

Two Types of States: A Cross-linguistic Study of Change-of-State Verb Roots

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Introduction

- It is typically assumed that verb meanings consist of an “event structure” constraining the events described by the verb, consisting of (a) a template that defines the verb’s grammatical properties (e.g. via functional v heads; Marantz 1997) and (b) idiosyncratic roots filling in real world meanings (e.g. manner, state; Rappaport Hovav and Levin 1998):

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

Are the notions of CAUSE and BECOME only introduced by templates – or can roots carry these meanings on their own?

- The null hypothesis is that if templates determine grammatical behavior, the templatic meanings (e.g. CAUSE, BECOME) should be excluded from roots, Embick’s (2009) “Bifurcation Thesis for Roots” (BTR) and Arad’s (2005) “Root Hypothesis”.
- We present a broad typological study into this question, focusing on the change entailment in change-of-state verbs, a meaning that in all approaches is templatic.

We show that across languages certain root classes entail change regardless of the template, and show morphosyntactic properties indicating that they are derived in distinct ways not predicted by the BTR.

Stative Forms

- One morphological prediction of the BTR is that barring lexical idiosyncrasy all roots of change-of-state verbs should show the same stative forms.
- We distinguish two types of roots: property concept (PC) roots and result roots:

Property Concept Roots	Result Roots
a. <i>Dimension</i> : large/big/enlarge, small/shrink/shrunken, short/shorten, ...	a. <i>Entity-specific Change of State</i> : burned/burn, melted/melt, frozen/freeze, ...
b. <i>Age</i> : old/aged/age	b. <i>Cooking Verbs</i> : cooked/cook, baked/bake, fried/fry, roasted/roast, ...
c. <i>Value</i> : bad/worsen/worse, good/improve/improved	c. <i>Breaking Verbs</i> : broken/break, cracked/crack, crushed/crush, ...
d. <i>Color</i> : white/whiten, black/blacken, red/redden, green/make green, ...	d. <i>Bending Verbs</i> : bent/bend, folded/fold, wrinkled/wrinkle, creased/crease
e. <i>Physical Property</i> : cool/cool, dirty/dirty, dry/dry, wet/wetted, ...	e. <i>Verbs of Killing</i> : dead/killed/kill, murdered/murder, drowned/drown
f. <i>Speed</i> : fast/speed up, slow/slow down	f. <i>Destroying Verbs</i> : destroyed/destroy (ruined/ruin)
g. <i>Human Propensity</i> : angry/anger, calm/calmed, sick/sicken, ...	g. <i>Verbs of Calibratable Change of State</i> : go up, go down, ...
	h. <i>Verbs of Inherently Directed Motion</i> : come/come, gone/go, go in, go out, ...

- In English, property concept roots show two stative adjectival forms: a simple, undervived adjective and a deverbal form with verbalizing $-en$ morphology:
 - (2) a. Look at the bright picture on your left. (=camera took a bright picture)
 - b. Look at the brightened picture on your left. (=camera took a bad picture, brightened with e.g. software)
- However, result roots have just one morphological form (the deverbal $-en$ form) for their stative adjectives:
 - (3) broken, chipped, cracked, crashed, crushed, fractured, ripped, shattered, smashed, snapped, splintered, split, torn, baked, barbecued, blanched, boiled, braised, ...
- Furthermore, the two adjectives of PC roots have different meanings – the $-en$ form entails change, but the simple form does not. The single form of result roots, the $-en$ form, always entails change:
 - (4) a. The vase is red, but it has never (been) reddened.
 - b. The vase is reddened, #but it has never reddened.
 - c. The vase is broken, #but it has never broken.
- The lack of a simple state for the result roots might be an accident of English.
- We show in this study, however, that this pattern recurs across languages.

Cross-linguistic Study

- Our methodology was to take a balanced language sample and check for the existence of simple statives based on specific root meanings.
- We targeted the World Atlas Language Structures (WALS) 100 Language Sample.
 - When we lacked sufficient grammatical and dictionary resources, languages were substituted from the sister WALS 200 list.
 - Several languages were added opportunistically (native speakers/fieldworkers).
- We collected paradigms of simple state-inchoative-causative-result state (e.g. *red-redden-redden-reddened*) for translations of the roots we examined in English, plus also any underlying root for languages in which such paradigms are based on a shared bound root:

(5) Language	underlying root	simple state	inchoative	causative	result state
Tenango Tzeltal	—	<i>tut</i> 'small'	<i>tut-ub</i> 'shrink'	<i>tut-ub-tes</i> 'shrink'	<i>tut-ub-en</i> 'shrunken'
Oromo	<i>dheer-</i> 'long'	<i>dheeraa</i> 'long'	<i>dheeraddh</i> 'become long'	<i>dheeressuu</i> 'lengthen'	—

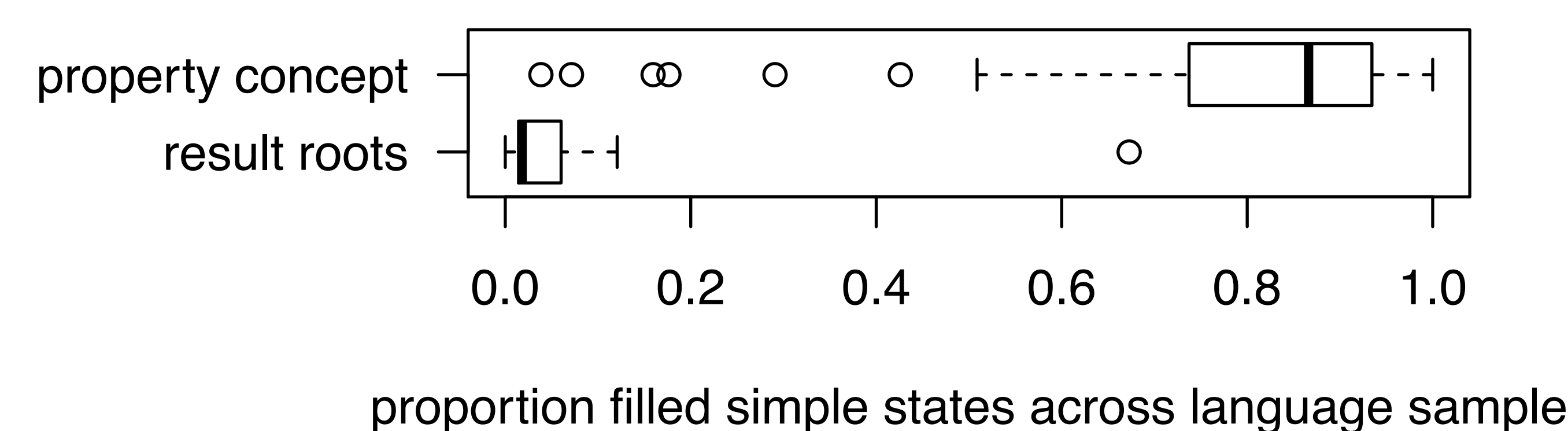
- Some grammars described productive processes for deriving these forms. In cases where we had highly agglutinating languages, hypotheticalizing data was appropriate:
 - (6) Language | underlying root | simple state | inchoative | causative | result state
 - Kiowa | | *ét* | @*ét-5m-gyá* | @*ét-5m* | @*ét-d5*
 - | | 'big' | 'enlarge' | 'enlarge' | 'enlarged'
- We privileged certain forms over others, with the ultimate preference rankings as follows: attested lexicalized form > attested productive morphological form > hypothetical productive morphological form > attested periphrastic form > hypothetical periphrastic form > no data

Results

- To date, we have full data on 73 languages. This yields 3120 PC roots and 2241 result roots.

The main overall pattern holds: PC roots overwhelmingly tend to have simple stative forms (that usually serve as input to the rest) and result roots overwhelmingly tend not to (though there are exceptions in both directions).

- We ran a Mann Whitney U-test on the proportion of simple statives for both PC and result roots ($p < 0.001$) These results did not change if we threw out hypotheticals.



Acknowledgments



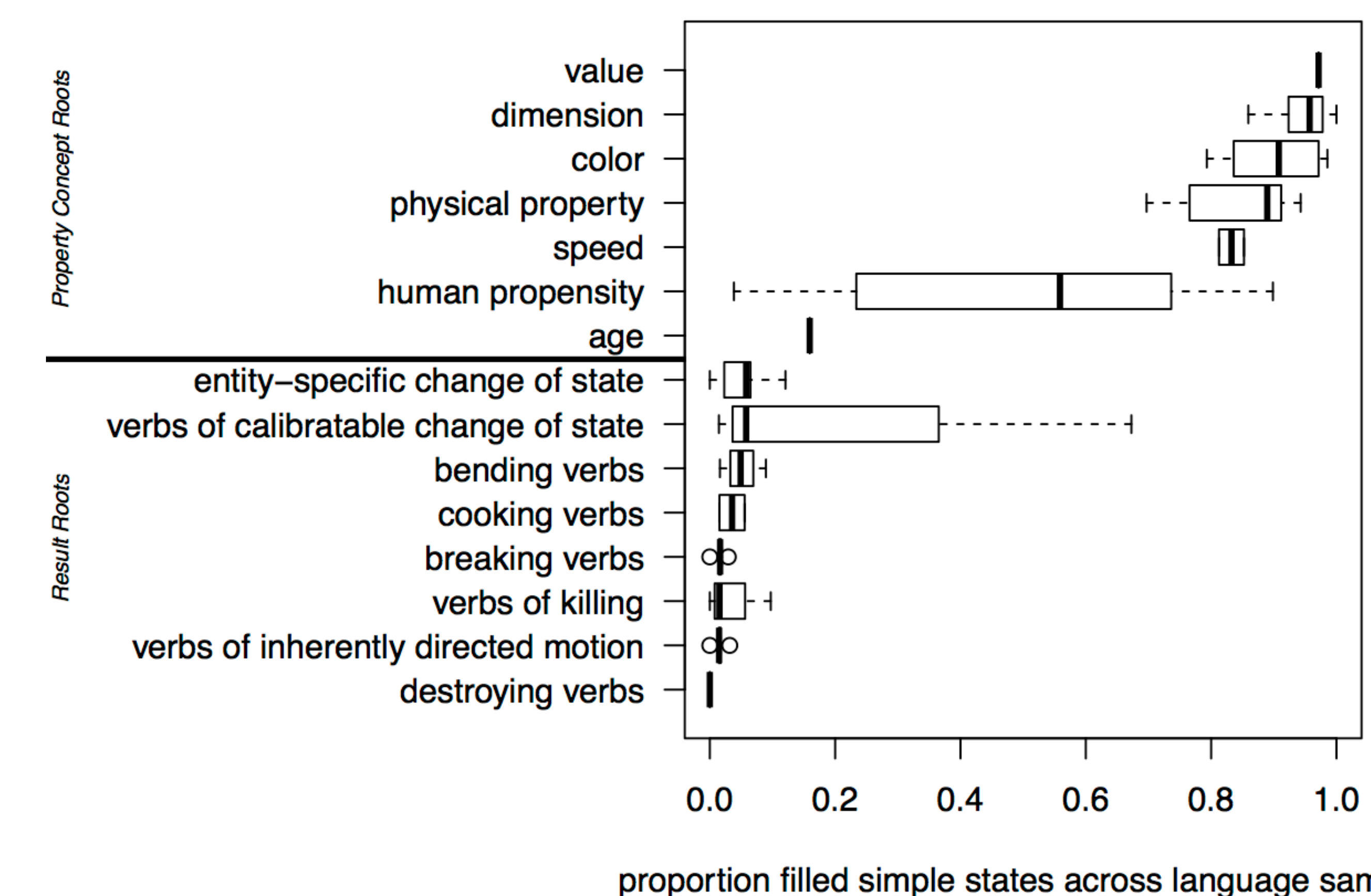
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We aim to have all of the data collected online in a searchable database sometime in the coming months, with a bibliography and additional information about the methodology and results.

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- We also did a similar comparison across root subclasses (and the difference was again significant on a one-way ANOVA across all subclasses; $p < 0.001$):



- To test the semantic predictions cross-linguistically, we chose opportunistic in-depth studies using Kinyarwanda and Kakataibo as case studies (see Jerro 2017 and Valle et al. 2017). These data are not presented here.
 - Crucially, PC roots behaved as predicted by the BTR (having a purely stative meaning) while result roots always had an entailment of change.

Conclusions

- The cross-linguistic morphological generalization seems clear:

State-denoting words based on result roots don't exist in the same morphological form that PC roots do. The former tend to lack simple stative forms, the latter have them.

- Under the BTR, the roots of result verbs should lack entailments of change and any forms based on them would have to acquire one through the addition of a v_{become} head.
 - In contexts without this head, the change entailment should not arise.
 - Statives are such contexts, yet the entailment is there – violating the BTR (see (4c)).
- Morphologically, in at least *some* languages result roots should have simple stative forms, but this rarely happens. And clearly not to the degree that it does with the PC roots.
- To explain these data, one can assume that roots of PC verbs and result root verbs differ in that the former describe simple states and the latter states for which it is also entailed that there exist a cause:
 - (7) a. $[[\sqrt{\text{flat}}]] = \lambda x \lambda s [flat'(x, s)]$
 - b. $[[\sqrt{\text{crack}}]] = \lambda x \lambda s [has.fissure'(x, s) \wedge \exists e' [become'(e', s)]]$
- Then, if the v_{become} head is defined as in (a) below, then you can generate inchoative verbs as in (b,c):
 - (8) a. $[[v_{\text{become}}]] = \lambda P \lambda x \lambda e \exists s [become'(e, s) \wedge P(x, s)]$
 - b. $[[v_{\text{become}} \sqrt{\text{flat}}]] = \lambda x \lambda e \exists s [become'(e, s) \wedge flat'(x, s)]$
 - c. $[[v_{\text{become}} \sqrt{\text{crack}}]] = \lambda x \lambda e \exists s [become'(e, s) \wedge has.fissure'(x, s) \wedge \exists e' [become'(e', s)]]$
- Morphological asymmetry would have to be addressed by positing morphological realization rules that are sensitive to root semantics: roots with no change entailment are unmarked adjectives but marked verbs, and roots with change entailments are unmarked verbs but marked adjectives.
- However, standard event structural approaches stress that regular morphological rules should not be sensitive to root semantics. Yet it seems clear that the pattern governing the overt realization must be contingent on root semantics, suggesting the overall correctness of our analysis, arguing against that aspect of event structural theories.

In sum, the root carries an entailment that can be elsewhere introduced templatically, and it can matter grammatically. This is inconsistent with the BTR.