

Change of state verbs and the semantics of roots

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All theories of event structure, whether lexicalist (e.g. Levin and Rappaport Hovav 1995), constructionalist (e.g. Goldberg 1995), or syntactic (e.g. Ramchand 2008) share the assumption that verb meanings decompose into an event template defining the broad temporal and causal structure of the event described and an idiosyncratic root filling in real world details about the event. For example, all change of state verbs share a lexical entailment of change of their theme arguments, represented through a shared BECOME operator in their event templates. How such verbs differ is in the specific state that the theme changes into, represented by a verb-specific lexical semantic root. A common implementation of this idea is that the verb's template is a syntactic decomposition into functional heads (e.g. v), one of which introduces the entailments of a BECOME operator, with the verb's morphological root introducing the state, as in (1) for *crack* and *flatten*:

- (1) a. John flattened a rug $\approx [{}_{vP} \text{John } [{}_{v'} v_{\text{cause}} [{}_{vP} \text{a rug } [{}_{v'} v_{\text{become}} \sqrt{\text{flat}}]]]]$
b. John cracked a vase $\approx [{}_{vP} \text{John } [{}_{v'} v_{\text{cause}} [{}_{vP} \text{a vase } [{}_{v'} v_{\text{become}} \sqrt{\text{cracked}}]]]]$

A basic assumption of much work on event structures is that root and template meanings are “bifurcated” (Embick 2009), i.e., that (i) the lexical entailments introduced by roots are only introduced by roots and (ii) those introduced by templates are only introduced by templates. In this talk we show through a study of change of state verbs that the second claim is false — entailments of change can be introduced directly by roots. In particular, we suggest this is so for roots of Levin's (1993) *break*, *cook*, and *kill* classes (hence *crack*-type), though not for roots of verbs of changes into Dixon's (1982) “property concept” states, i.e., Levin's (1993) deadjectival classes (hence *flat*-type). The evidence comes from both semantic and morphological considerations, which we explore in turn, followed by discussion of the analytical consequences of our observations.

Semantic predictions If the roots of change of state verbs never introduce entailments of change, then these must come from some v_{become} head, meaning that all change of state verbs must have structures like those in (1). Indeed, this is a common assumption (see e.g. Lakoff 1970; Hale and Keyser 2002; Embick 2004), e.g. in Generative Semantic analyses, not only are verbs like *flatten* treated as being derived from an underlying stative primitive, but also verbs like *kill*, famously decomposed syntactically as CAUSE BECOME *dead*. But the claim that the roots of change of state verbs never introduce entailments of change predicts that whenever the verb's morphological root appears in a syntactic context *lacking* the v_{become} head, a change should not be entailed. However for some roots, the evidence suggests the opposite.

Consider adjectival contexts, where the functional head defining the relevant stative template (e.g. *Asp* in Embick 2004) does not (necessarily) require a v_{become} . In this case, the surface adjective should not (necessarily) introduce any lexical entailments of change. This prediction is borne out for *flat*-type roots, which have morphologically simple adjectival forms lacking an entailment of change:

- (2) The dirt is red, but it never (got) reddened.

With *crack*-type roots this does not hold. The only adjectival forms are superficially deverbal, and categorically require an entailment of change, equivalent to that found with deverbal adjectives for *flat*-type roots:

- (3) a. # The dirt is reddened, but never (got) reddened. b. # The glass is cracked, but never (got) cracked.

We also demonstrate that is the case even for “derived stative” uses of adjectives based on *crack*-type roots like *split*, as in *Cleft refers to babies born with split lips*, where although there is no change over time it is nonetheless entailed by *split* that there is a change in space (Gawron 2009; Koontz-Garboden 2010; Deo et al. 2013). While the presence of deverbal morphology in (3) is surely related to the change entailment, the key fact is that *flat*-type roots have forms like (2) lacking a change entailment, but no such form exists for *crack*-type roots. Thus something about these roots ultimately requires the presence of change entailments.

Morphological predictions A standard assumption in event structural approaches is that templates and not roots determine a verb's grammatical properties, e.g. its regular (non-idiosyncratic) morphology. However, there are crucial morphological differences between *flat* and *crack*-type verbs: (i) *flat*-type verbs have verbalizing morphology (e.g. *reddden*, *flatten*, etc.), while *crack*-type verbs do not (e.g. *crack*, *break*, *cook*), (ii) while *flat*-type verbs have morphologically simple stative forms, *crack*-type verbs do not (as above). Embick

(2004) suggests this is an accident: some roots surface as bare adjectives with marked verbs and others as bare verbs with marked adjectives, and it is arbitrary which roots do which. But then the split should not be repeated crosslinguistically, since accidents by definition do not repeat themselves.

Preliminary data we have collected suggest this split is cross-linguistically attested: verbs with meanings in the *flat* class consistently have simple stative forms, while such forms rarely exist for *crack*-type verbs. This is evidenced by data we have collected from Ulwa (Koontz-Garboden 2009), Eastern Armenian (Megerdooomian 2002), and Pima (Smith 2006). There is, then, a crosslinguistic morphological generalization that a uniform theory of change of state verbs misses: the two root types have different morphological properties attested across unrelated languages, contrary to standard assumption that all change of state verbs are built in an identical fashion, suggesting a principled rather than arbitrary distinction between them.

Analysis We propose a simple analysis of the two root classes that elegantly captures the above data: while *flat*-roots relate individuals to simple states, *crack*-roots additionally come with an entailment of change:

- (4) a. $\llbracket \sqrt{flat} \rrbracket = \lambda x \lambda s [flat'(x, s)]$
 b. $\llbracket \sqrt{crack} \rrbracket = \lambda x \lambda s [has.fissure'(x, s) \wedge \exists e' [become'(e', s)]]$

Defining v_{become} as in (5a) and combining it with the roots in (4) derives the inchoative predicates in (5b,c).

- (5) a. $\llbracket v_{become} \rrbracket = \lambda P \lambda x \lambda e \exists s [become'(e, s) \wedge P(x, s)]$
 b. $\llbracket v_{become} \sqrt{flat} \rrbracket = \lambda x \lambda e \exists s [become'(e, s) \wedge flat'(x, s)]$
 c. $\llbracket v_{become} \sqrt{crack} \rrbracket = \lambda x \lambda e \exists s [become'(e, s) \wedge has.fissure'(x, s) \wedge \exists e' [become'(e', s)]]$

Truth conditionally, the events described by (5b,c) are identical save the final state: there is a state for the theme and an event of it coming about. But in the case of *crack*-type roots the root itself already asserts the existence of the change independent of v_{become} , something that will be preserved in all contexts the root is used in, correctly predicting that there can be no adjective form of a *crack*-root lacking this entailment, whereas there can be for a *flat*-type root. A key corroborating prediction of this analysis comes from the behavior of *crack*-type roots under sublexical modification, where a modifier like *again* can scope over just the root in an event structure like (1) to yield a so-called restitutive reading (see Dowty 1979:265). Rappaport Hovav (2010:7) observes that while *flat*-type verbs allow restitutive modification, verbs like *thaw* do not:

- (6) a. Kim flattened the metal again. (only one flattening necessarily presupposed)
 b. Kim thawed the meat again. (impossible where meat returned to unfrozen state only once)

That *flat*-type verbs allow a true restitutive reading follows if the root *again* scopes over has a meaning like (4a), since all that must have held before was a flatness state. The absence of this reading for *crack*-type roots follows even on low attachment of *again* if the root has a meaning like (4b), since not only must the state have held before but there also must have been a change into that state. Finally, this analysis offers an intuitive understanding of the morphological differences in terms of iconicity: roots with purely stative meanings are unmarked as adjectives but marked as verbs, while roots with change in their meaning are unmarked as verbs but marked as adjectives. More specifically, this could be understood as root-conditioned allomorphy of adjectivalizing and verbalizing heads (null if the root has the appropriate unmarked reading and marked otherwise, though necessitating that allomorphy is conditionable on root semantics), or as a requirement that *crack*-type roots lack Spell-Outs when combined solely with adjectivalizing heads and thus must always combine with a v_{become} first, making all adjectives with *crack*-type roots deverbal. Regardless of implementation, that these patterns are repeated crosslinguistically for the same underlying roots points to commonalities in lexicalization that most likely follow from common functional pressures on that process.

Analytical consequences *Crack*-type roots introduce not only entailments about the nature of the state, but also an entailment of change itself, much as independently proposed by Beavers and Koontz-Garboden (2012) for manner of killing verbs and cooking verbs, thereby invalidating the bifurcation thesis. These roots contrast with *flat*-type roots, which lack change entailments. That this distinction exists is explainable on simple conceptual grounds: while certain states may exist *a priori* of any event leading to them, in principle some states may only arise due to a specific event. Roots that have such states as part of their meaning will thus necessarily also have change in their meaning. Thus the existence of *crack*-type roots is expected, and the data above suggest that languages are sensitive to this distinction.