks are composed into more complex meanings.
- Last week we just focused on the semantics (of change). But an old but still important insight is that there is also *structure* within verbal meanings (Lakoff 1965).
- Specifically, it is often assumed that verb meanings consist partly of an "event structure" built from (a) a template of basic eventive predicates and (b) idiosyncratic roots filling in real world meanings (e.g. manner, state; Rappaport Hovav and Levin 1998) (Dowty 1979, Marantz 1997, Ramchand 2008, Alexiadou et al. 2015, Beavers and Koontz-Garboden 2020):

(1) John flattened the rug.

a. [$_{vP}$ John [$_{v'}$ v_{cause} [$_{vP}$ the rug [-*en*$_{v_{\text{become}}}$ $\sqrt{\text{FLAT}}$]]]]

b. [[John ACT] CAUSE [the rug [BECOME $<$ FLAT $>$]]]

- The template defines the verb's lexical aspectual properties, argument structure, and regular derivational morphology; the root just determines the verb's idiosyncratic morphology.
- Having a complete picture of a verb's meaning requires understanding the meanings of both the template and the root. Most work focuses on templates. But without a theory of root meanings we don't have a theory of what event structures can mean (Dowty 1979: 125-126).
- Andrew Koontz-Garboden and I have explored this question, based on two prior proposals, The Bifurcation Thesis of Roots and Manner/Result Complementarity. I focus on the former.
- Embick (2009) claims roots never introduce templatic meaning (see also Arad 2005, Borer 2005, Dunbar and Wellwood 2016):

(2) *The Bifurcation Thesis of Roots*: If a component of meaning is introduced by a semantic rule that applies to elements in combination [e.g. introduced by a functional head; JTB], then that component of meaning cannot be part of the meaning of a root.

- While not universally accepted (see e.g. Goldberg 1995, Rappaport Hovav and Levin 1998, Kelly 2013), if true it predicts that if a verb entails (say) change it must have v_{become} syntax.
- Beavers and Koontz-Garboden (2020) and Beavers et al. (2021) show that roots can entail templatic meaning, really anything a larger template can. We develop a typology of roots and templates that, in interaction, produce a complex typology of verb types.
- Change was a key case study, and today I ask the deeper question of how change itself decomposes into more basic ingredients, and how those arise in roots and templates.
- As discussed last week, change is now assumed to be scalar — degrees of holding a property along an ordered scale of degrees of that property. This was rooted in work on adjectives (e.g. Krifka 1998, Hay et al. 1999, Kennedy and Levin 2008, Rappaport Hovav 2008, Beavers 2008, 2012a, Koontz-Garboden 2010, Beavers and Koontz-Garboden 2020).

(3) a. The road is wide. ≈ The road has an above standard degree of width.
b. The road widened ≈ The road has increased in its degree of width.

- Scales provide a way to analyze a range of lexical aspectual facts (telicity as per Hay et al. 1999, Kennedy and Levin 2008, Beavers 2011, durativity as per Beavers 2008, 2012a).
- But can you decompose a scale (qua event structures)? On approaches that have, the assumption is that the root is a **measure function** returning a degree (Kennedy 2007); functional heads introduce **comparison** to the **relevant standard** that creates a predicate.

(4) a. The road is wide ≈ [The road is [*pos* [*adj* $\sqrt{\text{WIDE}}$]]]
b. The road widened ≈ [The road [v_{become} $\sqrt{\text{WIDE}}$]]

#1 We argue based on data from sublexical modification that roots denote stative predicates (cf. Wellwood 2015) that introduce *scalar comparison to an underspecified standard.*

#2 Functional heads (a) clarify the standard of comparison — for adjectives another degree at the same time and for verbs one across times — and (b) license degree expressions. They do not introduce basic comparison, though they *do* introduce other, higher order comparisons.

∴ If both roots and templates entail comparison this is another strike against bifurcation. Yet the root/template distinction is still justified, since only templates licensing comparison XPs.

- Note in what follows. I'll assume two things I'm not too fond of, for expository reasons:
  - As noted above, event decompositions can be modeled a million ways — representations internal to a lexicon (Levin and Rappaport Hovav 1995, Rappaport Hovav and Levin 1998), as translations into some logical language (Dowty 1979), or as syntactic phrase structures as above. I'll assume the syntactic version because it makes talking about the composition a bit easier. But nothing I say relies on it.
  - Last time I modeled scales as mereological path objects as per Krifka (1998) (see e.g. Beavers 2010, 2011, 2012a). But since I'm comparing this directly to a conventional degree-based analysis I'll translate the mereology to sets of degrees here as needed.

2 Evidence for Event Decompositions and the Need for Theories of Root Meaning

- I'll start with standard decompositions, where roots are stative predicates and change is the coming about of a state that did not hold before (Dowty 1979). The ingredients we need are:

(5) a. $[\![\sqrt{\text{OPEN}}]\!] = \lambda x \lambda s[\mathbf{open'}(x, s)]$ ("A state of openness s holds of x.")
b. $[\![v_{\text{become}}]\!] = \lambda P \lambda x \lambda e \exists s[\mathit{become'}(s, e) \wedge P(x, s)]$
("A state s of type P holds for individual x and came about in event e.")
c. $[\![v_{\text{cause}}]\!] = \lambda Q \lambda y \lambda v \exists e[\mathit{effector'}(y, v) \wedge \mathit{cause'}(v, e) \wedge Q(e)]$
("Event v with y as its effector causes an event e of type Q.")

- This yields (6) for causative and inchoative verbs, capturing the entailment relation:

(6) a. The door opened. $[\![\,[_{vP}$ the door $[_{v'}\ v_{\text{become}}$ $[\ \sqrt{\text{OPEN}}\ ]\ ]\ ]]\!]$
$= \exists e \exists s[\mathit{become'}(s, e) \wedge \mathbf{open'}(\mathbf{door'}, s)]$
b. Kim opened the door. $[\![\,[_{vP}$ Kim $[_{v'}\ v_{\text{cause}}$ $[_{vP}$ the door $[_{v'}\ v_{\text{become}}$ $[\ \sqrt{\text{OPEN}}\ ]\ ]\ ]\ ]\ ]]\!]$
$= \exists v \exists e[\mathit{effector'}(\mathbf{kim'}, v) \wedge \mathit{cause'}(v, e) \wedge \exists s[\mathit{become'}(s, e) \wedge \mathbf{open'}(\mathbf{door'}, s)]]$

- More evidence for this approach comes from sublexical modifiers like *again* (also *for an hour* and *too*) (Dowty 1979). Such modifiers can apply to any stative or eventive predicate:

(7) Kim loved peanuts again/smelled bad again/sneezed again/cried again.

- This suggests a very general analysis of *again* as taking any eventuality-denoting predicate and asserting it now while presupposing it held at a previous time as well:

(8) $[\![\text{again}]\!] = \lambda P \lambda z \lambda e'''[P(z, e''') \wedge \partial \exists e''[e'' \ll e''' \wedge P(z, e'')]]$

- If the roots of change-of-state verbs are stative predicates and the combinations with *v* are eventive predicates then we derive the possibility of a scopal ambiguity with *again*.

(9) John opened the door again (and it was open before/had been opened before).
   a. $[_{v\mathrm{P}}$ John $[_{v'}$ v_{cause} $[_{v\mathrm{P}}$ the door [v_{become} [$\sqrt{\text{OPEN}}$ again]]]]] (restitutive)
   b. [$[_{v\mathrm{P}}$ John $[_{v'}$ v_{cause} $[_{v\mathrm{P}}$ the door [v_{become} $\sqrt{\text{OPEN}}$]]]] again] (repetitive)

- Thus templatic structure derives key predictions about entailment and sublexical modifiers.

- Now, under bifurcation, roots are less interesting: they just name states, and thus should all occur in all the same contexts wanting a stative predicate, in the same way.

- Yet we see at least two types of roots when it comes to forming adjectives — those that have a corresponding simple and deverbal adjective and those that have just the latter:

(10)

Dixon (1982) Property Concept (PC) roots			**Result Roots**		
BASIC ADJ	VERB	DEVERBAL ADJ	BASIC ADJ	VERB	DEVERBAL ADJ
bright	brighten	brightened	—	break	broken
flat	flatten	flattened	—	bake	baked
ripe	ripen	ripened	—	shatter	shattered

- Embick (2004: 363-364) analyzes the two adjectives as one root occurring in two contexts: an adjectivalizing head applied to just a root, or to a verbal structure also including v_{become}:

(11) a. Basic states: $[_{adj\mathrm{P}}$ *adj* $\sqrt{\text{ROOT}}$] (where $[\![adj]\!] = \lambda P[P]$)
   b. Result states: $[_{adj\mathrm{P}}$ *adj* $[_{v\mathrm{P}}$ DP v_{become} $\sqrt{\text{ROOT}}$]]

- Why don't result roots appear in (11a)? Embick (2004: 358) claims they do, but *adj* here is *-ed/en*, while with PC roots it is null, a surface level morphological accident of English.

#1 However, this makes predictions about meanings of the various stative forms:

(12) a. Simple adjectives from PC roots (e.g. *bright*) will not entail change.
   b. Derived adjectives from PC roots (e.g. *brightened*) will entail change.
   c. Result root adjectives (e.g. *shattered*) will not entail change (due to reading (11a)).

- (12a,b) are borne out, but (12c) is not (Koontz-Garboden and Francez 2010, Deo et al. 2013):

(13) a. The bright/#brightened photo has never (been) brightened.
   b. #The shattered vase has never (been) shattered. (even if it is built in tiny pieces)

#2 Furthermore, result roots lack restitutive readings:

(14) [John lives in a hot region and finds a fruit with brown, fatty edges. He takes it home, trims off the edges, and puts it in the fridge. He later takes it out and fries it.]
#John fried the fruit again. (necessarily two fryings)

∴ An emergent generalization is that result roots are never disassociable from change — when you use a root, you get change. So there is a *positive* definition of a result root.

- Beavers and Koontz-Garboden (2020) propose that change is *part of the state itself*. By naming that state a root entails change, violating bifurcation (see also Beavers et al. 2021).

(15) $[\![\sqrt{\text{SHATTER}}]\!] = \lambda x \lambda s[\mathbf{shattered'}(x, s)]$,
where $\forall s \forall x[\mathbf{shattered'}(x, s) \rightarrow \exists e'[become(e', s)]]$

- This explains the semantics, which we can in turn tie the semantics to (adjectives end in *-en/ed* if the adjective entails change). Key is that roots stative predicates, providing attachment points for sublexical modification and a place to define the PC vs. result root distinction.

3 Measure Functions in Adjectives and Verbs

- But on scalar approaches (PC) roots are measure functions returning degree d theme x holds of property δ at state s (16a). Higher heads introduce comparison (Kennedy 2007, Kennedy and Levin 2008), e.g. *pos* compares d to δ's "positive standard" ($\boldsymbol{\delta}_P$ = P's dimension):

(16) a. $[\![\sqrt{\text{FLAT}}]\!] = \lambda x \lambda s[\mathbf{flat'}(x, s)]$ (returns degree, *not* truth value)
b. $[\![pos]\!] = \lambda P \lambda x \lambda s[P(x, s) \geq \mathbf{stnd'_{pos}}(\boldsymbol{\delta}_P)]$("$x$'s degree in s meets the standard")
c. $[\![\text{flat}_{\text{adj}}]\!] = [\![\ [\ pos\ [\ adj\ \sqrt{\text{FLAT}}\ ]\ ]]\!] = \lambda x \lambda s[\mathbf{flat'}(x, s) \geq \mathbf{stnd'_{pos}}(\text{FLATNESS})]$
("x's degree of flatness in s meets the standard for being flat")
d. $[\![\text{The rug is flat}]\!] = \exists s[\mathbf{flat'}(\mathbf{rug'}, s) \geq \mathbf{stnd'_{pos}}(\text{FLATNESS})]$

- Different scales yield different positive standards owing to Interpretive Economy, which says to maximize conventional meaning in determining truth conditions (Kennedy 2007: 36):

(17) a. The rod is straight. (max endpoint scale: standard is max)
b. The towel is wet. (min endpoint scale: standard is min)
c. The road is wide. (open scale: standard is from pragmatic context)

- Kennedy and Levin (2008) extend this to verb meanings. There are two conditions to be accounted for. First, the final degree must be higher than the initial degree, i.e. change occurs:

(18) #She straightened/wet the towel, but nothing has changed about it.

- Second, unless context intervenes, the final degree depends partly on scale type (Kennedy and Levin 2008: 168-170), though distinct from how it is determined by adjectives:

(19) a. She straightened the rod. (max endpoint scale: final degree is max or above initial)
b. She wet the towel. (min endpoint scale: final degree is min or above initial)
c. They widened the road. (open scale: final degree is contextual or above initial)

- This is the "verbal standard". Kennedy and Levin define the root as a measure of change function returning a degree of increase, defining a a de facto minimal endpoint scale, where:

(20) a. If context or the scale provides a minimum/maximum, that can be the standard.
b. Else the initial degree serves as the standard.

- Telic readings force a (lexical or contextual) maximum reading, atelic readings a minimum:

(21) a. Kim straightened the rod in/(?)for ten minutes. (telic = max, atelic = min)
b. Kim cooled the rod for/?in ten minutes. (atelic = min, telic = contextual max)

The (final) state is of holding a degree at or above some standard determined by scale type, word category, and context, with a measure function as the core, not a stative predicate.

- The advantage over decompositions is a more fine-grained analysis of verb and adjective meanings and how they relate (and of how aspectual factors are calculated; see §7).

4 Problems with a Decompositional Measure Function Analysis

#1 But a dangling issue is how to handle sublexical modifiers scoping over roots:

(22) Kim widened the road again (and it had been wide before).
$[_{v\mathrm{P}}$ Kim $[_{v'}$ v_{cause} $[_{v\mathrm{P}}$ the road $[_{v'}$ v_{become} [$\sqrt{\text{WIDE}}$ again]]]]]

- If PC roots were measure functions, purely for type reasons the lowest attachment site for *again* would be $v_{\mathrm{become}}{}'$, requiring a repetitive reading like result roots, contra §2.

#2 We could posit a special *again* over measure functions, presupposing the degree held before:

(23) $[\![\text{again}]\!] = \lambda P[P]$, Presupposition: $\forall s \forall x \exists s' \ll s[P(x, s) = P(x, s')]$

- However, the current and prior degrees can differ, arguing against this alternative:

(24) She widened the road again — it was built 20′, got narrowed to 15′, and now it's 30′.

#3 We could say the root is a stative predicate that says theme x holds some degree d on the scale in state s, and assume higher heads introduce comparison to the standard:

(25) $[\![\sqrt{\text{WIDE}}]\!] = \lambda x \lambda s \exists d[\mathbf{wide}'(x, s) = d]$

- However, comparison must be under *again*. First, telic readings as above pick up on whatever the standard is. If roads must be 50′ wide to be "wide", and workers' job is make it "wide", (26) means the road ends up 50′ (or whatever standard, even "wider"; see below).

(26) [The road was built 30′ wide. The workers made it 50′ wide in one day.]
The workers widened the road in a single day.

- Here restitutive modification requires the contextual standard (50′) to be met twice:

(27) #[The road was built 30′ wide, but got narrowed. The workers made it 50′ in one day.]
The workers widened the road again in a single day. (only OK if 50′ both times)

- Even on restitutive readings comparison to a standard is under *again*, and thus in the root. But which standard is it? The positive standard or the verbal standard or something else?

#4 With a maximal scale and telic reading the default restitutive comparison is to the maximum:

(28) She straightened the rod again in five minutes, #but it never was straight.

- But with open scale roots the comparison could be to a prior degree that isn't the positive standard (cp. deadjectival verbs do not in entail "become Adj"; Kennedy and Levin 2008):

(29) [A road is built too narrow, and somehow gets narrowed even more. Sandy's job is to restore it to its previous width, albeit it's still too narrow.]
Sandy widened the road again in a single day, but it never has been wide.

- Thus the comparison under *again* is to the verbal standard, not the positive standard.

#5 But with adjectives it's clearly the positive standard under *again*:

(30) The road is wide again. ≈ The road is and was above standard width.

- Yet it's the same root in both cases. So the standard *in the root* isn't the verbal or positive standard. It must be something else that can resolve to either.

Roots introduce comparison to some standard, *but not any specific standard*. The actual standard instead comes from the scale, context, and word category.

5 Comparison in Adjectives and Verbs

- Comparative adjectives also have a meaning of open comparison. Could it be that verbs are built from them (cf. Bobaljik 2012)? Evidence from *than* PPs suggest not.

#1 Comparatives express that the absolute property degree of the subject is greater than some standard that of the DP argument of the *than* phrase can express:

(31) The river is wider than the road. ≈ The degree of width of the river is greater than the degree of width of the road.

- If v_{become} were introduced directly over a comparative adjective, *than* should still be able to target the standard of the comparative. Thus a reading for (32) *should* be possible where the river became wider than the road (thus entailing (31)), contrary to fact:

(32) The river widened more than the road (but the river was not wider than the road).

- So the comparative standard is not what is expressed by *than* with inchoatives.

#2 Rather, *than* in inchoatives targets a *difference value* of how much change occurred (Hay et al. 1999), asserting it is greater than that of the *than* DP, a contradiction if this is not so:

(33) #The river widened more than the road. The river increased by $3'$ and the road by $4'$.

Change-of-state verbs are not built on comparative adjectives, i.e. there is no comparative adjective structure there, which would introduce a comparative standard. They must be derived equipollently (two structures over one root), thus reinforcing that comparison must be built into the root (and not from simple or comparative adjectival structure).

6 Fitting a Scalar Analysis on a Decompositional Approach

- We propose that PC roots are stative predicates that introduce comparison but *not* a specific standard, building on and expanding Beavers and Koontz-Garboden (2020: 35-48).

- In particular, PC roots introduce comparison to a patient/scale-specific standard $\mathbf{d}_x^{\delta}$:

(34) $[\![\sqrt{\text{WIDE}}]\!] = \lambda x \lambda s \exists d[\mathbf{wide}'(x, s) = d \wedge d \geq \mathbf{d}_x^{\text{WIDTH}}]$

- *pos* introduces the positive standard by setting the root-supplied standard equal to the positive standard (where $\mathbf{d}_x^{\boldsymbol{\delta}_P}$ for scalar stative predicate P is P's standard $\mathbf{d}_x^{\delta}$):

(35) $[\![\textit{pos}]\!] = \lambda P \lambda x \lambda s[P(x, s) \wedge \mathbf{d}_x^{\boldsymbol{\delta}_P} = \mathbf{stnd}'_{\mathbf{pos}}(\boldsymbol{\delta}_P)]$

- Applying (35) to *wide*, taking a patient, and $\exists$-binding s produces (36), where the ultimate interpretation depends on how we interpret the positive standard (see e.g. (17)).

(36) $[\![$ [The road is [*pos* [*adj* $\sqrt{\text{WIDE}}$]]]$]\!]$ ("The road is wide")
$= \exists s[\exists d[\mathbf{wide}'(\mathbf{road}', s) = d \wedge d \geq \mathbf{d}_{\mathbf{road}'}^{\text{WIDTH}}] \wedge \mathbf{d}_{\mathbf{road}'}^{\text{WIDTH}} = \mathbf{stnd}'_{\mathbf{pos}}(\text{WIDTH})]$
$= \exists s \exists d[\mathbf{wide}'(\mathbf{road}', s) = d \wedge d \geq \mathbf{stnd}'_{\mathbf{pos}}(\text{WIDTH})]$
"There is a state s in which the road holds a degree d of WIDTH at or above the positive standard for WIDTH."

- Alternatively to *pos*, a comparative head (e.g. μ of Kennedy and Levin 2008: 180) can apply, setting the standard as the degree d' of the thing(s) the patient is being compared to:

(37) $[\![\mu]\!] = \lambda P \lambda d' \lambda x \lambda s[P(x, s) \wedge \mathbf{d}_x^{\boldsymbol{\delta}_P} = d']$

- Here, we now have an open degree argument d' reflecting the comparand. Before any further event composition happens, this must be eliminated somehow, because what higher functional heads want is a predicate over individuals and/or events.

- We assume *-er/more* must apply to saturate d', and there are two variants. First, there's one that saturates d' with whatever the contextual standard is in cases where there's no *than* PP:

(38) a. $[\![\textit{-er/more}_1]\!] = \lambda P \lambda x \lambda s[P(x, \mathbf{d_c}, s)]$ (contextually defines d')
b. The road is wider.
$[\![$ [the road is [*-er*$_1$ [μ [*adj* $\sqrt{\text{WIDE}}$]]]]$]\!]$ ("The road is wider")
$= \exists s[\exists d[\mathbf{wide}'(\mathbf{road}', s) = d \wedge d \geq \mathbf{d}_{\mathbf{road}'}^{\text{WIDTH}}] \wedge \mathbf{d}_{\mathbf{road}'}^{\text{WIDTH}} = \mathbf{d_c}]$
$= \exists s[\exists d \mathbf{wide}'(\mathbf{road}', s) = d \wedge d \geq \mathbf{d_c}]$

- Then there's one that selects a *than* PP (which we assume only *-er/more* takes syntactically, and assuming PPs return degrees based on elliptical structures; see e.g. Wellwood 2015)

(39) a. $[\![\textit{-er/more}_2]\!] = \lambda P \lambda d' \lambda x \lambda s[P(x, d', s)]$ (saturates d' by licensing a PP)
b. The road is wider than the field.
$[\![$ [the road is [[*-er*$_2$ [μ [*adj* $\sqrt{\text{WIDE}}$]]] than the field]]$]\!]$
$= \lambda x \lambda s[\exists d[\mathbf{wide}'(\mathbf{road}', s) = d \wedge d \geq \mathbf{d}_{\mathbf{road}'}^{\text{WIDTH}}] \wedge \mathbf{d}_{\mathbf{road}'}^{\text{WIDTH}} = \mathbf{width\text{-}of\text{-}field}']$
$= \lambda x \lambda s \exists d[\mathbf{wide}'(\mathbf{road}', s) = d \wedge d \geq \mathbf{width\text{-}of\text{-}field}']$

- For verbs, v_{become} ensures there is an event of change at the end of which the theme holds a degree above the root-supplied standard and at the beginning it held a degree below it, where the root-supplied standard is in turn defined as the verbal standard. Thus v_{become}:

(40) a. introduces an event e of the coming about of s,
b. takes root P and sets P's standard at or above the verbal standard,
c. sets x's $\exists$-bound initial degree d_i below the standard,
d. and introduces an open difference degree threshhold argument d_d for d_f - d_i

- More formally, and indexing each bit of (40) by the bit of the formula that does that part:

(41) $[\![v_{\text{become}}]\!] = \lambda P \lambda d_d \lambda x \lambda e \exists s \exists d_f \exists d_i [\underline{[become'(e,s)]}_{\text{(40a)}} \wedge \underline{[P(x,s) \wedge \mathbf{d}_x^{\boldsymbol{\delta}_P} \geq \mathbf{stnd}'_{\mathbf{V}}(\boldsymbol{\delta}_P)]}_{\text{(40b)}} \wedge \underline{[\mathbf{R}'_P(x, init(e)) = d_i \wedge \mathbf{d}_x^{\boldsymbol{\delta}_P} > d_i]}_{\text{(40c)}} \wedge \underline{[\mathbf{R}'_P(x,s) = d_f \wedge d_f \text{ - } d_i \geq d_d]}]_{\text{(40d)}}$
(where $init$ is the intial state of e and $\mathbf{R}'_P$ is P's measure function)

#1 Since v_{become} entails d_f is at or above the root-supplied standard and d_i is definitely below that standard, it follows that $\mathbf{d}_f > d_i$, i.e. a change occurred.

#2 The root-supplied standard is in turn equated with the verbal standard, giving rise to the various readings discussed above (e.g. (19)).

(42) $[\![\text{ [} v_{\text{become}} \sqrt{\text{WIDE}} \text{]}]\!] = \lambda d_d \lambda x \lambda e \exists s \exists d_f \exists d_i [[become'(e,s)] \wedge [\exists d[\mathbf{wide}'(x,s) = d \wedge d \geq \mathbf{d}_x^{\text{WIDTH}}] \wedge \mathbf{d}_x^{\text{WIDTH}} \geq \mathbf{stnd}'_{\mathbf{V}}(\text{WIDTH})] \wedge [\mathbf{wide}'(x, init(e)) = d_i \wedge \mathbf{d}_x^{\text{WIDTH}} > d_i] \wedge [\mathbf{wide}'(x,s) = d_f \wedge d_f \text{ - } d_i \geq d_d]]$
$= \lambda d_d \lambda x \lambda e \exists s \exists d_f \exists d_i [[become'(e,s)] \wedge \exists d[\mathbf{wide}'(x,s) = d \wedge d \geq \mathbf{stnd}'_{\mathbf{V}}(\text{WIDTH})] \wedge [\mathbf{wide}'(x, init(e)) = d_i \wedge \mathbf{stnd}'_{\mathbf{V}}(\text{WIDTH}) > d_i] \wedge [\mathbf{wide}'(x,s) = d_f \wedge d_f \text{ - } d_i \geq d_d]]$

#3 Once again, there's an open degre, this time the difference degree d_d, so *-er/more (PP)* must eliminate it, though in the verbal domain *-er* we assume is $\emptyset$ with no PP and *more* with a PP (agreeing with Wellwood 2015 that comparison is the same across categories):

(43) a. widen
$[\![\text{ [} \emptyset/\textit{more}_1 \text{ [} v_{\text{become}} \sqrt{\text{WIDE}} \text{]]}]\!] = \lambda x \lambda e \exists s \exists d_f \exists d_i [[become'(e,s)] \wedge [\exists d[\mathbf{wide}'(x,s) = d \wedge d \geq \mathbf{d}_x^{\text{WIDTH}}] \wedge \mathbf{d}_x^{\text{WIDTH}} \geq \mathbf{stnd}'_{\mathbf{V}}(\text{WIDTH})] \wedge [\mathbf{wide}'(x, init(e)) = d_i \wedge \mathbf{d}_x^{\text{WIDTH}} > d_i] \wedge [\mathbf{wide}'(x,s) = d_f \wedge d_f \text{ - } d_i \geq \mathbf{d_c}]]$
b. widen more than the field.
$[\![\text{ [[} \textit{more}_2 \text{ [} v_{\text{become}} \sqrt{\text{WIDE}} \text{]] than the field]}]\!]$
$= \lambda x \lambda e \exists s \exists d_f \exists d_i [[become'(e,s)] \wedge [\exists d[\mathbf{wide}'(x,s) = d \wedge d \geq \mathbf{d}_x^{\text{WIDTH}}] \wedge \mathbf{d}_x^{\text{WIDTH}} \geq \mathbf{stnd}'_{\mathbf{V}}(\text{WIDTH})] \wedge [\mathbf{wide}'(x, init(e)) = d_i \wedge \mathbf{d}_x^{\text{WIDTH}} > d_i] \wedge [\mathbf{wide}'(x,s) = d_f \wedge d_f \text{ - } d_i \geq \mathbf{change\text{-}in\text{-}field}']]$

- Applied to a patient, with the event bound, produces (44) (for the case without a *than* PP).

(44) The road widened.
$[\![\text{ [the road [} \emptyset/\text{more}_1 \text{ [} v_{\text{become}} \sqrt{\text{WIDE}} \text{]]]}]\!]$ ("The road widened (more)")
$= \exists e \exists s \exists d_f \exists d_i [[become'(e,s)] \wedge [\exists d[\mathbf{wide}'(\mathbf{road}', s) = d \wedge d \geq \mathbf{d}_{\mathbf{road}'}^{\text{WIDTH}}] \wedge \mathbf{d}_{\mathbf{road}'}^{\text{WIDTH}} \geq \mathbf{stnd}'_{\mathbf{V}}(\text{WIDTH})] \wedge [\mathbf{wide}'(\mathbf{road}', init(e)) = d_i \wedge \mathbf{d}_{\mathbf{road}'}^{\text{WIDTH}} > d_i] \wedge [\mathbf{wide}'(\mathbf{road}', s) = d_f \wedge d_f \text{ - } d_i \geq \mathbf{d_c}]]$

$\approx$ "There is an event e in which the road goes from holding some degree d_i of WIDTH below the verbal standard for WIDTH to some degree d_f of WIDTH above the verbal standard, forming a difference of at least $\mathbf{d_c}$ degrees between the two degrees."

- Finally, and crucially, this analysis captures the *again* facts when *again* scopes over the root:

(45) $[\![\text{ [} \sqrt{\text{WIDE}} \text{ again]}]\!] = \lambda z \lambda e'''[\exists d[\mathbf{wide}'(z, e''') = d \wedge d \geq d_z^{\text{WIDTH}}] \wedge \partial \exists s'[s' \ll s \wedge \exists d[\mathbf{wide}'(z, e'') = d \wedge d \geq d_z^{\text{WIDTH}}]]]$

- This ensures the theme now and before held a degree above the root-supplied standard, which *adj* will fill in as the positive standard and v_{become} as the verbal standard.

7 Incrementality in Change of State

- However, a question arises: since v_{become} introduces a change from not being above the standard to being above it, do we need $become'$ or anything like it?
- Comparison to standards alone is sufficient to predict some facts about change-of-state verbs. For example, as Kennedy and Levin (2008) note maximal endpoint scalar predicates default to telic readings and open scale predicates to atelic readings:

(46) a. Sally straightened the rod in/(?)for an hour.
b. Sally widened the opening for/?in an hour.

- But as we discussed last time, patient expression can figure into telicity (see Beavers 2012a):

(47) a. Sally straightened rods for/??in an hour.
b. Sally widened openings for/??in an hour.

- Scales and themes also figure into durativity: gradability of scales and/or mereological complexity of themes (at least as conceived in context) are required for durative readings (Beavers 2012a), using ambiguity of *in an hour* modifiers as a test for durativity (Kearns 2000):

(48) a. The drop of soup will cool from 0.1°C to 0.0°C in an hour. (*after*)
b. The drop of soup will cool from 100.0°C to 0.0°C in an hour. (*during/after*)
c. Six bowls of soup will cool from 0.1°C to 0.0°C in an hour. (*during/after*)
d. Six bowls of soup will cool from 100.0°C to 0.0°C in an hour. (*during/after*)

- This requires more than comparison to a standard. The analysis I suggested last time was from Beavers (2012a), which tied the progress of the event to the scale and patient. Last time I did this using a mereological definition of scales; I'll translate that to a conventional "set of degrees" analysis:

(49) **Figure/Path Relation:** An event e, patient x, and continuous, ordered set of degrees S on some dimension δ stand in a Figure/Path Relation (FPR) iff every unique part $x' \leq x$ corresponds to a unique subevent $e' \leq e$, the sum of all such subevents constitutes e, and each e' stands in a Movement Relation (Krifka 1998) with a continuous subset $S' \subseteq S$, where S' includes x''s initial degree of δ in e' and where the maximal degree in S' is x''s final degree of δ in e'.

- We can define $become'$ as introducing incrementality, with the rest of the meaning of v_{become} delimiting the scalar endpoints (where $\boldsymbol{\delta}_s$ is the dimension of state s, $\mathbf{S}_s$ the set of degrees of s, and $\mathbf{d}_{\mathbf{x}}^{\boldsymbol{\delta}_s}$ is the degree asserted of some patient x on $\boldsymbol{\delta}$ in state s):

(50) for all e, s, x where x is the patient of e, $become'(s, e)$ is true iff s holds at the end of e and e is FPR-related to $\mathbf{x}$ and the continuous, ordered set of degrees $S' \subseteq \mathbf{S}_s$ of $\boldsymbol{\delta}_s$ containing $\mathbf{d}_{\mathbf{x}}^{\boldsymbol{\delta}_{init'(e)}}$ and whose maximal degree is $\mathbf{d}_{\mathbf{x}}^{\boldsymbol{\delta}_s}$.

- Given that with PC roots change only arises in the context of v_{become}, we need this as part of the analysis of v_{become}, but this also means degree change is not itself sufficient to capture the aspectual properties of change of state. We need measured progress.

8 Whither Result Roots?

- Decompositional work on scalar change has mostly focused on PC root verbs (descriptively "deadjectival verbs"), which we had argued above obey bifurcation.

- Putting the pieces above together, PC roots have more complex meanings than usually assumed, and do *not* obey bifurcation — the fact that v_{become} (and v_{cause}; see below) introduces comparison suggests it is a templatic notion, and yet PC roots also introduce comparison.

- But they do not have the meaning of v_{become} in them, which result roots do. But given that we have introduced scalar comparison in PC roots, are result roots still parallel?

- Scalar analyses have been extended to them before, e.g. Beavers (2011, 2012a) subsumed all change-of-state verbs under a scalar analysis. Largely this was due to the fact that they have essentially the same aspectual properties (e.g. what derives telicity and durativity as per §7).

- Crucially, result root verbs participate in scalar comparison in the same way PC roots do:

(51)
a.	This vase is cracked.	(predicative adjective)
b.	This vase is more cracked (than that one).	(comparative adjective)
c.	This vase cracked more (than that one).	(diff. degree comparison)
d.	I cracked this vase more (than that one).	(diff. degree comparison *or* quality)

- This all suggests treating result roots just like PC roots type-theoretically, with the only difference being that they also entail incrementality change ($become'$):

(52) $[\![\sqrt{\text{CRACK}}]\!] = \lambda x \lambda s \exists d[\mathbf{cracked'}(x, s) = d \wedge d \geq \mathbf{d}_x^{\text{CRACKEDNESS}}]$,
where $\forall x \forall s \forall d[[\mathbf{cracked'}(x, s) = d \wedge d \geq \mathbf{d}_x^{\text{CRACKEDNESS}}] \rightarrow \exists e' \exists d'[[become'(e', s)] \wedge [\mathbf{d}_x^{\text{CRACKEDNESS}} > \mathbf{cracked'}(x, init(e')) = d_i]]]$

- Type-theoretically this will generate all of the behavior in (51) in the same way as with PC roots, albeit with the additional condition that all cracked states being above the verbal standard must have arisen from a prior state of not being above the standard.

9 Scales and Comparison in Causative Heads

- So far, v_{become} introduces comparison between difference values via an open difference variable. It turns out v_{cause} also introduces comparison, albeit of degrees of prototypicality or quality, modelable on a scale following Kennedy and McNally (2010) and Bochnak (2010, 2013). Consider the following context and associated sentence:

(53) [You and I both have glasses of water; mine is an insulated cup and yours is a regular glass cup. I stick mine in the microwave, and then I stick yours in the microwave one minute later, and they finish microwaving at the same time. When I take both out, mine is cooler than yours because of the insulated cup.]

a. I heated up my drink more than yours, but your drink didn't heat up more than mine.

b. I heated up my drink more than yours, but my cup went up by 3°C and yours went up by 4°C.

- This seeming contradiction would only be possible if the causative *heat* introduces a property distinct from the difference value introduced by the inchoative.

- This is the 'goodness' of the heating, e.g. how long or how effective the event is, and *more* is asserting a greater-than ordering between the prototypicality of two events.

- This could be accommodated with an analysis of v_{cause} as follows that applies a state of the larger event having a certain quality compared to a comparison d' (obviously just positing $\mathbf{quality}'$ and leaving it that means I've not studied this issue well enough to say anything more concrete!):

(54) $[\![v_{\text{cause}}]\!] = \lambda P \lambda d' \lambda y \lambda v \exists e[\mathit{effector}'(y, v) \wedge \mathit{cause}'(v, e) \wedge P(e) \wedge$
$\exists d \exists s[\mathbf{quality}'(v \oplus e, s) = d \wedge d \geq d']]$

- Comparative heads as above can introduce a *than* PP targeting quality degrees to which individuals underwent changes or eliminate the argument for contextual interpretation.

- Importantly, introducing a comparison between degrees of prototypicality does not render the difference degree opaque to modification, and as such can still be targeted by *than* PPs:

(55) [You and I both have pots of water, but the water in my pot is 10°C and the water in yours is 20°C. We put both in ovens heated to 90°C, and after an hour we check and the water in both is 90°C.]
I heated up my water more than yours, because mine warmed up by 80°C and yours warmed up by 70°C.

- Here there's not obviously a prototypicality difference, but there's still a difference in difference degrees. So causatives allow both difference degree and quality comparison — exactly as expected since the causative embeds the inchoative on a decompositional analysis.

- Thus, among the three types of comparison – absolute property, difference degree, and quality – only the latter two, the verbal comparisons, can exist within the same structure.

- They are mutually exclusive with the adjectival comparison, easily captured if nothing like a comparative adjective underlies change-of-state verbs.

10 Root Licensed Degree Modification?

- Our claim so far is that roots introduce basic comparison, while functional heads introduce standards and higher order comparisons, and provide access to various degrees for *than* expression. But is the degree introduced by a root itself ever accessible for expression?

- Resultatives may indicate a possible case of root-licensed degree expression:

  (56) Mary opened the door wide.

- Here *wide* indicates the final degree, which is supposedly in the root meaning (e.g. d in (34)).

- It is beyond our scope to provide an account of resultatives, not least because they are known to come in a wide range of types that may not all be the same construction (see e.g. Wechsler 1997, Rappaport Hovav and Levin 2001, Goldberg and Jackendoff 2004, Kratzer 2004) and are subject to a variety of scalar semantic and aspectual constraints on possible combinations (see e.g. Wechsler 2005, Beavers 2008) (see Beavers 2012b for an overview).

- However, it is unlikely that roots are providing access to the final degree here *per se*:

  – Overt degree phrases are possible with some adjectives, but the reading is a current degree with positive adjectives but a difference with comparatives:

    (57) a. The rod is $10'$ long $\approx$ The rod has a length of $10'$

    b. The rod is $10'$ longer $\approx$ The rod is longer (than something) by $10'$

  – Resultative modifiers are quite unique and specific to verbal constructions, allowing AdjP, PP, and NP result states that rarely occur absent verbal structure context:

    (58)

resultative	deverbal adjective	simple adjective
sharpen x to a point	x is sharpened to a point	*x is sharp to a point
lengthen x to $10'$	x is lengthened to $10'$	*x is long to $10'$
smooth x flat	x is smoothed flat	*x is smooth flat
break x open	x is broken open	N/A
open x wide	x is opened wide	x is open wide

  $\therefore$ This suggests that access to degrees is governed by functional heads, not roots.

- Whatever resultatives are, they are clearly only productively licensed in verbal contexts, and thus verbal templatic structure must play a role, licensing access to the root's final degree.

11 Subject-oriented Comparison: Another Non-argument for Adjectives in Verb Meanings

- Borer (1991) and Kastner (2018) have argued for the adjectival nature of comparison by suggesting that at least some PC root verbs are deadjectival.

- In particular, they show an asymmetry in the interpretation of *like* modifiers with PC roots. *Like* PPs can compare properties with adjectives or manners with activities:

  (59) a. John runs like a dog.

  b. His muscles are hard like cement.

- Inchoatives allow both manner and property comparison, but causatives just manner:

(60) a. John reddened like a tomato.
(means: John became red to the degree a tomato is red.)
(also means: John became red the same way a tomato becomes red.)

b. John reddened his face like a tomato.
(means: John made his face red the same way a tomato becomes red.)
(cannot mean: John made his face red to the degree a tomato is red.)

- Because (59b) has the property reading, Borer and Kastner claim it underlies all cases where the property reading is available. Thus the inchoative is deadjectival but not the causative.

- However, the facts in (60) can be successfully captured with an analysis of *like* as just a quality-modifying term. Quality scales in Kennedy and McNally (2010) were introduced to distinguish between chromatic and intensity readings of color terms like *red*.

  - Chromatic readings (e.g. *red* vs. *green*) are instances of predicating over a quality scale, as the redness of the entity is being measured relative to a prototypical concept of red.
  - Intensity readings (e.g. *more red* vs. *less red*) are instances of predicating over a property scale, e.g. measuring how much of the color the entity has.

- The reading for *redden* in (60a) is actually a chromatic reading, not an intensity reading, as *tomato* provides a chromatic standard for redness against which John is being compared. That is, the paraphrase is 'John reddened to the particular hue of red a tomato has.'

- Thus it is felicitous to assert chromatic equivalency with *like* and deny intensity equivalency:

(61) John reddened like a tomato, but his face was still less red than (a nice, ripe) one.

- This effect can be seen with non-color terms, e.g. *harden* equivalent to *hard* in (59b).

(62) His muscles hardened like cement, but were still less hard than some (cement).

- Thus, *like* can be given a denotation as in (63), where it independently compares the quality of participant of the event which it is modifying in the relevant state to that of its argument.

(63) $[\![\textit{like}]\!] = \lambda x \lambda P \lambda y \lambda e[P(y,e) \wedge \exists s \exists s' \exists e'[participant'(e',x) \wedge \mathbf{quality}'(e,s) \geq \mathbf{quality}'(e',s')]]$

- Furthermore, *like* mandatorily attaches high, after comparative morphology but before the surface subject, and thus will always predicate over the highest event of which the surface subject will always be the participant.

  - In an inchoative with just v_{become} this is the patient, and thus the prototypicality is of the change-of-state event. Because this is tied intrinsically to the state, both manner quality and property quality readings are possible.
  - In an causative with v_{cause} this is an agent, and because v_{cause} is already asserts something about the quality of the causing event, **quality** in like is similarly constrained in its dimension of measurement. As such, property quality readings are excluded.

- The presence or absence of a property reading comes from the interaction of high attachment of *like* and the constraints placed on the interpretation of prototypicality by the verb.

∴ The data in (60) do not hinge on a structural asymmetry, i.e. presence/absence of an adjective. It emerges from independent properties of the components of the verb and its modifiers.

12 Conclusion

- A scalar analysis of change is possible in a decompositional approach, but classic aspects of decompositional such as sublexical scope give us insights into how best to integrate scales.
- Roots introduce absolute degree comparison, but standards and degree accessibility come from functional heads (see also Bochnak et al. 2020). Different templatic levels introduce different notions of scalarity, including difference degrees for v_{become} and quality for v_{cause}.

(64)

head	**introduces comparison**	**standard expressable by *than***
$\sqrt{\text{ROOT}}$	to generic standard	no
adj	no	no
pos	no (but sets positive standard)	no
μ	no (but sets comparative standard)	yes (comparative standard)
v_{become}	to difference degree (and sets verbal standard)	yes (difference degree)
v_{cause}	to quality degree	yes (quality degree)

- An alternative might decompose the semantics of our ultimate root forms into smaller heads (perhaps like Wellwood 2015) below category heads, but the results would be equivalent.
- Analyses that build truly adjectival meaning into verbs though seem not to be correct — rather, a more stripped down core of unspecified comparison is shared between adjectives and verbs, which are thus derived equipollently despite their surface morphology.
- The resulting picture, then, is that we need standard decompositional analyses built around stative roots, but the root meanings have to be much more complex than standardly assumed:
  - Stative roots themselves fall into the PC vs. result root divide.
  - PC roots have comparison to a standard in their meaning, something that is also introduced in other places by templatic heads.
  - Result roots have not just comparison to a standard in their meaning but also (incremental) change as well, something also introduced in templatic heads.
  - (Some result roots further have action that causes the change, defying Manner/Result Complementarity, another instance of defying bifurcation.)
  - The patterns of comparison in all cases are distinct across different surface categories, suggesting that there is no unified categorial core to change-of-state verbs and their corresponding adjectives, but the roots *do* introduce significant shared scalar meaning.
- The result is that apparent bifurcation violations abound, suggesting that roots are doing a lot of the semantic work we had previously attributed to templates.
- Yet templates are still needed: what degrees are modifiable, where attachment points are available for sublexical modifiers, and certain cases of regular addition of meaning (setting standards, introducing incrementality and causation) seem to require them.

- So while the picture above blurs the distinction between roots and templates, the division is still justified, thus supporting the earliest conclusions of Dowty (1979) of the need for event structures while addressing the lacuna that had left him concerned about their prospects.

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References

Alexiadou, Artemis, Elena Anagnostopoulou, and Florian Schäfer. 2015. *External Arguments in Transitivity Alternations: A Layering Approach*. Oxford: Oxford University Press.

Arad, Maya. 2005. *Roots and Patterns: Hebrew Morpho-Syntax*. Dordrecht: Springer.

Beavers, John. 2008. 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. 2010. The structure of lexical meaning: Why semantics really matters. *Language* 86:821–864.

Beavers, John. 2011. On affectedness. *Natural Language and Linguistic Theory* 29:335–370.

Beavers, John. 2012a. Lexical aspect and multiple incremental themes. In V. Demonte and L. McNalley, eds., *Telicity, Change, and State: A Cross-Categorial View of Event Structure*, pages 23–59. Oxford: Oxford University Press.

Beavers, John. 2012b. Resultative constructions. In R. I. Binnick, ed., *The Oxford Handbook on Tense and Aspect*, pages 908–933. Oxford: Oxford University Press.

Beavers, John, Michael Everdell, Kyle Jerro, Henri Kauhanen, Andrew Koontz-Garboden, Elise LeBovidge, and Stephen Nichols. 2021. States and changes-of-state: A cross-linguistic study of the roots of verbal meaning. *Language* 97:439–484.

Beavers, John and Andrew Koontz-Garboden. 2020. The Roots of Verbal Meaning. Oxford: Oxford University Press.

Bobaljik, Jonathan. 2012. *Universals in Comparative Morphology: Suppletion, Superlatives, and the Structure of Words*. Cambridge, MA: MIT Press.

Bochnak, M. Ryan. 2010. Quantity and gradability across categories. In *Semantics and Linguistic Theory*, vol. 20, pages 251–268.

Bochnak, M. Ryan. 2013. Two sources of scalarity within the verb phrase. In B. Arsenijević, B. Gehrke, and R. Marín, eds., *Studies in the composition and decomposition of event predicates*, pages 99–123. Springer.

Bochnak, M.R̃yan, Margit Bowler, Emily Hanink, and Andrew Koontz-Garboden. 2020. Degreefulness is the result of functional inventory, not a parameter. Paper presented at Sinn und Bedeutung 25, UCL and Queen Mary.

Borer, Hagit. 1991. The causative-inchoative alternation: A case study in parallel morphology. *The linguistic review* 8(2-4):119–158.

Borer, Hagit. 2005. *Structuring Sense, Vol. I and II*. Oxford: Oxford University Press.

Deo, Ashwini, Itamar Francez, and Andrew Koontz-Garboden. 2013. From change to value difference in degree achievements. In *Proceedings of SALT 23*.

Dixon, R. M. W. 1982. *Where Have all the Adjectives Gone!*. Berlin: Mouton Publishers.

Dowty, David. 1979. *Word Meaning and Montague Grammar*. Dordrecht: Reidel.

Dunbar, Ewan and Alexis Wellwood. 2016. Addressing the "two interface" problem: Comparatives and superlatives. *Glossa* 1(1):1–29.

Embick, David. 2004. On the structure of resultative participles in English. *Linguistic Inquiry* 35:355–392.

Embick, David. 2009. Roots, states, and stative passives. Talk given at the 2009 Roots Workshop, Stuttgart.

Goldberg, Adele E. 1995. *Constructions: A Construction Grammar Approach to Argument Structure*. Chicago, IL: University of Chicago Press.

Goldberg, Adele E. and Ray Jackendoff. 2004. The English resultative as a family of constructions. *Language* 80:532–569.

Hay, Jennifer, Christopher Kennedy, and Beth Levin. 1999. Scalar structure underlies telicity in degree achievements. In *The Proceedings of SALT IX*, pages 127–144.

Kastner, Itamar. 2018. Templatic morphology as an emergent property: Roots and functional heads in Hebrew. *Natural Language & Linguistic Theory* pages 1–49.

Kearns, Kate. 2000. *Semantics*. New York, NY: St. Martin's Press.

Kelly, Justin. 2013. *The Syntax-Semantics Interface in Distributed Morphology*. Ph.D. thesis, Georgetown University, Washington, DC.

Kennedy, Christopher. 2007. Vagueness and grammar: The semantics of relative and absolute gradable adjectives. *Linguistics and Philosophy* 30:1–45.

Kennedy, Christopher and Beth Levin. 2008. Measure of change: The adjectival core of degree achievements. In L. McNally and C. Kennedy, eds., *Adjectives and Adverbs: Syntax, Semantics, and Discourse*, pages 156–182. Oxford, UK: Oxford University Press.

Kennedy, Christopher and Louise McNally. 2010. Color, context, and compositionality. *Synthese* 174(1):79–98.

Koontz-Garboden, Andrew. 2010. The lexical semantics of derived states. *Linguistics and Philosophy* 33:285–324.

Koontz-Garboden, Andrew and Itamar Francez. 2010. Possessed properties in ulwa. *Natural Language Semantics* 18:197–240.

Kratzer, Angelika. 2004. Telicity and the meaning of objective case. In J. Guéron and J. Lecarme, eds., *The Syntax of Time*, pages 389–423. MIT Press.

Krifka, Manfred. 1998. The origins of telicity. In S. Rothstein, ed., *Events and Grammar*, pages 197–235. Dordrecht: Kluwer.

Lakoff, George. 1965. *On the nature of syntactic irregularity*. Ph.D. thesis, Indiana University, Bloomington, Bloomington, IN. Published 1970 as Irregularity in syntax. New York: Holt, Rinehart, and Winston.

Levin, Beth and Malka Rappaport Hovav. 1995. *Unaccusativity: At the Syntax-Lexical Semantics Interface*. Cambridge, MA: MIT Press.

Marantz, Alec. 1997. No escape from syntax: Don't try morphological analysis in the privacy of your own lexicon. In *Proceedings of the 21st Annual Penn Linguistics Colloquium*, vol. 4.2 of *University of Pennsylvania Working Papers in Linguistics*, pages 201–225.

Ramchand, Gillian. 2008. *Verb Meaning and the Lexicon: A First Phase Syntax*. Cambridge: Cambridge University Press.

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*, pages 13–42. 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.

Wechsler, Stephen. 1997. Resultative predicates and control. In *Texas Linguistics Forum 38: The Syntax and Semantics of Predication*, pages 307–321. The University of Texas at Austin, Austin, TX.

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.

Wellwood, Alexis. 2015. On the semantics of comparison across categories. *Linguistics and Philosophy* 38:67–101.