

States and Changes-of-State: A Cross-Linguistic Study of The Roots of Verbal Meaning

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Abstract

What are the basic building blocks of verb meanings, how are they composed into more complex meanings, and how does this explain the grammatical properties of verbs and their relationships to other words with related meanings? These questions are fundamental to the study of verb meaning, and some of the most fruitful attempts to answer them have come from event structural theories, wherein verb meanings are assumed to be decomposed into an event template capturing the verb's broad temporal and causal contours and an idiosyncratic root shared across templates naming specific actions and states for a given verb. Many such theories assume a bifurcation in the meanings contributed by roots and templates: broad eventive lexical entailments are only introduced by the templates, never the idiosyncratic roots. Since event templates and not roots are the primary semantic correlates of a verb's grammatical properties, bifurcation makes strong predictions about the correlation of a verb's broad temporal and causal semantics and its syntax and morphology. We argue against this bifurcation by comparing translation equivalents of Levin's (1993) non-deadjectival vs. deadjectival change-of-state verb roots in English (e.g. *crack* vs. *red* roots) across languages. A broad-scale typological study reveals that *red*-type roots tend to have unmarked stative forms and marked verbal forms, while *crack*-type roots have the opposite pattern. Semantic studies of several languages confirm that terms built on *crack*-type roots always entail change, while terms based on *red*-type roots do not. We thus suggest that *crack*-type roots entail change independent of the template, contra bifurcation. This presents a more complex, albeit still principled, theory of possible event structural meaning and its grammatical correlates, one that takes subclasses of roots into account.

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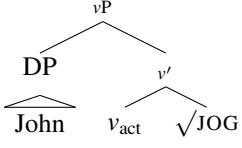
1 Introduction

Languages vary in the lexical categories which describe basic types of eventualities such as states and changes into states. Changes of state are typically lexicalized as verbs, while the states themselves are lexicalized as adjectives, verbs, or nouns. There is also variation in the relationship between words describing states and changes into those states. Sometimes the same surface form is used to describe both (e.g. English *open*), or they may be derivationally unrelated (e.g. *good* vs. *improve*). However, it is common that the change-of-state verb is derived from or otherwise overtly more marked than the stative, for example the English stative adjective *flat* is the basis for the (caused) change-of-state verb *flatten*. This is unsurprising since a change-of-state event is built conceptually around a state, so that the process of deriving an eventive term from a stative correlates iconically with deriving a more complex event that also incorporates causation and change.

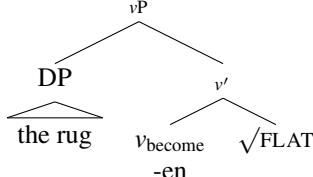
A common theoretical assumption derived from patterns such as these is that verb meanings consist at least partly of an “event structure” defining the kinds of events the verb describes (see e.g. Lakoff 1965, McCawley 1971, Ross 1972, Dowty 1979, Pinker 1989, Jackendoff 1990, Hale & Keyser 1993, 1997, 2002, Levin & Rappaport Hovav 1995, Rappaport Hovav & Levin 1998, Pesetsky 1995, Baker 1997, Marantz 1997, Wunderlich 1997, Van Valin & LaPolla 1997, Davis & Koenig 2000, Davis 2001, Folli & Ramchand 2002, Folli & Harley 2004, Harley 2003, 2012, Ramchand 2008, *inter alia*). Event structures are decomposed into two components. The first is a skeletal “event template” built from a small number of basic event-denoting primitives that define the broad temporal and causal contours of events described by the verb, grouping verbs into semantically-unified classes such as (caused) change-of-state. The second is an idiosyncratic lexical semantic “root” that fills in specific states or actions for a given verb’s template, distinguishing verbs within a class. A further assumption is that a verb’s grammatical properties, such as its argument structure and derivational morphology, are largely tied to its template, correctly predicting that semantically coherent verb classes tend to be syntactically homogeneous. Within a verb class the main overt distinction between verbs is their idiosyncratic morphological roots, essentially being the overt signal of a verb’s idiosyncratic lexical semantic root. Returning to states and change-of-state, the state is defined by the idiosyncratic root — which can also surface in (trivial) stative event structures as adjectives or other state-denoting categories — and it is the augmentation of this root by an event template that entails change that produces the change-of-state verb. The addition of the extra event structure may explain why change-of-state verbs are sometimes more marked than their more basic stative counterparts.

These insights have been formalized in different ways, ranging from approaches that treat event structures as purely lexical semantic representations to more configurationally-defined approaches. One common modern implementation in the latter mold is that a verb’s event structure is a phrase structure built from functional heads (e.g. light verbs of category *v*) that define the event template and an (acategorial) idiosyncratic morphological root that defines its lexical semantic root (Marantz 1997, Embick 2004, Ramchand 2008, Harley 2012). Thus *flatten* is the realization of two event structures consisting of a state-denoting root $\sqrt{\text{FLAT}}$ combined with *vs* introducing change and causation, as in (1b,c) (loosely following Embick 2004: 362, 365-366). Moving beyond change-of-state, activity *jog* is the surface realization of a manner-denoting root $\sqrt{\text{JOGL}}$ modifying an action-denoting *v* as in (1a). (We ignore structure introducing tense and grammatical aspect.)

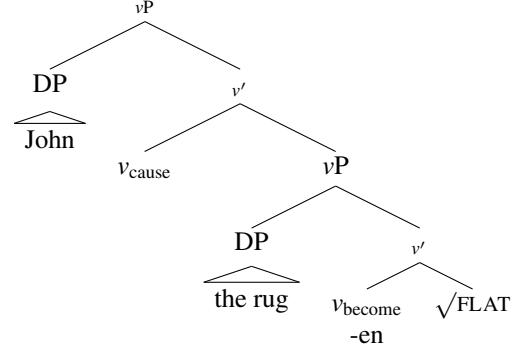
(1) a. John jogged.



b. The rug flattened.



c. John flattened the rug.



Each template predicts that the given verb belongs to a particular semantic class (action, change-of-state, caused change-of-state); other verbs in each class have the same templates but different roots naming different actions or states. Since the event structure is a phrase structural object, a correspondence with grammatical properties follows: the *vs* take the verb's arguments (determining its argument structure), contribute regular morphology (e.g. verbalizing *-en* from *v_{become}*), define the verb's aspectual class (e.g. (1a) is an activity, (1b) an achievement, and (1c) an accomplishment; Dowty 1979: Ch.2), and capture analytic relationships between verbs with shared roots (e.g. (1c) entails (1b) since the latter embeds the former). The root just determines the verb's idiosyncratic morphology. A root can occur in multiple templates, e.g. *√FLAT* occurs in (1b) and (1c) plus stative templates defining adjectives. Alternatively, event structures could be distinct representations related to the phrase structure by correspondence rules deriving the same predictions (see e.g. Levin & Rappaport Hovav 1995: 20-30, Rappaport Hovav & Levin 1998, Wunderlich 1997, Van Valin & LaPolla 1997: 102-129). Either way, event structures define broad verb types with shared grammatical properties, with idiosyncratic variation within the type. Provided we have a constrained theory of the building blocks of event structures, how they are composed, and how they correlate with a verb's grammatical properties, we make predictions about (im)possible verbs semantically and grammatically, with roots and templates having distinct roles in deriving the predictions.¹

However, while event structural approaches are clear about the grammatical division of labor between roots and templates, an underexplored question (though see Dowty 1979: 125-129, Goldberg 1995: 27-31, 59-66, and Wechsler 2005) is whether there is an equivalent divide in their semantic labor. Can templates introduce the idiosyncratic meanings roots do, or can roots ever introduce the broad, templatic meanings templates do? Or do they make entirely distinct contributions? To put it another way, is naming real world states solely the purview of idiosyncratic lexical units and is naming broad event types solely the correlate of regular grammatical constructs? Templates presumably never introduce highly idiosyncratic meanings: they are few in number and must host a range of roots, and so must of necessity have fairly general meanings. However, there is no reason a root could not introduce broad templatic meanings as well as idiosyncratic actions and states, and it is an open question if they do. The field, however, has mostly focused on templatic primitives. This is understandable — if templates predict most of the verb's grammatical and semantic properties a theory of templates is fundamental to a theory of possible verb classes. Furthermore, it may seem fruitless to explore root meaning in too much detail, where we mostly

¹Some event structural approaches (e.g. Pinker 1989, Jackendoff 1990) do not make a categorical ontological distinction between templates and roots. However, the distinction arises as an emergent property between shared vs. non-shared aspects of the event structures of verbs in a class, and thus it is still possible to theorize about the distinction.

expect to find a myriad of fine-grained but linguistically uninteresting distinctions. But as Dowty (1979: 125-126) notes if we do not have a theory of what roots can mean then we do not have a theory of what event structures can mean, since predictions based solely on a theory of templatic meanings would be blunted if a root can have any meaning at all.

A common implicit and sometimes explicit assumption is that templatic entailments are excluded from roots, for example as outlined in Embick's (2009: 1) "Bifurcation Thesis for Roots" and Arad's (2005: 79) "Root Hypothesis" (see also Borer 2005, 2013, Dunbar & 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 [i.e. is introduced by a functional head — AUTHORS], then that component of meaning cannot be part of the meaning of a root.

Bifurcation is a reasonable hypothesis about the organization of a lexicon. Roots need only name specific actions and states, and more complex meanings can be built compositionally from recurring, independently justified universal processes. If roots incorporated the meanings of templates it would lead to redundancy and a potential explosion in the lexicon. Bifurcation is also a strong hypothesis in predicting possible and impossible word meanings: all roots of the same type (e.g. action or state-naming) should by default occur in all the same templates. Thus the presence or absence of particular templatic meanings (e.g. causation) should by default correlate with a consistent set of regular grammatical properties (e.g. transitivity), since those meanings would have to be introduced by specific templates. Bifurcation thus predicts a strong correspondence between the broad templatic meaning and grammatical behavior of verbs. Of course, Bifurcation is not a necessary assumption. Many works on verb meaning have assumed otherwise (e.g. Goldberg 1995: 59-66 and Rappaport Hovav & Levin 1998: 109 associate roots or equivalent loci of idiosyncratic meaning in some cases with templatic meanings, while Marantz 1997: 216-217, Ramchand 2008: 58 and Alexiadou et al. 2006: 202-203 divide roots into grammatical classes based on such meanings). However, it has largely remained an open question what exactly would decide the issue within event structural traditions, and an answer will have ramifications for theories of possible and impossible verb meanings, raising the possibility that the truth conditional semantics of a verb alone can never be taken as evidence for its event template. Rather, a combination of semantics and other probes for event structure are needed, which would in turn lead to a more complex theory of what kinds of verb meanings we expect to find in languages.

For change-of-state verbs, the question is: does the root of a change-of-state verb just name the state itself, or can it name more than the state? Koontz-Garboden & Beavers (2017) provide an explicit argument against Bifurcation, proposing that roots of some English change-of-state verbs entail change (see also Beavers & Koontz-Garboden 2017 on entailments of possession in English ditransitive roots). They distinguish two types of change-of-state verb roots: those that underlie deadjectival change-of-state verbs (Levin 1993: 245), which do not entail change, and those that underlie the non-deadjectival change-of-state verbs, which do entail change.² This argument is based on distinct morphological properties of the two root classes in their adjectival forms, plus semantic evidence suggesting that one class of roots is disassociable from an entailment of change

²The terms "deadjectival" and "non-deadjectival" here are meant in a largely descriptive sense, related to asymmetrical markedness of surface forms. In event structural approaches the only necessary claim about related forms like *flat* vs. *flatten* is that they represent different event structures with a shared root $\sqrt{\text{FLAT}}$. Any specific asymmetrical derivational relationship (such as the event structure of one containing the other's) is a matter of a specific analyses, though any analysis should presumably capture regular surface-level morphological relationships.

while the other is not. These results argue against Bifurcation, calling into question the predictive value of event structures for constraining possible verb (and adjective) meanings.

However, Koontz-Garboden & Beavers's study is largely restricted to English, and the patterns they observe could amount to a series of language-particular coincidences analyzable in a way consistent with Bifurcation. We present a cross-linguistic study on entailments of change in the roots of change-of-state verbs that fundamentally confirms their conclusions, looking at two broad classes of evidence. First we consider entailments of change in change-of-state verbs in a series of (mostly) unrelated languages and use standard tests for examining root vs. template contribution (including sublexical modification à la Dowty 1979: 252–254, 260–269, von Stechow 1995, 1996, 2003, Marantz 2009 and cross-categorial entailment patterns) to show that roots with related meanings across languages tend to pattern like the deadjectival and non-deadjectival change-of-state verb root distinction seen in English, with the former class of roots not entailing change and the latter entailing change. We then couple this with a typological study of the morphological patterns of roots with similar meanings across languages. We show that in a balanced sample of languages roots in the two classes tend to have distinct stative forms, where translations of stative terms corresponding to English deadjectival change-of-state verbs tend to have both simple and deverbal stative forms while stative terms corresponding to non-deadjectival change-of-state verbs lack the simple stative forms. Similarly, translations of deadjectival change-of-state verbs tend to be morphologically marked (e.g. derived from more basic stative terms) while translations of non-deadjectival change-of-state verbs tend to be morphologically more basic. In other words, roots that underlie deadjectival change-of-state verbs tend to be lexicalized as basic statives while those that underlie non-deadjectival change-of-state verbs tend to be lexicalized as basic verbs. Putting all of these pieces together, the strong correlations of semantics to grammatical properties Bifurcation predicts do not hold: change-of-state verbs can differ semantically and grammatically depending on the root as well as the template. Nonetheless, we suggest there is still predictive value in event structures. Our results suggest the existence of two types of roots, where each root class interacts with different event templates to derive distinct grammatical and semantic patterns. However, these predictions are crucially more complex than expected under Bifurcation.

In §2 we review and expand the argument that English roots fall into two classes, and consider whether this is a confluence of quirks of English or reflective of a deeper fact about roots whereby some entail change. In §3 we give semantic evidence for an equivalent root class distinction in other languages, and in §4 we outline a typological study showing a morphological contrast between the same two root classes across languages. Taken together, the data suggest that any distinctions between the two root types indicate a larger cross-linguistic trend, supporting an analysis by which some roots entail change and this partly determines their morphology. In §5 we outline a formal analysis and the predictions it makes, considering also alternative implementations that maintain Bifurcation, but which are dispreferred on various grounds. We conclude in §6 with commentary on why the patterns we see exist. It will be useful to have a specific framework of event structures for concreteness, and we adopt the syntactified framework of event structures outlined above since it will provide an expositarily clean way to develop a compositional semantics, though nothing crucially hinges on this. Bifurcation is easily statable in any event structural framework, and thus our conclusions apply equally well to all of them. The key point is that while event structural approaches make an ontological distinction in roots vs. templates as parts of a theory of verb meaning, this distinction does not correspond to an ontological semantic one.

2 Two Types of English Change-of-State Verbs

2.1 Property Concept vs. Result Roots

We first outline the two relevant root classes. Building on a distinction first outlined in Dixon (1982: 50) (see also Megerdoomian 2002: 90-102, Koontz-Garboden 2006), we call the roots of deadjectival change-of-state verbs as in (3) “property concept (PC) roots”, since they name Dixon’s basic properties dimension, age, color, value, etc., while we call the roots of non-deadjectival change-of-state verbs as in (4) “result roots” (presaging our ultimate analysis), which form change-of-state verbs having to do with physical damage, cooking, killing, etc. The items in (3) are those Dixon claimed are most often lexicalized as adjectives across languages (i.e. the most canonical statives), and those in (4) are chosen from Levin (1993) for having meanings likely to have translation equivalents across languages, which will facilitate our later cross-linguistic studies. The examples are given in their verbal and adjectival forms (with synonyms/hyponyms given in parentheses).³

(3) Property Concept Roots

- a. *Dimension*: large/big/enlarge, small/shrink/shrunken, short/shorten, long/lengthen, deep/deepen, wide/widen, tall/height/heighten
- b. *Age*: old/aged/age
- c. *Value*: bad/worsen/worse, good/improve/improved
- d. *Color*: white/whiten, black/blacken, red/redden, green/make green, blue/make blue, brown/make brown
- e. *Physical Property*: cool/cool, cold/make cold, warm/warm, hot/heat up, dirty/dirty, dry/dry, wet/wetted, straight/straighten, hard/harden (tough/toughen), soft/soften, tight/tighten, clear/clear, clean/clean, smooth/smooth, sharp/sharpen, sweet/sweeten, weak/weaken, strong/strengthen
- f. *Speed*: fast/speed up, slow/slow down

(4) Result Roots

- a. *Entity-specific Change of State*: burned/burn, melted/melt, frozen/freeze, decayed/decay (rotten/rot), swollen/swell, grown/grow, bloomed/bloom (flowered/flower, blossomed/blossom), withered/wither (wilted/wilt), fermented/ferment, sprouted/sprout (germinated/germinate), rusted/rust, tarnished/tarnish
- b. *Cooking Verbs*: cooked/cook (baked/bake, fried/fry, roasted/roast, steamed/steam), boiled/boil
- c. *Breaking Verbs*: broken/break, cracked/crack, crushed/crush, shattered/shatter, split/split, torn/tear (ripped/rip), snapped/snap
- d. *Bending Verbs*: bent/bend, folded/fold, wrinkled/wrinkle (creased/crease)
- e. *Verbs of Killing*: dead/killed/kill, murdered/murder, drowned/drown
- f. *Destroying Verbs*: destroyed/destroy (ruined/ruin)
- g. *Verbs of Calibratable Change of State*: go up (raised/rise, ascended/ascend, increased/increase, gained/gain), go down (fallen/fall, dropped/drop, descended/descend, decreased/decrease, declined/decline), differ/different

³A seventh PC class we considered were roots of human propensity (e.g. *angry/anger* and *embarrassed/embarrass*). We ultimately excluded these since many of their verbal forms are stative, and our interest is in change-of-state.

- h. *Verbs of Inherently Directed Motion*: come/came, gone/go, go in (entered/enter), go out (exited/exit), returned/return

We consider several morphological and semantic contrasts between these root classes that suggest the simplest predictions of Bifurcation are not borne out. However, there are ways to analyze the data consistent with Bifurcation, though they involve a series of coincidences that would only be plausible if they were just quirks of English. We suggest an alternative by which result but not PC roots carry a non-cancelable inference of change, contra Bifurcation, owing to the nature of the states they describe. Showing that the patterns recur in other languages will argue against them being language-particular facts and support them being based on something deeper.

2.2 Distinct Stative Forms for PC and Result Roots

One of the simplest predictions of Bifurcation is that the roots of change-of-state verbs should by default show all of the same overt morphological forms. Any exceptions should be due to either (a) narrow subclasses of roots that for reasons compatible with Bifurcation have unique morphological properties or (b) pure lexical idiosyncrasy (e.g. for historical reasons). We first consider stative forms of these roots. English statives are typically adjectives, and PC roots generally show two adjectives: a simple, underived adjective as in (5a) and a superficially deverbal one as in (5b).

- (5) a. Look at the bright picture on your left.
- b. Look at the brightened picture on your left.

Embick (2004: 364-368) analyzes these two forms as the same root occurring in two adjectivalizing contexts: combining directly with a templatic adjectivalizing head Asp_S as in (6a), or combining with a v_{become} and then an adjectivalized Asp_R as in (6b).⁴

- (6) a. Basic states (cp. Embick 2004: 364, (23)): $[\text{Asp}^P \text{Asp}_S \sqrt{\text{ROOT}}]$
- b. Result states (cp. Embick 2004: 367, (29)): $[\text{Asp}^P \text{Asp}_R [v^P \text{DP } v_{\text{become}} \sqrt{\text{ROOT}}]]$

This analysis straightforwardly captures that there are two distinct adjectival forms.

Crucially, with result root change-of-state verbs the only adjective is a deverbal one like (5b):

- (7) baked, bent, bloomed, boiled, broken, burned, cooked, cracked, creased, crushed, decayed, destroyed, drowned, fermented, folded, fried, frozen, grown, melted, murdered, roasted, rusted, ripped, shattered, snapped, split, sprouted, steamed, swollen, tarnished, torn, etc.

There are few if any distinct simple adjectives corresponding to (5a) (one exception being *dead* vs. *killed*, though these are suppletive). Yet under Bifurcation, any stative root should appear in either structure in (6) and thus produce two distinct adjectives. Embick (2004: 358) claims, however, that the roots of (7) do appear in both of (6), but with result roots both Asp_S and Asp_R are overtly realized as *-ed/en* while with PC roots Asp_R is realized as *-ed/en* while Asp_S is null. In other words, (7) are all structurally ambiguous between the two types of adjectives. The split is considered an accident of English — it just happens that there are two classes of roots regarding surface morphology. If this were the only distinction between PC and result roots this would be a plausible analysis. However, there are additional contrasts which complicate this assumption.

⁴Embick labels the change-denoting head FIENT; we use v_{become} . Embick assumes distinct Asp heads for the two structures in (6), but the distinction is irrelevant here and we largely ignore it.

2.3 The Semantics of PC and Result Root Stative Forms

The analysis in (6) makes another prediction: simple PC adjectives will not entail change but deverbal PC adjectives will, since (6b) contains v_{become} and (6a) does not. Thus *bright* can describe something that has always been bright (i.e. it denotes a “simple state”), while *brightened* only describes something that has undergone brightening (i.e. it denotes a “result state”). This prediction is borne out. Simple adjectives are acceptable when change is denied, but not deverbal adjectives:

- (8) a. The bright/#brightened photo has never (been) brightened.
- b. The red/#reddened dirt has never (been) reddened.
- c. The long/#lengthened river has never (been) lengthened.
- d. The short/#shortened rod has never (been) shortened.

Thus PC roots themselves do not entail change, which must instead come from particular templates.

This analysis also predicts that result root adjectives should not entail change, since they are ambiguous between (6a) and (6b) and in any context could be interpreted as (6a). This is not borne out. Adjectival forms of result roots entail a change of the kind described by the corresponding verb (Koontz-Garboden 2005, 2010, Deo et al. 2011):

- (9) a. #The barbecued chicken has never (been) barbecued.
- b. #The cooked chicken has never (been) cooked.
- c. #The dead man never died.
- d. #The shattered vase has never (been) shattered.

This is true even in contexts where the putative state supposedly named by the root (e.g. being in small, separate pieces for $\sqrt{\text{SHATTER}}$) might be considered to hold absent a change into that state. For example, in a context where an artist has carefully made numerous tiny ceramic pieces which, when assembled in just the right way, form a vase, (9d) is still infelicitous. Thus adjectives formed from result roots entail change, suggesting they cannot be analyzed as basic adjectives as in (6a).

A counterexample might be so-called “derived statives” (Nedjalkov & Jaxontov 1988, Koontz-Garboden 2010), where a deverbal adjective occurs in a context without a prior event of change:

- (10) Broken or pecked lines, and dotted lines are constantly used for boundaries, paths, shore-lines, &c. (from the Oxford English Dictionary entry on *broken*)

However, this is not evidence of a (6a)-type structure. First, an apparently non-change-of-state usage of this root occurs with truly verbal forms as well (e.g. *The line breaks several times across the page*). Thus *broken* in (10) could be derived from this sense of the verb. Second, while there is no conventional change-of-state event in (10), recent work has shown that change-of-state is not a purely temporal notion. Instead, changes can also be measured along a spatial scale (Gawron 2006) or even non-spatial scales (Deo et al. 2011, 2013). *Broken* in (10) describes change across space — as one moves right to left along the page there is a line, then a gap, then a line, over and over again. That *broken* can describe atemporal change, and that change is lexically entailed by it, is evidenced by (11), where a double line containing a gap in the middle labeled “W” can be described as *broken* at “W”, but not if “W” precedes the double line.

- (11) a. _____ W _____
 The double line is broken at W.

b. ————— W —————

#The double line is broken at W.

One of the major results of work on non-temporal change is that temporal and non-temporal change are essentially the same notion with all the same aspectual properties, differing only in the specific axis of measurement, a fact which the data in (11) support. It is thus a fallacy to conclude that examples like (10) do not entail change. The change is simply of a previously unrecognized type. Going forward, we ignore the distinction between temporal and non-temporal change here for simplicity and focus just on examples that exhibit temporal change.

In sum, adjectival forms of result roots always entail change, something not explained if they are ambiguous between the two structures in (6). We can analyze this under Bifurcation by treating it as another fluke of English: perhaps result roots always occur only in the superficially deverbal adjectival structure (6b) and never the basic one in (6a), e.g. they have a syntactic feature requiring them to always cooccur with v_{become} , effectively categorizing the root (see e.g. Alexiadou et al. 2006: 202-203, Ramchand 2008: 58). This would derive that they will always be deverbal, and always entail a change. However, this analysis makes a further semantic prediction that is not borne out.

2.4 Restitutive Modification with PC and Result Roots

Sublexical modifier *again* generally allows two readings with change-of-state verbs (see e.g. Dowty 1979: 252-254, 260-269, von Stechow 1995, 1996, 2003, Marantz 2009). For example, (12) has a restitutive reading where the rug was created flat, made not flat, and restored to its prior state, and a repetitive reading where it has been flattened twice. This can be analyzed as an attachment ambiguity, where *again* attaches to just the root or to some vP as in (12a) and (12b) respectively.

- (12) John flattened the rug again, and it had been flat/flattened before.

- a. [_{vP} John [_{v'} v_{cause} [_{vP} the rug [-en_{v_{become}} [√FLAT again]]]]] (restitutive)
b. [[_{vP} John [_{v'} v_{cause} [_{vP} the rug [-en_{v_{become}} √FLAT]]]] again] (repetitive)

Bifurcation predicts this: on the restitutive reading *again* scopes over only a root and roots name simple states, so it is the simple state that occurred before. PC roots allow both readings, e.g. (12) and (13) all allow restitutive and repetitive readings; in (13) we give contexts clarifying a restitutive reading, which is the main reading that will ultimately be of interest to us.

- (13) a. [John buys a knife that was made by a process by which it was forged already sharp.
John uses it until it becomes blunt. He uses a whetting stone to sharpen it.]
John sharpened the knife again. (could be just one sharpening)
- b. [A film producer makes a 4 hour long film, which is significantly longer than the norm.
She is pressured to reduce its length, so cuts it to be two hours. But then the director and
actors protest, so she restores it to 4 hours.]
The producer lengthened the film again. (could be just one lengthening)
- c. [John takes a photo that is too large to use as a Facebook profile photo. He shrinks it to
a more appropriate size, but thinks it does not look good. So he restores it to its original
size and puts it on his personal website instead.]
John enlarged the photograph again. (could be just one enlarging)

However, result roots generally lack restitutive readings, instead having only repetitive readings (see e.g. Rappaport Hovav 2010: 7 and Beavers & Koontz-Garboden 2012: 358). This is shown in

(14) by incompatibility with contexts that require a restitutive reading (as best as it is possible to discern what the relevant state being restored even is distinct from a change that lead to it).

- (14) a. [John kills a rabbit, takes it home and skins and butchers it and then puts the fresh meat in the freezer for a week. He then takes it out and puts it on the table to thaw.]
#John thawed the meat again. (necessarily two defrostings)
- b. [An ice cream factory manufactures ice cream from a package of ingredients by adding water and then freezing the result. After adding the contents of the package to water and freezing it, Kim lets it melt into a liquid state.]
#Kim melted the ice cream again. (necessarily two meltings)
- c. [A store makes their shirts in the back. John buys one and leaves with it, but then decides he does not want it. He takes the shirt back to exchange it.]
#John returned the shirt again. (necessarily two returnings)
- d. [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)
- e. [The sheriff executes John by hanging him, but he comes back to life as a zombie. He is captured and then he is put to death by drowning.]
#The sheriff drowned John again. (necessarily two drownings)

This is difficult to analyze under Bifurcation. The root should be accessible to *again* modification, but this would derive a restitutive reading. We could, however, posit a syntactic feature preventing attachment to result roots, forcing *again* to attach at vP or higher, deriving a repetitive reading.

A potential objection to the idea that these facts challenge Bifurcation comes from the reversative analysis of *again* in Deo et al. (2013), Pedersen (2014), and Beck & Gergel (2015). Roughly following Deo et al. (2013: 111-112) *again* always modifies a vP (i.e. never a root), and entails a reversal of a prior change. On the restitutive reading the prior change is from being in the root-named state to not; the repetitive reading is where the prior state was itself the result of a change. Thus there is no scopal ambiguity. This does not change the fact that there is no restitutive reading with result verbs, and it is unclear how this analysis would derive its absence. Still, if we assume the lack of root attachment compromises the conclusions drawn from *again* then the point still holds for other sublexical modifiers. In particular, Spathas (2017) shows that focus-sensitive additive *also* and *too* show the same contrast but require a scopal analysis. In particular, (15) (with focus intonation on the object) allows one reading where the action had been performed before on another entity, and another where the other entity is in the relevant state and it had never changed into that state. The former is analogous to a repetitive reading and the latter a restitutive reading:

- (15) a. John flattened the RUG too, so that it matched the drapes, which were created flat.
b. John flattened the RUG too, after having flattened the drapes.

As Spathas shows a reversative analysis will not work here, since there is no prior change to reverse. Instead a scopal analysis is required. Crucially, Spathas argues that the same distinction between PC and result root verbs found with *again* obtains with *also*, which he illustrates for Greek (see §3.5), but his English translations behave identically:

- (16) a. [Yesterday, John bought some new pants and a new shirt but dropped them near some water right after he got out of the store. The pants stayed dry, but the shirt got very wet.

At home, when he put both in the washing machine. ...]
The SHIRT dried too.

- b. [Last week, Mary bought a new TV and a new laptop. Three days later the laptop was working fine, but the TV wasn't. Very upset, Mary brought her tools and ...]
#Mary fixed the TELEVISION too. (based on Spathas 2017: 10-11, (43)-(44), (47)-(48))

Thus with result root verbs it is not possible to (semantically) assert the prior existence of the state divorced from the change that lead to it via sublexical modification, even controlling for whether the relevant reading is derived scopally or not. We now turn to a final prediction of Bifurcation.

2.5 Markedness of Verbal Paradigms with PC and Result Roots

Just as all roots should show the same stative forms, they should show the same verbal forms, modulo subregularities or lexical idiosyncrasy orthogonal to Bifurcation.⁵ However, in English PC root verbs are often marked (i.e. deadjectival) as in (17a) while result root verbs are usually unmarked (i.e. basic verbs) as in (17b) (see also Koontz-Garboden 2005: 88-90).

- (17) a. widen, whiten, straighten, stiffen, shorten, enlarge, harden, etc.
b. burn, melt, freeze, cook, break, crack, crush, shatter, murder, wrinkle, etc.

This is not what Bifurcation predicts. It predicts that different roots across the same templates will have the same morphological forms, whether adjectival as in §2.2 or verbal here.

However, these facts are not necessarily inconsistent with Bifurcation. Rather, (17) is simply the inverse of the situation in §2.2, where PC roots but not result roots form unmarked adjectives. Thus we could save Bifurcation in a manner parallel to (6) via two verbal templates, one combining a root with a null v_{become} and one with Asp_S and a v_{become} realized as *-ed/en*:⁶

- (18) a. Basic verbs: [$v_P v_{\text{become}} \sqrt{\text{ROOT}}$]
b. Derived verbs: [$v_P v_{\text{become}} [\text{Asp}_P \text{Asp}_S \sqrt{\text{ROOT}}]$] (cp. (6))

The problem is that many English PC roots do not show unmarked verbal forms and few result roots show marked ones. If we assume as in §2.3 that result roots require v_{become} by virtue of some feature à la Alexiadou et al. (2006: 202-203) or Ramchand (2008: 58) this would rule out them occurring in (18b). But this leaves open why PC roots cannot occur in both structures in (18). We could posit structural ambiguity à la Embick (2004: 358) as in §2.2: perhaps PC roots appear in both structures, but v_{become} is always overt with them. Alternatively, parallel to the idea that result roots have a feature requiring v_{become} in §2.3, perhaps PC roots have a feature requiring them to occur with Asp_S , effectively categorizing them as adjectives in the lexicon.⁷ Taking these constraints together, we have in essence recreated the descriptive generalization that PC roots are lexicalized as adjectives and result roots as verbs. This is a natural explanation of the morphological facts,

⁵One subregularity is whether the causative or inchoative is relatively more marked than the other, something that depends on various factors such as spontaneity of change, the nature of the causation, frequency, and language type (see e.g. Haspelmath 1993, Levin & Rappaport Hovav 1995: 82-110, Doron 2003, Nichols et al. 2004, Chierchia 2004, Alexiadou et al. 2006, Koontz-Garboden 2009, Haspelmath et al. 2014, *inter alia*). Our focus here is just in whether there are distinct patterns of morphological marking in the overall verbal paradigms of PC and result roots.

⁶One difference between (18) and (6) is that (6) has an additional semantic correlate while (18) does not. This raises the question of what the independent motivation of (18) is. However, our goal here is not to fully justify or defend this analysis, but rather to demonstrate that a plausible analysis of (17) is possible.

⁷This requires a modification of (6b) so that the complement of v_{become} could be an AspP rather than just a root.

though it is not in line with the Distributed Morphology tradition that treats roots as acategorial (e.g. Harley & Noyer 2000: 355-356), though there is no reason to maintain that assumption here. We next summarize and evaluate the picture so far.

2.6 Morphosyntactic Accidents vs. Entailments of Change in Result Roots

English PC and result roots differ morphologically and semantically. PC roots tend to have simple adjectival forms and marked verbal forms, while result roots tend to have simple verbal forms and marked adjectival forms. Result root adjectives entail change and result verbs disallow restitutive modification, while simple PC root adjectives do not entail change and PC verbs allow restitutive modification. Explaining these facts in a way consistent with Bifurcation entails appealing to various syntactic diacritics stipulating what templates each root type occurs in and what modificational possibilities each has. This captures the data, but leaves open why these factors come together like this. Other combinations should be possible, and different roots could have shown each property. While each fact on its own could be a happenstance in English, the specific confluence amounts to coincidence of happenstances, raising the question of whether there is a deeper explanation.

There is an alternative that rests on a simple emergent generalization from the data above: unlike PC roots, the states described by result roots are not disassociable from an entailment of change. It is present in both adjectival and verbal forms of the root, and the state cannot be said to have held prior to reference time without a change also happening before. Thus whatever state is entailed by a given result root, a change is always entailed with it. PC roots name simple states, where change is only entailed owing to the event template. This distinction would follow if the states described by the two classes of roots differed in that result root states have changes as part of their meaning, but PC roots do not, essentially the observation made by Dixon (1982: 50), and the morphology reflects this semantic distinction. Accepting this analysis, though, requires rejecting Bifurcation as a guiding principle, and with it would the fairly strong correlation of semantics to syntax Bifurcation gives rise to, although it may open the door for a more complex theory of the syntax/semantics relationship that admits a cross-cutting parameter for type of root.

Were the data above unique to English, both analyses would be possible. If Bifurcation were otherwise motivated it might militate for analyses consistent with it. But if the same patterns recur across languages for roots with similar meanings the analysis rooted in properties of the particular states would be more plausible. In what follows, we show that the asymmetries between English result and PC roots are found across languages, suggesting a deeper and more systematic generalization about stative roots. The goal is not to show that translation equivalents across languages always pattern exactly the same. We expect language-particular variation, so that terms canonically used to describe a state in some language may not have the exact same meaning as terms used to describe it in another. Indeed, we see mismatches already for English: simple adjective *old* entails a change (to be old one must have first been young/new), while deverbal *closed* does not (e.g. a door can be built closed).⁸ Rather, we show that these patterns are attested in other languages in ways that reflect a systematic recurring trend, so that the equivalents of English PC and result terms will largely show similar morphological patterns and give rise to similar semantic inference patterns. We first look at the semantics in a small sample of languages before turning to a broader typological study of their morphology. We then return to a possible formal analysis of these facts that rejects Bifurcation, and discuss its consequences for theories of verb meaning.

⁸Interestingly, the OED claims English *old* itself is historically deverbal, from the past participle of Old English *alan* “nourish”, though this verb is in turn apparently deadjectival (Elly van Gelderen, p.c.).

3 Semantics

To verify that the semantic patterns obtain cross-linguistically we present in-depth studies drawn from prior literature and native speaker judgments of a small sampling of roots mostly chosen from among those in §2.1. The case studies are Greek (Indo-European; see Spathas 2017), Kakataibo (Panoan; Eastern Peru; see Valle Arevalo et al. 2017), Kinyarwanda (Northeastern Bantu; Rwanda; see Jerro 2017), Hebrew (Semitic, Afro-Asiatic), and Marathi (Indic, Indo-European). The goal is not to show that this pattern is broadly attested, but more modestly to show that certain meanings drawn from the two classes show similar entailment patterns in other languages as a proof-of-concept, thus showing that it is not obviously an idiosyncrasy of one language.

3.1 Kakataibo

Kakataibo statives are adjectives while inchoatives and causatives are verbs, two distinct categories (see Valle Arevalo 2017: 69–72, 74). Simple state terms and inchoatives are usually labile (i.e. the same surface stem), with causatives generally formed by causative *-o* (though there are numerous relationships that are anticausative, i.e. the inchoative is derived from the causative, and equipollent, i.e. both are derived from a separate shared form). Result statives are formed by factive *-kë*. This is illustrated in (19) (see Valle Arevalo et al. 2017 in general).⁹

(19)	language	root	simple state	inchoative	causative	result state
	Kakataibo	large	<i>ani</i>	<i>ani</i>	<i>ani-o</i>	<i>ani-kë/ani-o-kë</i>
	Kakataibo	wrinkle	—	<i>churi</i>	<i>churi-o</i>	<i>churi-kë/churi-o-kë</i>

Valle Arevalo et al. (2017) examined the PC terms *xo paxada* ‘yellow’, *ani* ‘big’, *upi(t)* ‘pretty, beautiful’, *tuna(n)* ‘black’, *uxu(a)* ‘white’, *inru* ‘hard’, *xana* ‘hot’, *bata* ‘sweet’, *bachu* ‘soft’, *'aidama* ‘bad’, *bënsi(t)* ‘thin’, *xëni* ‘old’, *chadkë(t)* ‘thin’, *chabat* ‘wet’, *puntë(t)* ‘straight’, *diba(t)* ‘smooth’, *kacha* ‘sour’, *anaha* ‘wide’, *chukúma* ‘small’, *cha* ‘big’, *mamúa* ‘round’, *ëd-ki-kë* ‘dry-INTR-NMLZ’ and the result terms *tëa-kë* ‘cut-NMLZ’, *nën* ‘burn’, *a-ru-kë* ‘do-UP-NMLZ’, *katët-kë* ‘feel.embarrassed-NMLZ’, *tun-ka-kë* ‘shoot-TR-NMLZ’, *rëtë* ‘kill/murder’, *këñu* ‘exterminate’, *chachi* ‘stab’, *xui* ‘barbecue’, *sasa-ka* ‘fry-TR’, *musa* ‘mix/stir/mash’. In general PC vs. result roots show a distinction in change entailments. Simple PC stative terms as in (20a) do not entail change, but derived PC stative terms as in (20b) do, where the form derived from a caused change-of-state verb cannot be asserted while also denying the caused change of state.¹⁰

⁹The following glosses are used: 1-14(S)=(subject) noun classes, 3=third person, A=subject of transitive verb, ACC=accusative, CAUS=causative, DAT=dative, DEM=demonstrative, EMPH=emphatic, ERG=ergative, FACT=factive, FEM=feminine, FV=final vowel, HANDS(8)=classifier, IMPF=imperfective, INCH=inchoative, INDF=indefinite, INTR=intransitive, INF=infinitive, ITR=iterative, M=masculine, N.PROX=non-proximate, NEG=negation, NFUT=non=future, NMLZ=nominalizer, NOM=nominative, OBJ=object, PART=participle, PASS=passive, PST=past, PRFV=perfective, POSS=possessive, PRO=pronoun, PRES=present, PROX=proximate, REFL=reflexive, S=subject of intransitive verb, SE=simultaneous event, SUBJ=subject, TR=transitive, UP=up, VAL=validational.

¹⁰Valle Arevalo et al. (2017) use causative verbs to test contradiction, opening up the possibility that what is being denied is causation and not change. However, if causation is entailed change must be as well, so the contradictoriness of the examples still suggests an entailment of change. The only exception is negating the causative while asserting a simple PC root stative, where the root could entail change but what is being denied is just causation. This is a fairly implausible view of the data and would mean the root entails change, supporting our hypothesis that Bifurcation is incorrect. We set this issue aside since regardless the data suggest a distinction between PC and result roots unexpected under Bifurcation. This potential, if unlikely, confound does not arise for data from other languages below.

- (20) a. *báinka ani 'ikë 'aibika uini abi ni*
 báin=ka=a ani 'ikë 'ai=bi=ka=a uini a=bi ni
 hill=VAL=3A/S big be.3.IMPF then=EMPH=VAL=3A/S INDF.PRO 3=EMPH nor
 Diosabi ni uni yubë unibi anioima.
 Diosabi ni uni yubët uni=bi ani-o-i-i=ma.
 God=EMPH nor man sorcerer man=EMPH big-FACT-IMPF=PROX=NEG
 ‘The hill is big, but nobody nor God nor a sorcerer made it big.’
- b. *#taïka puntëokë ikë aibika*
 tain=ka=a puntët-o-kë ikë ai=bi=ka=a
 arrow.stick=VAL=3A/S straight-FACT-NFUT.NMLZ be.IMP.3 then=EMPH=VAL=3A/S
 uini abi puntëoima iáxa.
 uini a=bi puntët-o-i=ma i-a-x-a
 INDF.PRO 3=EMPH straight-FACT-A/S>S:SE=NEG be-PRFV-3-N.PROX
 ‘The tree (used to make arrows) stem is straightened but nobody made it straight.’

Statives of result roots pattern like derived statives of PC roots exclusively:

- (21) *#naëka nënkë 'ikë 'aibika uini*
 naë-ka nën-kë 'ikë 'ai=bi=ka=a uini
 dig=VAL=3A/S burn-NFUT-NMLZ be.3.IMPF then=EMPH=VAL=3A/S INDF.PRO
 abinënkëma 'ikë.
 a=bi nën-kë=ma 'ikë.
 3=EMPH burn-NFUT.NMLZ=NEG be3.IMPF
 ‘The farm is burnt but nobody burnt it.’

Additionally, PC roots generally allow restitutive readings under iterative *-tékén* marking as in (22a), while result roots usually resist them as in (22b) (though again it is sometimes difficult to figure out exactly what the relevant state would be divorced from the change leading to it):

- (22) a. [The desert starts off dry. Then, it is made non-dry. Then it turns dry again.]
 madin papanka édkitékënia.
 madi=n papa=n=ka=a éd-ki-tékëni-a.
 sand=POSS father=A/S=VAL=3A/S dry-INTR-again-IMPF=N.PROX
 ‘The desert is getting dry again.’
- b. [The man picks up a banana. A wizard makes it inedible. The man fries/cooks it.]
 #uninka nodi
 uni=n=ka=a nodi
 man=A/S=VAL=3A/S banana
 sasakatékënia/arutékëa.
 sasa-ka-tékëni-a-x-a/ a-ru-tékëni-a-x-a
 fry-TR-again-PRFV-3-N.PROX/do-UP-again-PRFV-3-N.PROX
 ‘The man fried/cooked the banana again.’

Taken together, these data all suggest the same confluence of semantic patterns we saw in English.

That said, there are some contrasts with English. For example, the Kakataibo for *kill* allowed restitutive modification, as with an inanimate that has been brought to life by magic and then killed:

- (23) [The stone was always dead. Then, it was brought to life. Then, I kill it.]

<i>maxákana</i>	<i>rë(të)tékëa.</i>
<i>maxat=ka=na</i>	<i>rëtë-tékëen-a</i>
<i>stone=VAL=1A/S</i>	<i>kill-again-PRFV</i>

‘I killed the stone again.’

Conversely, sometimes PC roots seem to generate an inference of change:

Such variation is expected; not all translation equivalents are perfectly synonymous. For (23) the facts are compatible with a simple analysis where the root of *kill* means “dead”, which can only apply to living entities, while the root of the Kakataibo equivalent means “not alive”, which allows inanimates. For (24) all such cases involved man made patients, e.g. *fierro* is a man made metal. Speakers may deem the creation of a hard metal as the creation of metal and then a process that made it hard. That the same root does not require a change with other patients is evidenced by (25).

- (25) *xaxuka inru ikë aibika inrumi ama ikë.*
 xaxuka inru ikë aibika inrumi ama ikë
 iron hard be.IMPF.3 then=EMPH=VAL=3A/S hard.CAUS.A/S>S:SE 3=NEG be.IMPF.3
 'Iron is hard but nobody made it hard.'

On balance, result root translations that also entail change exist in Kakataibo, while PC roots do not seem to have entailments of change.

3.2 Kinyarwanda

In Kinyarwanda we see something similar (Jerro 2017). An important point about the Kinyarwanda data is that result state, simple state, and inchoative are usually a labile set. Various patterns relate these paradigm members to the causative (either zero-marked, equipollent, or derived from an unmarked causative by detransitivizing *-ik/ek*; the former two being common among PC roots and the latter among result roots; see Jerro 2017, to appear). Consider *-tyara* ‘be(come) sharp’ in (26) where the simple stative, inchoative, and result stative have the same form.¹¹

¹¹The perfective suffix -(y)e triggers spirantization of the preceding consonant. Dahl's law triggers consonant dissimilation in voicing of consonants preceding the verb root. Kinyarwanda has lexical and grammatical tone, but these are not represented in the standard orthography used here, as tone does not come into play for the data under discussion.

- b. *Icy-uma cy-a-tyay-e.*
 7-knife 7S-PST-sharp-PRFV
 ‘The knife sharpened.’ (inchoative)
- c. [In a scenario where the speaker has witnessed a knife being sharpened.]
M-perez-a icy-uma gi-tyay-e.
 1SGO-hand-IMPF 7-knife 7S-sharp-PRFV
 ‘Hand me the sharpened knife.’ (result state)

The causative differs in the morphological shape of the root, i.e. *-tyaza* ‘sharpen’ in (27), which is equipollent to *-tyara* above (in the sense that the final root consonant alternates across causative and inchoative, the remnant of a historical causativization process).

- (27) *Umu-gabo a-ri gu-tyaz-a icy-uma.*
 1-man 1S-be INF-sharpen-IMPF 7-knife
 ‘The man is sharpening the knife.’ (causative)

While statives and inchoatives are not marked with respect to one another, the tense/aspect inflection provides disambiguation, where (roughly) past + perfective and present + imperfective are purely inchoative while present + perfective combinations are stative (see Jerro 2017, to appear). For example, *-ryoha* ‘sweet’ has a stative reading in (28a) but an inchoative reading in (28b).

- (28) a. *Ubu-ki bu-ra-ryoshy-e.*
 14-honey 14S-NPST-sweet-PRFV
 ‘The honey is sweet.’ (stative)
- b. *Umu-vinyo w-a-ryoshy-e.*
 3-wine 3S-PST-sweet-PRFV
 ‘The wine became sweet.’ (inchoative)

The contrast is also shown by persistive morpheme *cya-* ‘still’, which occurs with states but not events (cf. Kratzer 2000: 386-386):

- (29) a. *N-da-cya-rakay-e.*
 1SGS-NPST-still-angry-PRFV
 ‘I am still angry.’ (stative)
- b. *#N-a-cya-rakay-e.*
 1SGS-PST-still-angry-PRFV
 Intended: ‘I became still angry.’ (inchoative)

Given all this, PC stative for *-tyara* ‘sharp’ entails no change (and similar results obtain for *-ongera/nini* ‘large/enlarge’, *umutuku* red, *-re-re* ‘long’) while result root stative for *gu-teka* ‘cook’ does (and similar results for *gu-shongesha* ‘freeze (harden)’, *ku-mena* ‘break’, *gu-subiza* ‘return’, *gu-ca* ‘tear’, *gu-hanuka* ‘fall’). Only the former and not the latter is possible in contexts where the relevant state always held, even if a context is clarified that pulls out an approximation of the state described by the verb divorced from a change (and even with a modifier like *-hora* ‘always’ that might bring out that meaning).¹²

¹²When *hor-a* ‘always’ arises with a verb marked for imperfective there is a habitual reading; when the verb is marked in the perfective, the reading is that the event has always held.

- (30) a. [Habimana buys a knife that is manufactured very sharp.]

Icy-uma gi-hor-a gi-tyay-e.
7-knife 7S-always-FV 7S-sharp-PRFV

‘The knife has always been sharp.’

- b. [Consider a hypothetical fruit called the Mupiri that is always soft and ripe since it first grows and can be eaten any time.]

#Umu-keri u-hor-a u-tek-ets-e.
3-fruit 3S-always-FV 3S-cook-NEUTR-PRFV

‘The fruit has always been cooked.’

Similarly, restitutive and repetitive modification show a contrast, with only PC roots permit restitutive readings with the *-ongera* ‘again’ but not result roots:

- (31) a. [Habimana buys a knife that was manufactured sharp, uses it until it goes blunt, and then sharpens it.]

Habimana y-ongey-e gu-tyaz-a icy-uma.

Habimana 1S-again-PRFV INF-sharpen-FV 7-knife

‘Habimana sharpened the knife again.’

- b. [You have a bunch of small pieces of glass, manufactured in that size, such that they would fit together in a single pane if you wanted to. Suppose Karemera puts them together to make a single piece of glass, and then he breaks it.]

#Karemera y-ongey-e ku-men-a iki-rahure.

Karemera 1S-again-PRFV INF-break-FV 7-glass

‘Karemera broke the glass again.’

Thus result roots but not PC roots describe states non-dissociable from a change.

3.3 Hebrew

Hebrew stative, causative, and inchoative forms are typically equipollent (an artifact of the Semitic root/template morphological system, the details of which are not relevant here; see Doron 2003).

(32)	language	root	underlying	simple state	inchoative	causative	result state
	Hebrew	large	<i>g-d-l</i>	<i>gadol</i>	<i>gadal</i>	<i>hi-gdil</i>	<i>mu-gdal</i>
	Hebrew	break	<i>š-v-r</i>	—	<i>ni-šbar</i>	<i>šavar</i>	<i>šavur</i>

Once again, though, PC simple stative forms do not entail a prior change while their corresponding result stative forms do, as with the following for *'arox/he'erix/hit'arex* ‘long/lengthen/lengthened’ (and similar results obtain for PC *xad/xided/me-xudad* ‘sharp/sharpen/sharpened’, *gadol/hi-gdil/mu-gdal* ‘large/enlarge/enlarged’, *xazak/xizek/me-xuzak* ‘strong/strengthen/strengthened’, *tov/šiper/me-šupar* ‘good/improve/improved’):

- (33) *ha-seret 'arox/#mu'arax 'aval 'af-paʃam lo hu'arax/hit'arex.*

the-movie long/lengthened but never NEG lengthened.PASS/lengthened

‘The movie is long but (was) never lengthened.’

Statives related to result root change-of-state verbs categorically entail change as with *nipēc/me-nupac* ‘shatter/shattered’ (and similar results obtain for *nafal/naful* ‘fall/fallen’, *hexzir/hu-xzar* ‘return/returned’, *šavar/šavur* ‘break/broken’, *bišel/me-vušal* ‘cook/cooked’):

- (34) #*ha-zxuxit menupecet*, 'aval hi 'af-paγam lo hitnapca.
 the-glass shattered, but she never NEG shattered.REFL
 ‘The glass is shattered, but it never shattered.’

Similarly, PC but not result roots allow restitutive readings with *again*-type modifiers. There are two such modifiers, *šuv* and *me-xadaš* (literally ‘from new’), the latter of which generates only restitutive readings (similar to English *re-* prefixation):

- (35) a. [A film producer makes a 4 hour long film, which is significantly longer than the norm. She is pressured to reduce its length, so cuts it to be two hours. But then the director and actors protest, so she restores it to 4 hours.]

ha-mefika he'erixa šuv/me-xadaš 'et ha-seret
 the-producer.FEM lengthened.FEM again/anew ACC the-film
 ‘The producer lengthened the film again.’

- b. [There are a bunch of small pieces of glass, manufactured in that size, such that they would fit together in a single pane if one wanted to. Kim puts them together to make a single piece of glass, and then shatters it.]

#*Kim nipca šuv/me-xadaš 'et ha-zxuxit*
 Kim shattered again/anew ACC the-glass
 ‘Kim shattered the glass again.’

This suggests again a semantic PC vs. result root distinction akin to what has been observed above.

3.4 Marathi

Marathi simple states are largely adjectives, with verbs either derived from the adjectives (morphologically/peripherastically) or basic (with variation on the relationship between the causative and the inchoative) (see Shibatani & Pardeshi 2001: 91-92 and Dhongde & Wali 2009: 143-156):

(36)	language	root	simple state	inchoative	causative	result state
	Marathi	long	<i>lāmb</i>	<i>lāmb-ɳe</i>	<i>lāmb-əv-ɳe</i>	<i>lāmb-əv-lele</i>
	Marathi	melt	—	<i>vitəl-ɳe</i>	<i>vitəl-av-ɳe</i>	<i>vitəl-lele</i>

PC vs. result roots show the expected distinction regarding change entailments as with *lāmb/lāmb-av-ɳe/lāmb-av-lele* ‘long/long-CAUS-INF/long-CAUS-PART’ “long/lengthen/lengthened” vs. *phod-ɳe/phod-lele* ‘break/shatter-INF/break/shatter-PART’ “break/shatter/broken/shattered” (and similar results obtain for PC *rikāme/rikāme kər-ɳe/rikāme ke-lele* ‘empty/empty make-INF/empty make-PART’ “empty_{Adj}/empty_V/emptied”, *tsāngle/tsāngle kər-ɳe/tsāngle ke-lele* ‘good/good make-INF/good make-PART’ “good/improve/improved”, *dhār-dārl/dhār lāv-ɳe/lāv-lele* ‘sharpness-ful/sharpness attach-INF/sharpness attach-PART’ “sharp/sharpen/sharpened”, *lāl/lāl kər-ɳe/lāl ke-lele* ‘red/red make-INF/red make-PART’ “red/redden/reddened”, *mothe/mothe kər-ɳe/mothe ke-ləl* ‘large/large make-INF/large make-PRT’ “large/enlarge/enlarged” vs. result *vital-ɳe/vitəl-lele* ‘melt-INF/melt-PART’ “melt/melted”, *pərət-əv-ɳe/pərət-əv-lele* ‘return-CAUSE-INF/return-CAUSE-PART’ “return/returned”):

- (37) a. *chitrəpət lāmb/#lāmb-əv-lelā āhe āŋi to kədhi*
 movie.NOM.SG long/long-CAUS-PART.M.SG be.PRES.3.SG and DEM.SG ever
lāmb-əv-lelā nāhi.
 long-CAUS-PART.M.SG NEG
 ‘The movie is long, but it has never been lengthened.’

b. *#kāc phod-leli āhe pəŋti kədhi*
 glass.NOM.F.SG shatter.TRAN-PART.F.SG be.PRES.3.SG but DEM.F.SG ever
phut-leli nāhi.
 shatter.INTR-PART.F.SG NEG
 ‘The glass is shattered, but it never shattered.’

PC but not result roots allow restitutive readings with *again*-type modifiers:

- (38) a. [Kim buys a knife that was manufactured sharp, uses it until it goes blunt, and then sharpens it.]

Kim-ne suri-lə pərət dhār lāv-li
kim-ERG knife.FEM.SG-DAT again sharpness.FEM.SG.NOM attach-PRFV.FEM.SG
'Kim sharpened the knife again.'

b. [A bunch of small pieces of glass were manufactured in that size, such that they would fit together in a single pane if you wanted to. Suppose Kim puts them together to make a single piece of glass, and then shatters it.]

#*Kim-ne parat kach phod-li*
Kim-ERG again glass-FEM.SG.NOM break-PRFV.FEM.SG
#'Kim broke the glass again.'

Once again, a PC vs. result root distinction similar to those in other languages is observed.

3.5 Greek

Finally, Spathas (2017) shows that Greek has the same distinction between verbs that have states dissociable from a change and those that do not. As noted in §2.4, this comes from the interpretation of additive modifiers. Among change-of-state verbs, those in (39a) allow the additive equivalent of a restitutive reading, where the patient comes to be in the same state as something else that has always had that state, and those in (39b) allow only the equivalent of a repetitive reading, where both the expressed patient and some other entity underwent the same change.

- (39) a. *petheno* ‘die’, *skotono* ‘kill’, *kurazome* ‘get tired’, *filakizo* ‘imprison’, *skuriazio* ‘get rusty’, *vutirono* ‘butter’, *skonizome* ‘get dusty’, *etimazome* ‘get ready’, *stejnono* ‘dry’, *adjazo* ‘empty’, *isiono* ‘straighten’, *orimazo* ‘ripen’
 b. *spazo* ‘break’, *ftiahno* ‘fix’, *liono* ‘melt’, *ragizo* ‘crack’, *anatinazo* ‘explode’, *vrisko* ‘find’, *eksafanizome* ‘disappear’, *pnigo* ‘drown’ (Spathas 2017: 10, 16, (76))

This is illustrated by examples such as the following:

- (40) a. [Yesterday, John bought some new pants and a new shirt but dropped them near some water right after he got out of the store. The pants stayed dry, but the shirt got very wet. At home, when he put both in the washing machine, ...]

Stegnose ke to PUKAMISO.

dried also the clothes

‘The shirt dried too.’

- b. [Last week, Mary bought a new TV and a new laptop. Three days later the laptop was working fine, but the TV wasn't. Very upset, Mary brought her tools and ...]

#I Maria eftiakse ke tin TILEORASI.

the Mary fixed also the television

#‘Mary fixed the television too.’

(Spathas 2017: 10-11, (43)-(44), (47)-(48))

The verbs in (39a) overlap considerably with the PC root meanings we give above for English, including many degree achievements (but with some variation from English — the ‘kill’ verb patterns as it does in Kakataibo, possibly thus amenable to the same analysis). Those in (39b) clearly draw from the same class of meanings for result roots we give above for English, including verbs of breaking, destroying, killing, and entity-specific change-of-state.

3.6 Summary

Across various languages result root meanings often show inferences of change while PC root meanings do not, including lexical entailments of change in stative forms and inferences of prior change under sublexical modification. Thus the cooccurrence of these two properties in §2 is not purely coincidental in English but likely due to some deeper connection. This alone already suggests that the typology of possible roots of change-of-state verbs is richer than previously expected, which in turn may break the strong correlation of the lexical semantics of surface verbs to their supposed event templates and thus to their grammatical properties. We now consider whether the corresponding morphological distinctions between PC and result roots also recur across languages.

4 Morphology

Previously published data suggests an absence of simple states for result roots in other languages (on Eastern Armenian see Megerdumian 2002: 92, on Ulwa see Koontz-Garboden 2007: 183, on Tongan see suggestive data in Koontz-Garboden 2005: 92-94, on O’odham, Hale & Keyser 1998: 92, on Pima see Smith 2006: 3, on Kakataibo see Valle Arevalo et al. 2017: 6-8, on Kinyarwanda see Jerro 2017: 14-15). To explore this more thoroughly we examined a balanced language sample for a consistent set of root meanings. We first outline our data collection methodology, then the results for the relevant contrasts, looking first at the existence of simple stative forms, where the expected trend from §2.2 is that PC roots should have more simple statives than result roots, and then at verbal markedness, where the expected trend from §2.5 is that PC roots will have more marked verbal paradigms than result roots.

4.1 Basic Methodology

Our methodology consisted of a dictionary and grammar-mining study of equivalent root meanings across languages, using English terms (or equivalents in other metalanguages) as initial search terms (following the methodology of the study of transitivity encoding in Nichols et al. 2004: 157). The root meanings we examined are the 36 PC and 36 result root meanings in (3) and (4) in §2.1 (plus the hyponyms and synonyms given in parentheses). We targeted the World Atlas of Language Structures (WALS) 100 Language Sample (Dryer & Haspelmath 2013), an areally and genetically balanced sample known to have available grammatical resources, although some modifications

were required for our final list. In some cases we lacked sufficient access to grammatical and dictionary resources, and in other cases the dictionaries or grammars we had access to were deemed insufficient for the project. In these cases, where possible, we substituted languages from the sister WALS 200 list covering similar geographic regions and language families for which we had (superior) resources. We also added a few languages based on available resources or native speakers/fieldworkers. The final total was 88 languages, listed in §A, mostly covering the original areas and families of the WALS 100 (see the supplemental materials for a list of references used).

In looking for equivalents to (3) and (4) we did not assume all translations were perfect, just that the meanings were similar enough to fall into the same semantic root class. The methodology was to read available grammatical resources to understand the language's verbal and stative systems, and then do bidirectional dictionary searches to capture the full range of meaning of the given term according to the resources (using also relevant data found in the grammatical resources). We collected paradigms of simple state-inchoative-causative-result state (e.g. *red-reden-redden-reddened*) for each root (plus glosses), plus underlying roots for cases where the entire paradigm was based on derivation from a shared (often bound) morpheme. Two examples are given in (41).

(41)	language	root	underlying root	simple state	inchoative	causative	result state
	Tzeltal	small	—	<i>tut</i>	<i>tut-ub</i>	<i>tut-ub-tes</i>	<i>tut-ub-en</i>
	Oromo	long	<i>dheer-</i>	<i>dheer-aa</i>	<i>dheer-addh</i>	<i>dheer-essuu</i>	—

For stative terms we looked for forms used in predicative constructions, including possessive predicational strategies (Francez & Koontz-Garboden 2015) in languages that utilize those. The category of stative terms did not matter. As Dixon (1982) showed stative forms can be adjectives, verbs, or nouns depending on the language. We were just interested in whether a specific form existed. Similarly, certain morphosyntactic category features were not relevant to our study, such as agreement, tense, and grammatical aspect. For such features we followed the relevant resource, e.g. if the datum came from an example sentence we kept the features of the form in the sentence, or we used whatever citation form (or bound root or stem) a dictionary provided. Thus in Murrinh-Patha the causative for ‘crush’ is *mam-lerrkperk* ‘1SGS.HANDS(8).NFUT-crush’ “crush” with verbal agreement, a verbal classifier, and tense plus the lexical stem (taken from Seiss 2013: 79, (3.14a)), whereas in Spanish all verbs are in canonical infinitival citation forms.

If a form was unattested but the resources gave explicit, productive processes for deriving it from another member of the paradigm, we constructed a hypothetical form but marked it via a diacritic @ so that analyses both with and without such forms could be conducted. This was especially needed for agglutinating languages such as Kiowa where dictionaries do not give full paradigms but instead only roots and rules, as for “big” (Watkins & McKenzie 1984: 153):

(42)	language	root	underlying root	simple state	inchoative	causative	result state
	Kiowa	big	—	ét	@ét-́m-gyá	@ét-́m	@ét-dó·

In cases where the surface hypothesized phonological form was not entirely clear we recorded instead a glossed form. For example, Paiwan has two prefixes *ka-* and *ma-* (with some phonological variants) that can derive inchoatives from statives (e.g. *qatsa* ‘big’ vs. *me-qatsa* ‘INCH-big’ “enlarge”, though we had no *ka-* forms in our data). But the choice of prefix appears to be lexically determined (Ferrel 1982: 18, 20). Thus for stative *taladj* ‘deep’ we hypothesized the inchoative as @INCH-*taladj* since we were unsure which prefix was used. This does not affect the analysis since all that matters for present purposes is whether the form exists and its morphological breakdown in

terms of the categories of interest here. Below we present analyses with hypothetical data included; removing them does not significantly affect the results (see the supplemental materials).

We privileged lexicalized terms over productively derived terms, and morphologically derived terms over peripherastically derived terms. This was motivated by the general tendency across languages for more lexical(ized) forms to be “normal” or “default” expressions, followed by synthetic forms, and then analytical forms (see e.g. the literature on causative expressions as in Shibatani & Pardeshi 2001). The ultimate preference rankings for the forms we collected were:

- (43) attested lexicalized form > attested morphological form > hypothetical morphological form
 > attested periphrastic form > hypothetical periphrastic form > no data

We treated synonyms as one root meaning associated with multiple paradigms.

To determine a term’s semantic category we could have relied on translation (qua semantics) or morphology, on the assumption that typically result state terms are likely to be deverbal and simple states the input for verbal forms, etc. We primarily used translation, however we also coded each item X for its morphological relationship to all other items within its paradigm by assigning X a 5-character code relating it to each form Y_k ($1 \leq k \leq 5$) in its paradigm in the following order:

(44)	Position k in X’s code:	1	2	3	4	5
	Corresponding form Y_k:	underlying root	simple state	inchoative	causative	result state

The possible codes are given in (45), a generalization over those in Haspelmath (1993: 90-92).

- (45) a. i - X is the input to a rule forming Y_k .
 b. d - X is the output of a rule on Y_k .
 c. t - X is transitively related to Y_k by a series of input/output pairs.
 d. l - X and Y_k are labile.
 e. e - X and Y_k are equipollent.
 f. u - X and Y_k are unrelated (suppletive, or no above relation applies).
 g. n - Y_k is unattested.
 h. s - X is Y_k

We based the coding on surface morphological relationships, unless a grammar or dictionary was explicit on a morphological relationship not obvious from the surface forms. Thus (41) are coded as in (46), where the Tzeltal inchoative for “make small” is coded ndsii: n-related to the underlying root (since there is none), d-related to (derived from) the simple state, s-related to itself, i-related (input) to the causative, and i-related (input) to the result state, and similarly for the rest.

(46)	language	root	underlying root	simple state	inchoative	causative	result state
	Tzeltal	small	—	tut	tut-ub	tut-ub-tes	tut-ub-en
	Oromo	long	dheer-	nsitt	ndsii	ntdse	ntdes
			siiin	dseen	desen	deesn	—
				dheer-aa	dheer-addh	dheer-essuu	—

From this we can reconstruct a morphological classification to compare to the translation-based classification and examine morphological properties such as relative markedness. Finally, for seven languages (boldfaced in §A) fieldworkers collected data or we got it directly from native speakers.

For purposes of analysis we made assumptions about what to do with parts of paradigms for which we had no data or too much data (i.e. synonymous forms). We completely ignored any root meaning in any language for which we had no data for any member of the paradigm, on the assumption that in this case there is presumably some way to convey the relevant concept but we lacked resources that told us what it was (e.g. we were unable to find any data for a root meaning ‘hurt’ in Anejoñ, so we assumed we had a gap in the resources). Conversely, if a root meaning corresponded to several apparent synonyms for any given analysis we selected one random synonym. We ended up with 3,365 PC and 3,501 result roots with data, for a total of 6,866 paradigms and a total of 34,330 possible forms. Of these 18,055 were recorded (with 3,117 being hypothetical). Once one synonym is chosen per synonym set there are 2,710 PC roots and 2,415 result roots with data, with the exact number of cells filled depending on which random synonyms were chosen.¹³

4.2 The Existence of Simple Stative Forms

We first consider whether PC roots are more likely to have simple stative terms than result roots, as expect from §2.2. After excluding root meanings in any language for which we had zero attested data, we treated a simple stative form as existing if we had a form for it. The general pattern seen for example in (46) was dominant, and a statistical analysis confirms this. We assigned each root meaning the percentage of languages for which we had a simple state form among those languages that had data for that root at all (i.e. the denominator was the number of languages with at least one form related to a given root, and the numerator was the number among those for which a simple stative form was in our database; see Fig. 9 in §B for the root percentages). We then compared the distributions for PC vs. result roots. The difference in Fig. 1 was statistically significant on a Mann–Whitney U test (PC median = 97.38%, result median = 1.64%, $U = 1265.5$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed).¹⁴

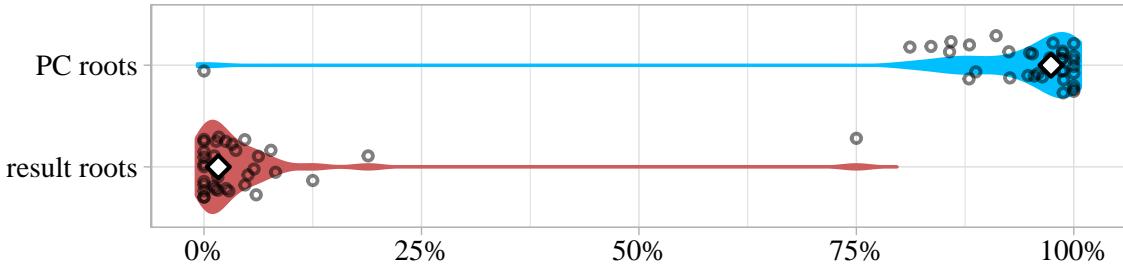


Figure 1: Percentage of Languages With Underived States by Root Class Coded by Translation

This overwhelmingly suggests that PC roots across languages tend to have simple stative terms and

¹³To verify that our procedure for treating synonym sets — choosing synonyms at random — does not skew our results, we repeated our statistical tests 2,000 times in a Monte Carlo setting, picking a random synonym with replacement from each synonym set in each repetition (1,000 of the runs were conducted with hypothetical forms included, 1,000 without them). Examination of the resulting distributions showed our results to be unaffected by the choice of synonyms (see supplemental materials). In particular, the results of all the statistical tests reported below in §4.2–4.3 were statistically significant at the $p < 0.001$ level across all 2,000 Monte Carlo runs.

¹⁴In all figures, each individual data point represents one root, jittered about the y -axis for increased readability. The shaded area gives the distribution density (from a kernel density estimation), and the diamonds indicate distribution medians. To compare PC and result root distributions, we chose to employ the non-parametric Mann–Whitney test over the more conventional t -test for the reason that many of our distributions — notably those in Fig. 1 — are non-normal.

result roots do not, suggesting that the pattern observed in English is, in fact, typologically robust.

On a purely descriptive basis, the differences are fairly consistent across the PC and result root subclasses. Subclasses of PC roots tend to cluster together in having simple stative forms and subclasses of result roots cluster together in overwhelmingly lacking them, as illustrated in Fig. 2.

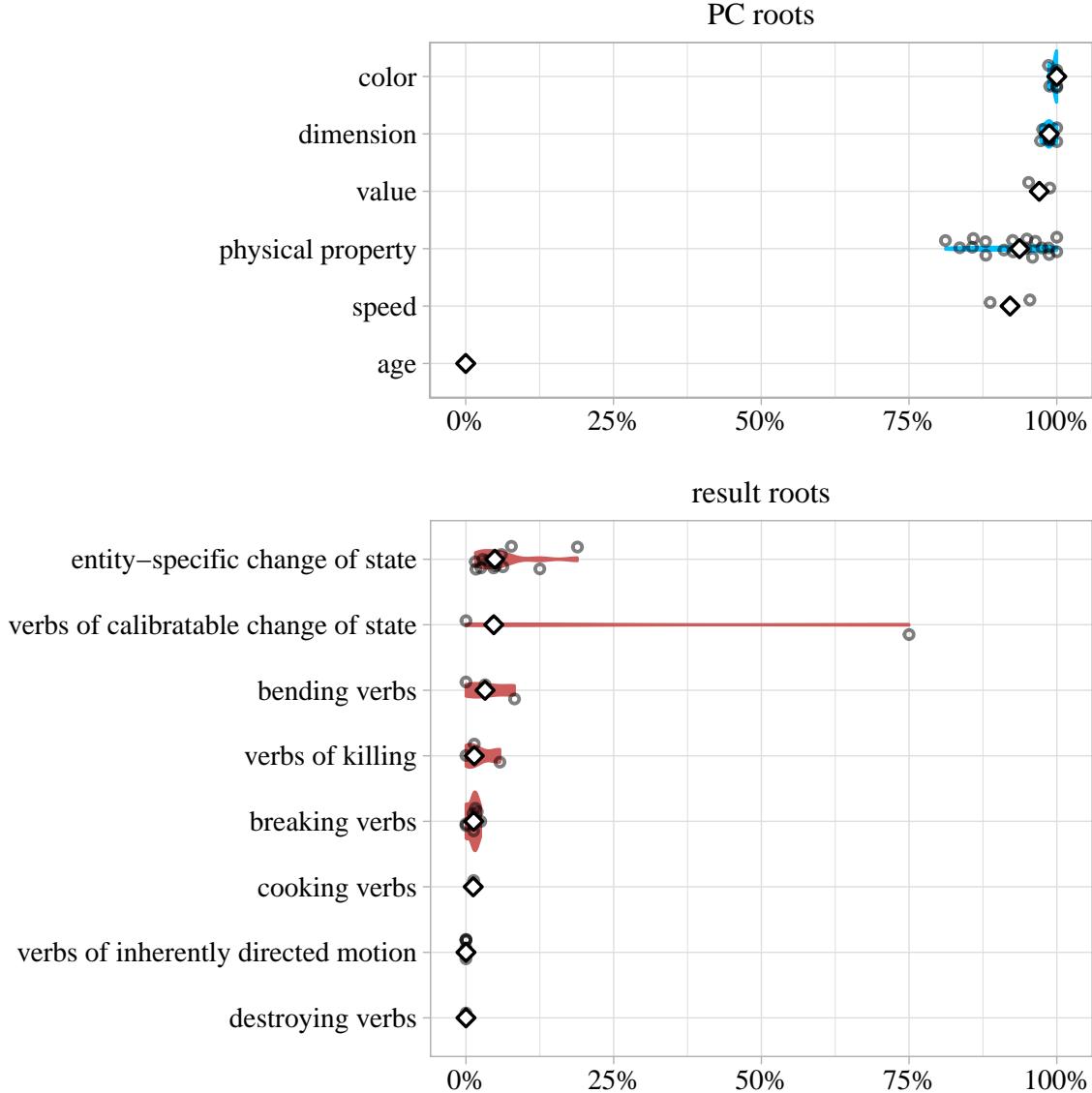


Figure 2: Percentage of Languages With Underived States by Root Subclass Coded by Translation

There are two exceptions to these trends. First, age roots pattern like result roots rather than PC roots. This follows from an observation from §2.6 that guided our coding: *old* entails a prior *young/new* state and thus we coded anything translated as *old* (or *aged*) as a result state, meaning no paradigms for this root had simple states. This had no effect on the results: had we classified *old/aged* as simple states it would have made the only outlier not an outlier. The other odd case is calibratable change-of-state, which consisted of translations of *rise*, *fall*, and *differ* and had more variation in the existence of a simple state than other result roots. However, *differ* patterned like a

PC root since we treated the translation “different” as a simple stative.¹⁵

A potential objection to our methodology is that some stative terms corresponding to English result roots might have semantically simple stative meanings, but since there is no corresponding English simple stative form the dictionary or grammar author gave the closest equivalent translation, namely a result state form. For example, a root that describes some simple state inherent in √BREAK has no English translation equivalent, so the author uses *broken* as the closest equivalent. This would introduce translation bias into the data if translation is used as a proxy for semantics. To verify this was not the case, we reclassified result state terms as simple state terms if they met certain morphological criteria, namely if it was the input to, equipollent to, or labile with any other form in the paradigm. In other words, in this reclassification the only stative terms we called result states were those that were translated as result states and also clearly exclusively derived from another form; everything else was classified as a simple state. The results are given in Fig. 3. Crucially, reclassifying the data in this way does not change the significance of the distinction (PC median = 98.05%, result median = 39.56%, $U = 1295$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed).

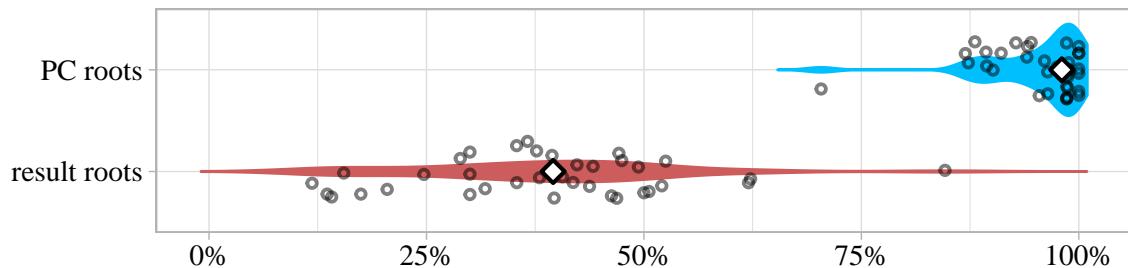


Figure 3: Percentage of Languages With Underived States by Root Class Coded by Morphology

The cross-linguistic generalization is that state-denoting words based on result roots do not exist in the morphological forms words based on PC roots do. The former tend to lack simple stative forms, the latter have them.

4.3 Preferences for Marked vs. Unmarked Verbal Forms

4.3.1 A First Pass: Using Only Complete Verbal Paradigms

The second question is whether the verbal paradigms of a given root were marked or unmarked. The expectation if PC and result roots differ as in §2.5 is that PC root verbs will tend to be marked within their overall paradigm, while result root verbs will be unmarked. Since we collected data on two verbal forms, one of which could be more marked than the other, we took the question to be whether either of the verbal forms was relatively unmarked within its paradigm. We coded every verb as “marked” iff it was overtly derived from or equipollent to something else in its paradigm; anything else would have only labile and suppletive relationships and thus was coded as unmarked. If we had two verbal forms we coded the entire paradigm as marked iff both verbal forms are marked. If the verbal paradigm had one attested unmarked verb we coded the paradigm as unmarked regardless of the coding of the other verb or even whether it is attested (since one

¹⁵A further problem with *differ* is that it has a purely stative use implying no change, and thus translations to it might be stative and not eventive (as with human propensity roots in fn. 3). Thus perhaps it should be excluded from the analysis, though we have left it here for completeness.

unmarked verb is sufficient to say the paradigm is unmarked). However, a question arises of what to do for paradigms with one attested marked verb and no data on the other or where we have no attested verbs at all but do have stative data. The most conservative assumption is to exclude such data from analysis since we cannot be certain whether its verbal paradigm is marked or not (though see §4.3.3 for alternative assumptions). Comparing the distribution of marked paradigms among PC and result roots under this assumption (see Fig. 10 in §B for the root percentages) PC roots had significantly more marked verbal paradigms than result roots as in Fig. 4 (PC median = 73.33%, result median = 28.99%, $U = 1296$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed).

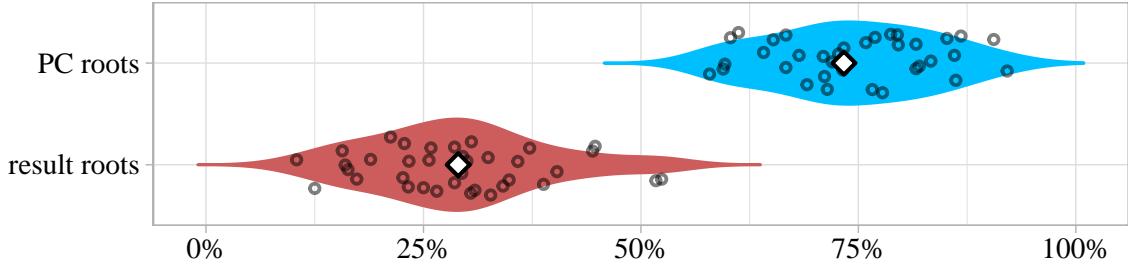


Figure 4: Percentage of Languages With Marked Verbal Paradigms by Root Class For Complete Paradigms

This suggests that PC roots are more likely to have marked verbal paradigms than result roots.

4.3.2 Relationship of Verbal Markedness to Language Type

The general trend is that PC root verbal paradigms are more likely to be marked than result root paradigms. However, taking a more qualitative view of the data, some interesting (though impressionistic) subregularities emerge that show that this tendency plays out in different ways and to varying degrees contingent on idiosyncratic language-internal facts, including a language's basic typological profile. Consider Fig. 5. The first two columns for each language represent the number of PC and result root verb paradigms respectively for which markedness could be determined (i.e. there are two marked verbs or at least one unmarked verb). The next two columns represent the percentage of marked PC and result root verb paradigms respectively. The final column represents the ratio of the percentage of marked result root verb paradigms to marked PC root verb paradigms, by which the languages are ranked high to low.¹⁶ A ratio around 1.0 indicates parity of marked PC and result root verb paradigms, a ratio well above 1.0 indicates more markedness among result paradigms than PC paradigms, and a ratio well below 1.0 indicates more markedness among PC paradigms than result paradigms. The expectation from §2.5 is that languages should show a ratio well below 1.0. This is indeed largely the case. However, three additional cases emerge: some languages show roughly the same amount of markedness in both root classes, either with little to no marking in either case or quite a lot. Second, four languages (boldfaced in Fig. 5) show much more verbal markedness among result roots than PC roots, counter to expectation. These are explained by a combination of linguistic typological factors plus idiosyncrasies of particular languages.

¹⁶Some languages showed zero marked PC paradigms, and thus the ratio is impossible to compute; we notate this as —. However, in these cases the percentage of marked result root verb paradigms is also or almost zero, with zero or one attested example, save Indonesian, which has three. For more on low degrees of verbal markedness see §4.3.3.

# Verb Paradigms			% Markedness			# Verb Paradigms			% Markedness		
Language	PC	RR	PC	RR	RR/PC	Language	PC	RR	PC	RR	RR/PC
Kinyarwanda†	24	33	4.17	9.09	2.18	Kwoma†	11	25	27.27	4.00	0.15
<i>Paumari*</i>	3	18	66.67	100.00	1.50	Mandarin	39	57	89.74	12.28	0.14
<i>Navajo*</i>	18	19	66.67	94.74	1.42	Zoque_Copainala	32	34	68.75	8.82	0.13
<i>Kakataibo†</i>	59	64	23.73	31.25	1.32	<i>Koirai</i>	5	20	40.00	5.00	0.13
Acholi*	20	31	85.00	93.55	1.10	<i>Kiowa</i>	14	9	100.00	11.11	0.11
Gujjolaay_Eegimaa*	31	26	80.65	88.46	1.10	Rama	31	20	90.32	10.00	0.11
Lakhota†	34	31	8.82	9.68	1.10	Yupik	36	30	91.67	10.00	0.11
Hebrew*	36	48	94.44	95.83	1.01	Greek_Modern	22	44	63.64	6.82	0.11
Tagalog*	40	52	87.50	88.46	1.01	Vietnamese	31	35	83.87	8.57	0.10
Arabic_Egyptian*	24	36	100.00	100.00	1.00	Tenango_Tzeltal	34	40	76.47	7.50	0.10
Burushaski†	16	49	6.25	6.12	0.98	Meithei	38	44	94.74	9.09	0.10
Paiwan*	31	29	96.77	86.21	0.89	Russian	37	40	83.78	7.50	0.09
Berber_MiddleAtlas*	30	45	83.33	73.33	0.88	Quechua_Huallaga	44	47	81.82	6.38	0.08
Oneida*	26	20	80.77	70.00	0.87	<i>Martuthunira</i>	6	19	100.00	5.26	0.05
Oromo_Harar*	34	19	100.00	84.21	0.84	Swahili	39	42	53.85	2.38	0.04
Cree_Plains*	39	56	87.18	73.21	0.84	<i>Georgian*</i>	10	34	70.00	2.94	0.04
Malagasy*	69	35	100.00	73.53	0.74	Jakaltek	30	25	96.67	4.00	0.04
Yagua†	36	57	19.44	14.04	0.72	English	43	60	46.51	1.67	0.04
Persian	41	46	85.37	52.17	0.61	Huitoto_Minica*	25	42	68.00	2.38	0.04
Hausa	27	28	59.26	35.71	0.60	Spanish	36	34	91.67	2.94	0.03
Finnish	56	48	100.00	54.17	0.54	Barasano†	16	31	12.50	0.00	0.00
Pintupi	14	26	85.71	46.15	0.54	Burmese†	39	49	12.82	0.00	0.00
<i>Kannada†</i>	9	37	33.33	13.51	0.41	French	46	41	69.57	0.00	0.00
Korean	42	49	80.95	32.65	0.40	Khoekhoe†	14	53	14.29	0.00	0.00
Warao	14	26	71.43	26.92	0.38	<i>Koasati</i>	11	30	36.36	0.00	0.00
Basque	36	43	77.78	27.91	0.36	Mixtec_Chalcatongo	50	39	98.00	0.00	0.00
Yaqui	33	38	81.82	26.32	0.32	Mocovi†	16	34	25.00	0.00	0.00
Japanese	18	45	83.33	26.67	0.32	Otomi†	46	74	15.22	0.00	0.00
Khalkha	34	26	85.29	26.92	0.32	<i>Tiwi†</i>	9	19	33.33	0.00	0.00
Hindi	40	52	62.50	17.31	0.28	Yoruba	40	97	40.00	0.00	0.00
Hopi	31	44	90.32	25.00	0.28	Zulu†	33	47	12.12	0.00	0.00
Kayardild	26	22	100.00	27.27	0.27	Anejom†	17	35	0.00	0.00	—
<i>Guarani†</i>	11	42	9.09	2.38	0.26	Bariai†	12	39	0.00	0.00	—
Chamorro	34	42	73.53	19.05	0.26	Chukchi†	31	19	0.00	0.00	—
<i>Dani_LowerGrandValley</i>	7	24	100.00	25.00	0.25	<i>Daga†</i>	5	23	0.00	4.35	—
<i>Karok</i>	9	29	44.44	10.34	0.23	<i>Fijian†</i>	0	17	0.00	5.88	—
Mapudungun	45	29	88.89	20.69	0.23	<i>Gooniyandi†</i>	0	10	0.00	0.00	—
<i>Carib*</i>	24	19	95.83	21.05	0.22	<i>Indonesian†</i>	19	47	0.00	6.38	—
<i>Hawaiian†</i>	11	57	9.09	1.75	0.19	<i>Kewa†</i>	5	34	0.00	0.00	—
Turkish	42	43	85.71	16.28	0.19	<i>Koyraboro_Senni†</i>	4	26	0.00	0.00	—
German	36	29	97.22	17.24	0.18	<i>Lezgian†</i>	8	27	0.00	3.70	—
Oksapmin	20	36	80.00	13.89	0.17	<i>Murrinh-Patha†</i>	4	24	0.00	0.00	—
<i>Alambalak</i>	6	12	100.00	16.67	0.17	<i>Sango†</i>	30	60	0.00	0.00	—
<i>Tsimshian_Coast†</i>	6	37	16.67	2.70	0.16	<i>Thai†</i>	10	54	0.00	1.85	—

Figure 5: Languages Sorted by Ratio of Markedness of Result Root (RR) Verbal Paradigms vs. PC Root Verbal Paradigms (boldface = more marked RR verbal paradigms than PC root paradigms, italics = low data language, † = low verbal marking language, * = high marking language)

First, there are reasons to not consider the four boldfaced languages exceptional. Consider first Paumarí, for which 100% of result root verbal paradigms were marked but only 66.66% of PC verbal paradigms were. However, it is clear there is a data problem — there are only three sufficiently complete PC verbal paradigms whereas there are 18 for result roots. Furthermore, the morphological paradigm in Paumarí is resoundingly equipollent based on shared bound roots:

(47)	language	root	underlying root	simple state	inchoative	causative	result state
	Paumarí	tough	dakha-	dakhaki	a'dakhaki	bina'dakhaki	—
	Paumarí	break	dan-	—	@a'daniki	bi'danivini	a'daniki

Yet one of the three PC paradigms happened to involve a suppletive causative and no underlying root (*sapasapaki* ‘wide’, *bavi bini’avini* ‘widen’), thus skewing the results. A more natural view of Paumarí is that all paradigms are marked regardless of the PC vs. result root distinction, save one irregular case. Low data potentially creates similar issues in other languages (e.g. with Gooniyandi being an extreme case with only 10 sufficiently complete verbal paradigms, all among result roots). We excluded no data from the analysis, but languages with data quality problems, somewhat arbitrarily defined as having less than 12 sufficiently complete verbal paradigms among PC or result roots (i.e. less than 33.33% of the minimum 36 each), are italicized in Fig. 5.

Navajo, like Paumarí, relies heavily on equipollence, and as such there is high degree of marking in PC and result root verbal paradigms. However, a few paradigms have suppletive verbs and there are slightly more of these among PC roots than result roots, with six out of 18 (33.33%) vs. one out of 19 (5.26%) respectively. Kinyarwanda has almost twice as many marked result verbal paradigms as PC verbal paradigms. But as noted in §3.2 Kinyarwanda relies heavily on labile relationships among its paradigm members, so typically one verb is always unmarked. Of the 24 PC verbal paradigms only one was marked (4.17%) and of the 33 result paradigms only three were (9.09%). So the ratio likely represents a fluke of the data — one more marked PC paradigm would have put the ratio at nearly 1.0. Finally, as discussed in §3.1, Kakataibo is also largely a labile language, but equipollence is a notable subpattern. The marked paradigms are entirely from this subclass, but are slightly imbalanced towards result roots, seen for 14 of 59 PC roots (23.73%) and 20 of 64 result roots (31.25%). Thus of the four major outliers, combinations of particulars of the data and typological paradigms of morphological marking explain their exceptional nature.

Typology also correlates with further trends. Twelve languages have marked members in both PC and result root verbal paradigms at rough parity (a ratio between 1.1 and .84). Crucially, though, in our sample ten pattern like Navajo and Paumarí in relying heavily on equipollent marking across the board or else rely on underlying roots from which at least one of the surface forms is derived (and for forms not directly derived from it they are derived from those that are). The 16 languages marked by a * in Fig. 5 are those in which 66.66% or more of all pairs of forms within each paradigm in our data set are related equipollently or are based on an underlying root (see Fig. 11 in §B for all data used to classify languages typologically). Interestingly, 13 of these languages are found among the top 18 languages in Fig. 5 (i.e. those where the ratio of marked result root verbal paradigms to marked PC root verbal paradigms was above .70). The near perfect correlation with equipollent or underlying root systems and high degrees of markedness regardless of root class is striking, but is in fact expected: these languages in general tend to mark paradigm members across the board, thus obscuring the PC vs. result root distinction.

Conversely, systematic non-derivational relationships like those in Kinyarwanda and Kakataibo explain other languages at parity. For example, Lakhota statives and inchoatives tend to be labile as

with ‘black’, though there were exceptions as with ‘cool’, with PC and result exceptions at parity:

(48)	language	root	underlying root	simple state	inchoative	causative	result state
	Lakhota	black	—	sápa	sápa	sabyá	@sápahā
	Lakhota	cool	sni-	cusní	@cusní	sniyáŋ	@cusníhā

More broadly, the 30 languages marked by a † in Fig. 5 exhibit low degrees of overall verbal markedness, defined here (somewhat arbitrarily) as having 33.33% or less marked paradigms among both PC and result roots. Five fill out the rest of the top 18 languages in Fig. 5, three of which are (as noted) heavily labile between simple states and inchoatives, while Yagua relies on suppletive pairs, accounting for nearly all unmarked PC verbal paradigms (e.g. stative *jamuca*- ‘long’ vs. causative *ratya* ‘lengthen’). A further 20 near the bottom have either zero or close to zero marked verbal paradigms in either root class. Five — Gooniyandi, Murrinh-Patha, Anejom̄, Sango, and Otomi — rely on labile or suppletive pairs for 66.66% or more of relationships between all pairs of forms within each paradigm in our data (though two are also low data languages). An additional six are high data languages which, like Lakhota, rely heavily on labile simple state/inchoative pairs (Burmese, Chukchi, and Indonesian) or a mix of labile and suppletive relations (Barasano, Khoehoe, Zulu). The remaining low-marking languages are all low data, so it is hard to discern the patterns. But where there is sufficient data the pattern is clear: languages that generally do not rely on overt derivational relationships show low marking across both PC and result roots, obscuring the distinction in effectively the opposite way of equipollent or underlying root languages. In sum, wholesale typological factors can obscure the result vs. PC root verbal markedness distinction, and language particular idiosyncrasies or quirks of the data may result in unexpected patterns. Otherwise, when the distinction does emerge it strongly patterns as expected from §2.5.

4.3.3 Alternative Treatments of Incomplete Verbal Paradigms

Our results above ignore data where we cannot definitively tell from the attested or hypotheticalized verb forms whether the paradigm is marked or not. But in the absence of a complete paradigm is it possible to make educated guesses about what the missing verbal forms are? And would making such assumptions change our results? One alternative is that provided we have other data attested for a given root we could assume that the language is likely to have some periphrastic construction for constructing inchoative or causative meanings based on either an extant stative or verbal form (e.g. via light verbs meanings ‘become’ and ‘cause’). In this case any missing verbal forms can be assumed to be marked, i.e. they will look like what we expect PC verbal forms to look like. Taking this assumption, the distributions for PC vs. result roots were still significantly different as in Fig. 6 (PC median = 79.12%, result median = 25.74%, $U = 1295$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed).

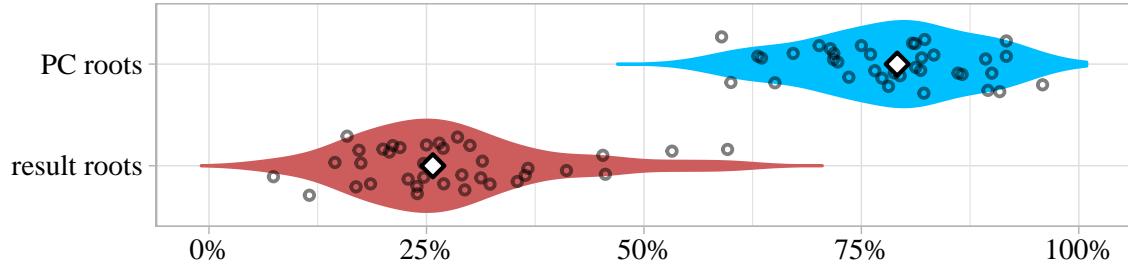


Figure 6: Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Marked

A second alternative would be that that missing forms are unmarked, i.e. the language allows forms labile with an extant stative or other verbal form to express the missing concept (e.g. as with English *The paper is now red*, which by default conveys that the paper become red). In other words, we could assume that all missing verbal forms will look like what we are expecting result root verbal forms to look like. On this assumption the results were again significant, as in Fig. 7 (PC median = 44.92%, result median = 19.25%, $U = 1296$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed).

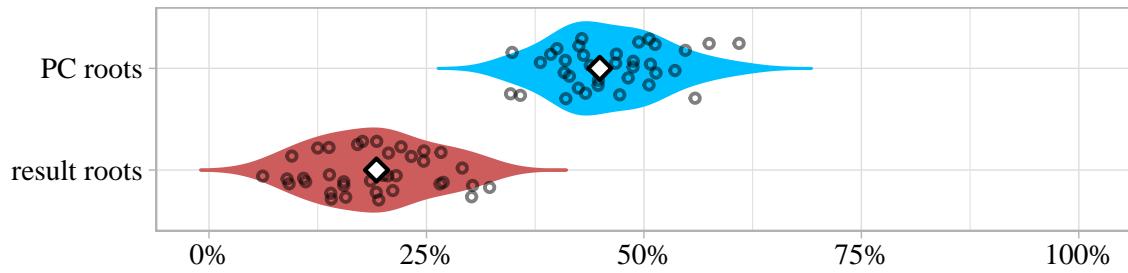


Figure 7: Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Unmarked

Finally, we could assume the worst case scenario for the expectations from §2.5: missing PC verbs are unmarked and missing result root verbs are marked, i.e. PC roots pattern the way we expect result roots to vice versa. Yet even on this assumption the results are significant, as in Fig. 8 (PC median = 45.63%, result median = 25.74%, $U = 1169.5$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed).

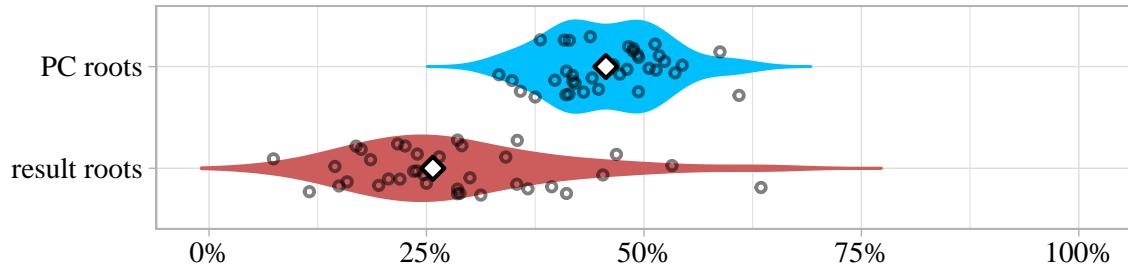


Figure 8: Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing PC Forms are Unmarked and Missing Result Forms are Marked

Thus regardless of the assumptions about missing verbal forms, the pattern is clear: verbal forms of PC roots tend to be more marked within their paradigms than verbal forms of result roots.

4.4 Summary

Words based on result roots do not exist in the same morphological forms PC root words do. The former but not the latter tend to lack simple stative forms and tend to be lexicalized as basic verbs. These are the same root classes that tend to show consistent semantic patterns, where result roots carry non-cancelable inferences of change and PC roots do not. Thus the confluence of facts we saw in §2 are not just an accident of English, but represent a recurring pattern across languages.

5 A Sketch of an Analysis

In §2.6 we suggested that under Bifurcation the correlating semantic and morphological facts of English are a series of coincidences. But if the patterns recurred across languages a deeper explanation is more likely, in which result roots but not PC roots describe states associated with a non-cancelable inference of change, with the distinct morphological properties keyed to this. Since the patterns did recur across languages, this is the preferred analysis, disconfirming Bifurcation as a principle of how word meanings are built and its strong correlation of lexical semantics to syntax.

We consider here one possible implementation of this idea. The starting point is the observation that the inference of change found with all forms of result roots is the same as that found in verbs built on PC forms. In particular, it gives rise to similar patterns regarding the non-deniability of change in contexts in which the state is asserted in §2.3 and in deriving repetitive readings under *again* modification in §2.4. Since that meaning of change with PC verbs comes from v_{become} then some aspects of that meaning should be incorporated into the meaning of result roots. To flesh this out we assume a compositional semantics wherein roots and functional heads represent functions from individuals — real world entities, events, and states — and functions over individuals to truth values, represented using a typed λ -calculus. We define v_{become} as the function in (49) taking a state-denoting predicate P (i.e. a root), an individual x , and an event e as arguments and asserting that P obtains for x in state s and e is the coming about of s , represented by logical operator *become'*:

$$(49) \quad \llbracket v_{\text{become}} \rrbracket = \lambda P \lambda x \lambda e \exists s [\text{become}'(e, s) \wedge P(x, s)]$$

The simplest implementation of the idea that result roots have a non-cancelable inference of change that is consistent with the architecture in §1 — maintaining the same templatic structures, the (acategorial) root vs. template distinction, and no special diacritics for roots or any other assumptions — would be to assume that all stative roots denote functions relating an individual x to a state s of the sort idiosyncratically named by that root, but result roots additionally entail the existence of some change-of-state event e' by which s came about in exactly the same way v_{become} does (though see §6 for an alternative perspective on how this is introduced):

- (50) a. $\llbracket \sqrt{\text{FLAT}} \rrbracket = \lambda x \lambda s [\text{flat}'(x, s)]$
- b. $\llbracket \sqrt{\text{CRACK}} \rrbracket = \lambda x \lambda s [\text{cracked}'(x, s) \wedge \exists e' [\text{become}'(e', s)]]$

This might be what Rappaport Hovav & Levin (1998: 109) have in mind in saying that *break* type verbs are built on “result states”. (See also the above-mentioned observation of Dixon 1982: 50.) Applying (49) to (50) produces (51), the stems of the change-of-state verbs *flatten* and *crack*:

- (51) a. $\llbracket v_{\text{become}} \sqrt{\text{FLAT}} \rrbracket = \lambda x \lambda e \exists s [\text{become}'(e, s) \wedge \text{flat}'(x, s)]$
- b. $\llbracket v_{\text{become}} \sqrt{\text{CRACK}} \rrbracket = \lambda x \lambda e \exists s [\text{become}'(e, s) \wedge \text{cracked}'(x, s) \wedge \exists e' [\text{become}'(e', s)]]$

Flatten in (51a) only entails change by virtue of v_{become} , but *crack* in (51b) has the entailment itself. Of course, v_{become} also introduces change, but this is semantically inconsequential since conjunctively there is just one such entailment in the composed meaning. Thus the semantics of the verbs built on the two roots is identical, modulo the specific state.

But (50) predicts other uses of (50b) without v_{become} will entail change. If Asp_S is the identity function as in (52a) then (50) will differ in that only the $\sqrt{\text{FLAT}}$ adjective will lack an entailment of change while the $\sqrt{\text{CRACK}}$ adjective will, even in a structure lacking v_{become} :

- (52) a. $\llbracket \text{Asp}_S \rrbracket = \lambda P \lambda x \lambda s [P(x, s)]$
 b. $\llbracket \text{Asp}_S \vee \text{FLAT} \rrbracket = \lambda x \lambda s [flat'(x, s)]$
 c. $\llbracket \text{Asp}_S \vee \text{CRACK} \rrbracket = \lambda x \lambda s [cracked'(x, s) \wedge \exists e' [become'(e', s)]]$

Finally, if *again* has the meaning in (53a) where it applies to a predicate P , individual x , and eventuality s and says that P holds of x in s and that there was some prior s' in which P holds of x , then as applied to (50) we would have the two restitutive attachment readings given in (53b) and (53c) (where for eventualities $s, s', s' \ll s$ is true iff s' occurred prior to s).

- (53) a. $\llbracket \text{again} \rrbracket = \lambda P \lambda x \lambda s [P(x, s) \wedge \exists s' [s' \ll s \wedge P(x, s')]]$
 b. $\llbracket \sqrt{\text{FLAT}} \text{ again} \rrbracket = \lambda x \lambda s [flat'(x, s) \wedge \exists s' [s' \ll s \wedge flat'(x, s')]]$
 c. $\llbracket \sqrt{\text{CRACK}} \text{ again} \rrbracket = \lambda x \lambda s [cracked'(x, s) \wedge \exists e' [become'(e', s)] \wedge \exists s' [s' \ll s \wedge cracked'(x, s') \wedge \exists e' [become'(e', s')]]]$

Crucially, while in (53b) *x* holds a flatness state and held one before, in (53c) the reading is that *s* holds a cracked state that came about because of some event and previously held a cracked state that came about because of some event. This effectively derives a repetitive reading, albeit under restitutive attachment, meaning we need no diacritics to rule out such an attachment (see also Beavers & Koontz-Garboden 2012: 359-362). Thus this analysis captures the semantic facts above with no additional assumptions other than a difference in the semantics of the two types of roots.

A simple analysis for the morphology of PC and result roots furthermore builds directly off of this proposed semantic distinction. In the basic logic of event structural approaches change is an entailment typically introduced in verbal contexts and not adjectival contexts. The root forms that are unmarked in the data above are result roots as verbs and PC roots as adjectives. If result roots entail change and PC roots do not then the descriptive generalization is that each root is unmarked in the category that most closely matches its meaning, and marked otherwise. More precisely, we could capture this by adopting the following default realization rules for $\text{Asp}_{S/R}$ and v_{become} heads (which operate in the absence of narrower lexical idiosyncrasies or specific subregularities):

- (54) Default realization of v_{become} with complement $\sqrt{\text{ROOT}}$:

 - If $\sqrt{\text{ROOT}}$ entails change, then $-\emptyset$ (result roots derive unmarked verbs)
 - If $\sqrt{\text{ROOT}}$ does not entail change, then $-en/ed$ (PC roots derive marked verbs)

(55) Default realization for $\text{Asp}_{S?R}$ with complement X (root \sqrt{R} or vP):

 - If X does not entail change, then $-\emptyset$ (PC roots derive unmarked adjectives)
 - If X entails change, then $-en/ed$ (result roots derive marked adjectives)

Of course, this is for languages like English. Equipollent languages tend to realize almost everything as marked, and labile/suppletive languages tend to realize almost everything as unmarked.

The unattested type is the opposite of English, with marked adjectives entailing no change and marked verbs entailing change, which we would not expect on markedness grounds. This is superior to the analysis sketched in §2 that is consistent with Bifurcation. In that analysis the morphological facts would have to be treated as effectively superficial accidents of English that divide roots into exactly two morphological classes that happen to correlate with certain syntactic facts deriving non-disassociability of change from result roots. The rules in (54) have a deeper functional motivation: roots have distinct meanings and the two lexical categories are unmarked for opposite meanings.¹⁷ In sum, we can accommodate the facts in an elegant way by abandoning Bifurcation and assuming templatic meaning in roots is similar to templatic meaning in functional heads.

There are other analyses than the one in §2 that preserve Bifurcation. However, they all suffer from similar objections. For example, following the theory of allosemes in Myler (2014) and Wood & Marantz (2015) we could assume all stative roots name simple states but must first combine with Asp_S (even before v_{become} , i.e. all verbs are technically deadjectival). But Asp_S is polysemous between an identity function meaning for PC roots vs. a v_{become} -type meaning for result roots. Making appropriate assumptions to get the morphology right (e.g. v_{become} is only overtly realized if its complement has a PC root) and to ensure *again* always attaches at AspP or higher, we could derive the data here. But this does not explain why the same root meanings across languages would trigger the same senses of Asp_S . Furthermore, it requires extra machinery to get the full set of facts right. In essence, just as with the analysis in §2, additional assumptions are needed to explain why this particular set of facts comes together again and again across languages, often appealing to an otherwise unmotivated distinction between roots. Alternatively, Embick (2009: 16-17) explains the difference between PC and result roots by claiming that while the former are state-denoting the latter are manner roots (i.e. like $\sqrt{\text{JOG}}$ in §1) that modify v_{cause} , with the state introduced by some functional head ST acting as the complement of v_{become} . This analysis might handle the cross-linguistic data if the state vs. manner root distinction held up for roots naming equivalent meanings across languages. However, it is hard to see that there is any evidence that all result roots entail manner. Rather, as Beavers & Koontz-Garboden (2012) discuss in detail, some do and some do not. Furthermore, the analysis still requires assumptions about the morphology — that these manner roots give rise to *-ed/en* adjectives when typically manner roots form *-ing* adjectives — and about sublexical modifiers whereby such modifiers do not scope over ST without scoping over the head introducing change (or by positing that ST entails change, yet only occurs with result roots, another coincidence). The analysis that rejects Bifurcation just posits that some states come with associated entailments of change and that morphology is sensitive to this in functionally natural ways.

Accepting these conclusions, however, does not blunt the types of predictions event structural approaches give rise to. Rather, it simply addresses the larger challenge posed by Dowty (1979:

¹⁷However, (54) might go against the grain of event structural approaches that separate morphological realization and semantic interpretation (such as the separation of Phonetic Form and Logical Form and the operations on each common in Distributed Morphology implementations of event structures; see e.g. Harley 2014: 242-247 for one such approach) An alternative is (as per Ramchand 2008: 58) that roots come with syntactic features that determine what heads they combine with. One such feature (say, [+become]) could be found exclusively on roots that entail a change, and this determines the morphology. This still abandons Bifurcation — to get the semantic inferences right — but preserves the idea that morphology is not contingent directly on semantics. However, this redundantly reproduces the semantic classification via syntactic features; the case for handling the data either way would rest on how otherwise motivated the assumption that morphology is not sensitive to semantics is.

125-129) by suggesting that a more complex theory of possible verb meanings is needed within theories of event structure. First, if a verb or any other category entails change-of-state this does not technically require a v_{become} -type component to its event structural decomposition, nor any of the concomitant grammatical behavior (e.g. an overt inchoative morpheme in languages that have these). Yet if other evidence suggests a v_{become} -type element we should expect it to have certain grammatical properties, and thus there are still predicted correlations. Furthermore, patterns of sublexical modification suggest that there is still a critical role for event templates. Templates have a decompositional structure that allows the state to be separated from the change while roots do not. Thus verbs with change introduced in different ways will show different patterns of sublexical modification, albeit being consistent within a class. Finally, although we have said that roots can be determinative of morphological paradigms, we have not denied that templates are as well; it just requires a careful teasing apart of which aspects of a surface form's regular morphology is owing to its root vs. its template. Thus a theory of event structures is still predictive — and in fact justified since it explains certain facts that would not be otherwise explained — but the facts are not as one-to-one as a theory that also assumes Bifurcation would have them.

6 Conclusion

Result roots entail change while PC roots do not, suggesting that Bifurcation does not hold — there is no clean division of labor between templates and roots in terms of the types of lexical entailments they introduce. While roots are the locus of idiosyncratic meaning they may also introduce templatic meaning as well. Thus the simplest predictions of event structural approaches with Bifurcation do not hold: just looking at given verb's lexical entailments will not make any predictions about its grammatical properties, since some templatic notions may come from the root and not the template. But this does not mean that no predictions are made. While roots and templates can both introduce change-of-state, they do not do so in equivalent ways, and this leads to distinct patterns within change-of-state verbs in terms of facts like sublexical modification, among other things.

But why should there be two types of stative roots? Here we believe the reason hinges on at least two distinctions between types of states. First, there are certain states that people can conceive of as existing independent of any process that leads to them, while others only arise if something leads to them. If a root names a state of the former type then it will simply name a state; any inference of change must come from somewhere else. But if a root names a state that is conceived as only coming about through a change — the state has change as a part of its definition — then the root will entail the change since it is part and parcel with entailing the state itself. Second, certain states may be so conventionally associated with certain processes that particular roots are lexicalized that have the process as part of their meaning as well. If the change/state association is widespread across different linguistic communities it would explain the cross-linguistic patterns. On either grounds, the states that result roots name that are common to human experience are such that they cannot be divorced from the events that lead to them, or are too often associated with such events, and this is reflected in the means languages have developed for describing those states.¹⁸ To

¹⁸Indeed, another explanation for the distinction between PC and result roots would be that it reflects frequency à la Haspelmath et al. (2014): result root states are more frequently discussed in terms of changes into them and PC root states are more frequently discussed in the absence of change, and the unmarked forms correspond to the most frequent uses. An examination of the frequency patterns is a matter of a separate study, though if those correlations do obtain it would still raise the question of why these frequency distributions would be the way they are. Our analysis would explain that. Furthermore, a purely frequency-based analysis would not explain the entailment patterns seen

put it more formally, it could be that a meaning representation like (50b) is redundant and the real meaning of $\sqrt{\text{CRACK}}$ is something like the following, where the change is entailed by the state:

$$(56) \llbracket \sqrt{\text{CRACK}} \rrbracket = \lambda x \lambda s [\text{cracked}'(x, s)], \text{ where } \forall x \forall s [\text{cracked}'(x, s) \rightarrow \exists e' [\text{become}(e', s)]]$$

Thus while Bifurcation is a reasonable principle for how lexicons are organized, with its clean division of labor and relatively small lexicon, we have shown that certain root meanings exhibit templatic entailments such as change, which necessarily requires a richer possible semantic content for verbal roots and ultimately a richer set of predictions for event structural approaches at large.

A Languages Used in the Typological Study

All macroareas and genetic affiliations are taken from WALS. Each language is listed with its genus and family, except where those are the same. Italicized languages are from WALS 200 and languages, languages not on WALS 200 or 100 are underlined, and data from boldfaced languages were collected from native speaker informants. Otherwise all languages are from WALS 100 and data were collected through dictionary and grammatical resources (Spanish, German, and French data were collected from resources but checked by a native speaker).

Eurasia Basque (Basque)

Burmese (Burmese-Lolo, Sino-Tibetan)

Mandarin (Chinese, Sino-Tibetan)

Meithei (Kuki-Chin, Sino-Tibetan)

Burushaski (Burushaski)

Chukchi (Northern Chukotko-Kamchatkan, Chukotko-Kamchatkan)

English (Germanic, Indo-European)

German (Germanic, Indo-European)

Modern Greek (Greek, Indo-European)

Persian (Iranian, Indo-European)

Russian (Slavic, Indo-European)

Spanish (Romance, Indo-European)

French (Romance, Indo-European)

Hindi (Indic, Indo-European)

Finnish (Finnic, Uralic)

Georgian (Kartvelian)

Modern Hebrew (Semitic, Afro-Asiatic)

Japanese (Japanese)

Kannada (Southern Dravidian, Dravidian)

Khalkha (Mongolic, Altaic)

Korean (Korean)

Lezgian (Lezgic, Nakh-Daghestanian)

Thai (Kam-Tai, Tai-Kadai)

Turkish (Turkic, Altaic)

Vietnamese (Viet-Muong, Austro-Asiatic)

Africa Acholi (Nilotic, Eastern Sudanic)

Egyptian Arabic (Semitic, Afro-Asiatic)

above; something else along the lines of what we propose would be required.

Middle Atlas Berber (Berber, Afro-Asiatic)
Hausa (West Chadic, Afro-Asiatic)
Harar Oromo (Lowland East Cushitic, Afro-Asiatic)
Gújjolaay Eegimaa (Bak, Niger-Congo)
Swahili (Bantoid, Niger-Congo)
Kinyarwanda (Bantoid, Niger-Congo)
Zulu (Bantoid, Niger-Congo)
Sango (Ubangi, Niger-Congo)
Yoruba (Defoid, Niger-Congo)
Khoekhoe (Khoe-Kwadi)
Koyraboro Senni (Songhay)
Malagasy (Barito, Austronesian)

North America Plains Cree (Algonquian, Algonquian)
Hopi (Hopi, Uto-Aztecán)
Yaqui (Cahita, Uto-Aztecán)
Jakaltek (Mayan)
Tenango Tzeltal (Mayan)
Karok (Karok)
Kiowa (Kiowa-Tanoan)
Koasati (Muskogean)
Lakhota (Core Siouan, Siouan)
Chalcatongo Mixtec (Mixtecan, Oto-Manguean)
Mezquital Otomí (Otomian, Oto-Manguean)
Navajo (Athapaskan, Na-Dene)
Oneida (Northern Iroquoian, Iroquoian)
Rama (Rama, Chibchan)
Tsimshian (Penutian)
Yup'ik (Eskimo, Eskimo-Aleut)
Zoque (Mixe-Zoque)

South America Barasano (Tucanoan)
Carib (Cariban)
Guaraní (Tupi-Guaraní, Tupian)
Minica Huitoto (Huitoto, Huitotoan)
Kakataibo (Cashibo-Cacataibo, Panoan)
Mapudungun/Mapuche (Araucanian)
Mocoví (South Guaicuruan, Guaicuruan)
Paumarí (Arauan)
Huallaga Quechua (Quechuan)
Warao (Warao)
Yagua (Peba-Yaguan)

Papunesia Alamblik (Sepik Hill, Sepik)
Kwoma (Middle Sepik, Sepik)
Anejoñ (Oceanic, Austronesian)
Bariai (Oceanic, Austronesian)

Fijian (Oceanic, Austronesian)
Hawaiian (Oceanic, Austronesian)
Chamorro (Chamorro, Austronesian)
Indonesian (Malayo-Sumbawan, Austronesian)
Paiwan (Paiwan, Austronesian)
Tagalog (Greater Central Philippine, Austronesian)
Lower Grand Valley Dani (Dani, Trans-New Guinea)
Kewa (Engan, Trans-New Guinea)
Koiari (Koiarian, Trans-New Guinea)
Daga (Dagan)
Oksapmin (Oksapmin)

Australia Gooniyandi (Bunuban)
Kayardild (Tangkic, Tangkic)
Martuthunira (Western Pama-Nyungan, Pama-Nyungan)
Pintupi (Western Pama-Nyungan, Pama-Nyungan)
Murrinh-Patha (Murrinh-Patha, Southern Daly)
Tiwi (Tiwian)

B Numerical Data for Typological Study

PC root	#states	#languages	attested	Result root	#states	#languages	attested
bad	80	84	95.24%	bend	6	73	8.22%
black	84	84	100.00%	bloom	5	65	7.69%
blue	67	67	100.00%	boil	1	77	1.30%
brown	55	55	100.00%	break	1	85	1.18%
clean	56	67	83.58%	burn	3	82	3.66%
clear	51	56	91.07%	come	0	81	0.00%
cold	83	83	100.00%	cook	1	86	1.16%
cool	54	63	85.71%	crack	1	63	1.59%
deep	71	72	98.61%	crush	0	71	0.00%
dirty	77	78	98.72%	decay	4	79	5.06%
dry	73	85	85.88%	destroy	0	70	0.00%
fast	63	71	88.73%	differ	39	52	75.00%
good	84	85	98.82%	drown	1	71	1.41%
green	71	72	98.61%	enter	0	76	0.00%
hard	75	79	94.94%	exit	0	63	0.00%
hot	80	83	96.39%	fall	4	85	4.71%
large	87	87	100.00%	ferment	3	50	6.00%
long	81	82	98.78%	fold	0	64	0.00%
old	0	81	0.00%	freeze	5	40	12.50%
red	80	80	100.00%	go	0	78	0.00%
sharp	66	75	88.00%	grow	2	70	2.86%
short	77	77	100.00%	kill	5	87	5.75%
slow	63	66	95.45%	melt	3	64	4.69%
small	82	84	97.62%	murder	0	45	0.00%
smooth	70	73	95.89%	return	0	71	0.00%
soft	71	71	100.00%	rise	0	83	0.00%
straight	72	76	94.74%	rust	10	53	18.87%
strong	78	80	97.50%	shatter	1	52	1.92%
sweet	71	72	98.61%	snap	1	40	2.50%
tall	71	73	97.26%	split	0	67	0.00%
tight	56	69	81.16%	sprout	1	63	1.59%
warm	62	67	92.54%	swell	2	79	2.53%
weak	63	68	92.65%	tarnish	2	32	6.25%
wet	73	83	87.95%	tear	1	77	1.30%
white	83	84	98.81%	wither	1	59	1.69%
wide	77	78	98.72%	winkle	2	62	3.23%

Figure 9: Percentage of Languages with a Simple State for a Given Root when there is Data for that Root (#States = Number of languages with a simple state, #Languages = Number of languages with any data for that root, Attested = #Roots/#Languages)

PC root	#marked	#languages	marked	Result root	#marked	#languages	marked
bad	36	50	72.00%	bend	17	55	30.91%
black	46	53	86.79%	bloom	10	35	28.57%
blue	30	36	83.33%	boil	18	61	29.51%
brown	25	29	86.21%	break	26	67	38.81%
clean	30	46	65.22%	burn	13	75	17.33%
clear	22	37	59.46%	come	5	48	10.42%
cold	41	56	73.21%	cook	23	66	34.85%
cool	39	49	79.59%	crack	13	49	26.53%
deep	37	43	86.05%	crush	12	40	30.00%
dirty	30	49	61.22%	decay	23	57	40.35%
dry	41	68	60.29%	destroy	14	41	34.15%
fast	30	42	71.43%	differ	15	29	51.72%
good	44	58	75.86%	drown	15	58	25.86%
green	35	38	92.11%	enter	8	50	16.00%
hard	42	54	77.78%	exit	7	37	18.92%
hot	44	60	73.33%	fall	20	70	28.57%
large	38	55	69.09%	ferment	7	33	21.21%
long	41	50	82.00%	fold	10	39	25.64%
old	30	44	68.18%	freeze	4	32	12.50%
red	48	53	90.57%	go	8	49	16.33%
sharp	25	39	64.10%	grow	13	57	22.81%
short	36	47	76.60%	kill	13	83	15.66%
slow	22	31	70.97%	melt	19	53	35.85%
small	34	57	59.65%	murder	5	17	29.41%
smooth	30	39	76.92%	return	12	53	22.64%
soft	32	45	71.11%	rise	21	69	30.43%
straight	33	45	73.33%	rust	17	38	44.74%
strong	40	49	81.63%	shatter	12	37	32.43%
sweet	31	39	79.49%	snap	7	30	23.33%
tall	32	44	72.73%	split	13	52	25.00%
tight	28	42	66.67%	sprout	10	43	23.26%
warm	32	48	66.67%	swell	18	59	30.51%
weak	37	47	78.72%	tarnish	11	21	52.38%
wet	33	57	57.89%	tear	18	55	32.73%
white	46	54	85.19%	wither	16	43	37.21%
wide	40	49	81.63%	wrinkle	20	45	44.44%

Figure 10: Percentage of Languages with a Marked Verbal Paradigm for a Given Root when there is Sufficient Data to Determine Markedness (#Marked = Number of languages with a marked paradigm, #Languages = Number of languages sufficient data, Marked = #Marked/#Languages)

Language	#Roots	%Und	#Pairs	%Equi	%ND	Language	#Roots	%Und	#Pairs	%Equi	%ND
Acholi	102	85.29%	249	64.86%	34.54%	Koasati	70	0.00%	69	1.45%	18.84%
Alamblak	20	10.00%	29	6.90%	13.79%	Koirai	57	19.30%	49	22.45%	30.61%
Anejom	85	0.00%	54	0.00%	88.89%	Korean	94	22.34%	183	39.89%	18.58%
Arabic_Egyptian	76	100.00%	272	45.77%	27.76%	Koyraboro_Senni	55	0.00%	133	26.32%	3.76%
Barasano	73	0.00%	100	2.00%	50.00%	Kwoma	63	0.00%	45	0.00%	62.22%
Bariai	85	1.18%	109	3.67%	19.27%	Lakhota	68	2.94%	282	20.74%	18.26%
Basque	82	9.76%	235	11.49%	43.62%	Lezgian	82	3.66%	55	7.27%	27.27%
Berber_MiddleAtlas	94	80.85%	206	8.74%	30.10%	Malagasy	87	37.63%	34	70.72%	3.15%
Burmese	88	1.14%	238	0.42%	61.13%	Mandarin	101	3.96%	394	11.93%	39.97%
Burushaski	106	10.38%	92	4.35%	38.04%	Mapudungun	75	2.67%	191	7.59%	26.96%
Carib	48	58.33%	86	69.77%	11.63%	Martuthunira	50	0.00%	36	19.44%	11.11%
Chamorro	77	0.00%	170	19.41%	17.35%	Meithei	87	4.60%	198	28.79%	6.57%
Chukchi	51	0.00%	114	3.51%	50.44%	Mixtec_Chalcatongo	93	5.38%	247	30.77%	4.45%
Cree_Plains	105	84.76%	247	69.23%	21.26%	Mocovi	70	4.29%	120	7.92%	36.25%
Daga	77	0.00%	23	4.35%	43.48%	Murrinh-Patha	49	0.00%	29	0.00%	96.55%
Dani_LowerGrandValley	31	29.03%	91	51.65%	3.30%	Navajo	59	100.00%	101	43.56%	33.66%
English	103	0.00%	432	3.01%	37.50%	Oksapmin	62	0.00%	91	23.08%	13.19%
Fijian	66	3.03%	148	31.08%	3.38%	Oneida	55	98.18%	116	77.16%	19.40%
Finnish	104	36.54%	469	21.64%	23.99%	Oromo_Harar	57	94.74%	140	96.07%	3.57%
French	87	0.00%	377	11.27%	18.17%	Otomi	172	2.33%	97	11.34%	67.01%
Georgian	78	5.13%	67	70.15%	8.96%	Paiwan	60	61.67%	181	67.40%	3.87%
German	67	11.94%	284	14.08%	17.78%	Paumari	61	90.16%	72	68.06%	25.00%
Gooniyandi	33	0.00%	3	0.00%	100.00%	Persian	91	14.29%	217	27.19%	18.66%
Greek_Modern	76	5.26%	154	8.44%	42.86%	Pintupi	75	21.33%	73	31.51%	6.85%
Guarani	95	1.05%	122	3.28%	36.89%	Quechua_Huallaga	93	9.68%	163	19.02%	7.36%
Guujolaay_Eegimaa	75	97.33%	263	5.70%	47.91%	Rama	54	0.00%	223	19.73%	13.90%
Hausa	73	28.77%	90	50.56%	26.67%	Russian	82	4.88%	276	15.22%	20.29%
Hawaiian	117	0.85%	89	3.37%	39.33%	Sango	102	3.92%	171	4.09%	87.13%
Hebrew	95	98.95%	194	87.11%	13.14%	Spanish	72	2.78%	301	18.27%	7.64%
Hindi	93	2.15%	258	28.10%	14.34%	Swahili	98	23.47%	214	21.96%	18.93%
Hopi	75	21.33%	249	46.59%	3.21%	Tagalog	93	82.80%	205	79.51%	9.27%
Huitoto_Minica	85	94.12%	93	56.45%	38.71%	Tenango_Tzeltal	76	5.26%	291	19.93%	10.31%
Indonesian	94	15.96%	161	3.73%	36.96%	Thai	102	3.92%	110	2.73%	53.64%
Jakaltek	57	0.00%	123	26.02%	6.50%	Tiwi	45	0.00%	46	6.52%	23.91%
Japanese	83	28.92%	100	38.00%	20.00%	Tsimshian_Coast	73	6.85%	83	1.20%	31.33%
Kakataibo	123	26.02%	531	14.69%	16.57%	Turkish	89	8.99%	216	15.05%	4.86%
Kannada	71	16.90%	58	16.38%	31.03%	Vietnamese	71	0.00%	144	18.06%	22.57%
Karok	75	13.33%	60	15.00%	15.00%	Warao	60	1.67%	131	14.89%	18.70%
Kayardild	49	0.00%	104	30.77%	0.00%	Yagua	124	6.45%	205	10.24%	37.80%
Kewa	71	0.00%	17	0.00%	58.82%	Yaqui	76	1.32%	248	18.75%	21.17%
Khalkha	65	13.85%	167	27.25%	8.68%	Yoruba	175	2.29%	204	2.94%	62.75%
Khoekhoe	89	0.00%	194	12.89%	22.16%	Yupik	66	12.12%	309	11.97%	13.92%
Kinyarwanda	69	5.80%	129	3.88%	45.74%	Zoque_Copainala	69	0.00%	288	20.83%	10.59%
Kiowa	23	0.00%	111	18.02%	18.92%	Zulu	84	0.00%	324	19.14%	34.72%

Figure 11: Data on Language Types (#Roots = Number of roots with any data, %Und = Percentage of roots with data that have an underlying root, #Pairs = Number of related pairs in data set, %Equi = Percentage of pairs related equipollently, %ND = Percentage of pairs related non-derivationally, i.e. as labile or suppletive)

References

- Alexiadou, Artemis, Elena Anagnostopoulou & Florian Schäfer. 2006. The properties of anti-causatives crosslinguistically. In Mara Frascarelli (ed.), *Phases of interpretation*, 187–211. Berlin: Mouton de Gruyter.
- Arad, Maya. 2005. *Roots and patterns: Hebrew morpho-syntax*. Dordrecht: Springer.
- Baker, Mark C. 1997. Thematic roles and syntactic structure. In Liliane Haegeman (ed.), *Elements of grammar*, 73–137. Dordrecht: Kluwer.
- Beavers, John & Andrew Koontz-Garboden. 2012. Manner and result in the roots of verbal meaning. *Linguistic Inquiry* 43(3). 331–369.
- Beavers, John & Andrew Koontz-Garboden. 2017. The semantic contribution of idiosyncratic roots to ditransitive verbs. In *Proceedings of the 34th west coast conference on formal linguistics*, Summerville: Cascadilla Proceedings Project.
- Beck, Sigrid & Remus Gergel. 2015. The diachronic semantics of *again*. *Natural Language Semantics* 23. 157–203.
- Borer, Hagit. 2005. *Structuring sense, vol. I and II*. Oxford: Oxford University Press.
- Borer, Hagit. 2013. *Structuring sense, vol. III*. Oxford: Oxford University Press.
- Chierchia, Gennaro. 2004. A semantics for unaccusatives and its syntactic consequences. In Artemis Alexiadou, Elena Anagnostopoulou & Martin Everaert (eds.), *The unaccusativity puzzle*, 22–59. Oxford: Oxford University Press.
- Davis, Anthony. 2001. *Linking by types in the hierarchical lexicon*. Stanford: CSLI Publications.
- Davis, Anthony & Jean-Pierre Koenig. 2000. Linking as constraints on word classes in a hierarchical lexicon. *Language* 76. 56–91.
- Deo, Ashwini, Itamar Francez & Andrew Koontz-Garboden. 2011. The morphosemantics of *-ed*. Paper presented at Dimensions of grammar in honor of Paul Kiparsky. Konstanz, August 3, 2011.
- Deo, Ashwini, Itamar Francez & Andrew Koontz-Garboden. 2013. From change to value difference in degree achievements. In *Proceedings of semantics and linguistic theory 23*, 97–115. Ithaca, NY: CLC Publications.
- Dhongde, Ramesh Vaman & Kashi Wali. 2009. *Marathi*. Amsterdam: John Benjamins.
- Dixon, R.M.W. 1982. *Where have all the adjectives gone?* The Hague: Mouton.
- Doron, Edit. 2003. Agency and voice: The semantics of the Semitic templates. *Natural Language Semantics* 11. 1–67.
- Dowty, David. 1979. *Word meaning and Montague grammar*. Dordrecht: D. Reidel Publishing.
- Dryer, Matthew S. & Martin Haspelmath (eds.). 2013. *Wals online*. Leipzig: Max Planck Institute for Evolutionary Anthropology. <http://wals.info/>.
- Dunbar, Ewan & 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(3). 355–392.
- Embick, David. 2009. Roots, states, and stative passives. Talk given at the 2009 Roots Workshop, Stuttgart.
- Ferrel, Raleigh. 1982. *Paiwan dictionary*. Canberra: Department of Linguistics and Research School of Pacific Studies, Australian National University.
- Folli, Raffaella & Heidi Harley. 2004. Consuming results: Flavors of little-*v*. In Paula Kempchim-

- sky & Roumyana Slabakova (eds.), *Aspectual enquiries*, 1–25. Dordrecht: Kluwer.
- Folli, Raffaella & Gillian Ramchand. 2002. Event structure composition: The case of goal of motion and resultative constructions in Italian and Scottish Gaelic. In Henk J. Verkuyl (ed.), *Proceedings of perspectives on aspect conference*, Utrecht: OTS.
- Francez, Itamar & Andrew Koontz-Garboden. 2015. Semantic variation and the grammar of property concepts. *Language* 91.3.
- Gawron, Jean Mark. 2006. Paths and scalar change. Unpublished Ms., San Diego State University, dated May 18, 2006.
- Goldberg, Adele E. 1995. *Constructions: A construction grammar approach to argument structure*. Chicago, IL: University of Chicago Press.
- Hale, Ken & Samuel Jay Keyser. 1997. The limits of argument structure. In Amaya Mendikoetxea & Myriam Uribe-Etxebarria (eds.), *Theoretical issues at the morphology-syntax interface*, 203–230. Bilbao: Universidad de País Vasco, Euskal Herriko Universtitatea.
- Hale, Kenneth L. & Samuel Jay Keyser. 1993. On argument structure and the lexical expression of syntactic relations. In Ken Hale & Samuel Jay Keyser (eds.), *The view from building 20: Essays in linguistics in honor of Sylvain Bromberger*, Cambridge, MA: MIT Press.
- Hale, Kenneth L. & Samuel Jay Keyser. 1998. The basic elements of argument structure. In *Papers from the UPenn/MIT roundtable on argument structure and aspect*, vol. 32, 73–118. MITWPL.
- Hale, Kenneth L. & Samuel Jay Keyser. 2002. *Prolegomenon to a theory of argument structure*. Cambridge, MA: MIT Press.
- Harley, Heidi. 2003. Possession and the double object construction. In Pierre Pica & Johan Rooryck (eds.), *Linguistic variation yearbook* 2, 31–70. Amsterdam: John Benjamins.
- Harley, Heidi. 2012. Lexical decomposition in modern syntactic theory. In Wolfram Hinzen, Edouard Machery & Markus Werning (eds.), *The oxford handbook of compositionality*, 328–350. Oxford: Oxford University Press.
- Harley, Heidi. 2014. On the identity of roots. *Theoretical Linguistics* 40. 225–276.
- Harley, Heidi & Rolf Noyer. 2000. Formal versus encyclopedic properties of vocabulary: Evidence from nominalisations. In *The lexicon-encyclopedia interface*, 349–374. Amsterdam: Elsevier.
- Haspelmath, Martin. 1993. More on the typology of inchoative/causative verb alternations. In Bernard Comrie & Maria Polinsky (eds.), *Causatives and transitivity*, 87–120. Amsterdam: John Benjamins.
- Haspelmath, Martin, Andreea Calude, Michael Spagnol, Heiko Narrog & Elif Bamyaci. 2014. Coding causal-noncausal verb alternations: A form-frequency correspondence explanation. *Journal of Linguistics* 58. 627–655.
- Jackendoff, Ray. 1990. *Semantic structures*. Cambridge, MA: MIT Press.
- Jerro, Kyle. 2017. Change-of-state in Kinyarwanda: a study in root meaning. In *Proceedings of the Linguistic Society of America Annual Meeting 2017*.
- Jerro, Kyle. To appear. Change-of-state paradigms and the middle in Kinyarwanda. *Southern African Linguistics and Applied Language Studies*.
- Koontz-Garboden, Andrew. 2005. On the typology of state/change of state alternations. *Yearbook of Morphology* 2005. 83–117.
- Koontz-Garboden, Andrew. 2006. The states in changes of state. In press Proceedings of the 32nd annual meeting of the Berkeley Linguistics Society.
- Koontz-Garboden, Andrew. 2007. *States, changes of state, and the monotonicity hypothesis*: Stanford University dissertation.

- Koontz-Garboden, Andrew. 2009. Anticausativization. *Natural Language and Linguistic Theory* 27. 77–138.
- Koontz-Garboden, Andrew. 2010. The lexical semantics of derived statives. *Linguistics and Philosophy* 33. 285–324.
- Koontz-Garboden, Andrew & John Beavers. 2017. Change of state verbs and the semantics of roots. In *Proceedings of the 34th west coast conference on formal linguistics*, Summerville: Cascadilla Proceedings Project.
- Kratzer, Angelika. 2000. Building statives. In *Bls* 26, 385–399.
- Lakoff, George. 1965. *On the nature of syntactic irregularity*. Bloomington, IN: Indiana University dissertation. Published 1970 as *Irregularity in syntax*. New York: Holt, Rinehart, and Winston.
- Levin, Beth. 1993. *English verb classes and alternations*. Chicago, IL: University of Chicago Press.
- Levin, Beth & 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 University of Pennsylvania Working Papers in Linguistics, 201–225.
- Marantz, Alec. 2009. Roots, re-, and affected agents: can roots pull the agent under little v. Talk given at Roots, Universitat Stuttgart, June 2009.
- McCawley, James D. 1971. Prelexical syntax. In *Report of the 22nd annual roundtable meeting on linguistics and language studies*, 19–33. Washington, DC: Georgetown University Press.
- Megerdoomian, Karine. 2002. *Beyond words and phrases: A unified theory of predicate composition*. Los Angeles, CA: University of Southern California dissertation.
- Myler, Neil. 2014. *Building and interpreting possession sentences*: New York University dissertation.
- Nedjalkov, Vladimir P. & Sergej Je. Jaxontov. 1988. The typology of resultative constructions. In Vladimir P. Nedjalkov (ed.), *Typology of resultative constructions*, 3–62. Amsterdam: John Benjamins.
- Nichols, Johanna, David A. Peterson & Jonathan Barnes. 2004. Transitivity and detransitivizing languages. *Linguistic Typology* 8. 149–211.
- Pedersen, Walter A. 2014. A scalar analysis of again-ambiguities. *Journal of Semantics* 32. 373–424.
- Pesetsky, David. 1995. *Zero syntax: Experiencer and cascades*. Cambridge, MA: MIT Press.
- Pinker, Steven. 1989. *Learnability and cognition: The acquisition of argument structure*. Cambridge, MA: MIT Press.
- Ramchand, Gillian Catriona. 2008. *Verb meaning and the lexicon: A first-phase syntax*. Cambridge: Cambridge University Press.
- Rappaport Hovav, Malka. 2010. Building scalar changes. The Hebrew University of Jerusalem.
- Rappaport Hovav, Malka & Beth Levin. 1998. Building verb meanings. In Miriam Butt & Will-hel Geuder (eds.), *The projection of arguments: Lexical and compositional factors*, 97–133. Stanford: CSLI Publications.
- Ross, John Robert. 1972. Act. In Donald Davidson & Gilbert Harman (eds.), *Semantics of natural language*, 70–126. Dordrecht: Reidel.
- Seiss, Melanie. 2013. *Murrinh-patha complex verbs: Syntactic theory and computational implementation*: Universitat Konstanz dissertation.

- Shibatani, Masayoshi & Prashant Pardeshi. 2001. The causative continuum. In Masayoshi Shibatani (ed.), *The grammar of causation and interpersonal manipulation*, 85–126. Amsterdam: John Benjamins.
- Smith, Marcus. 2006. Canalization of causative derivations. Paper presented at 2006 meeting of LSA, Albuquerque, New Mexico.
- Spathas, Giorgos. 2017. Results in the decomposition of verbal predicates: Evidence from additive operators. Talk given at The Building Blocks and Mortar of Meaning II, University of Tübingen, 3-4 November.
- von Stechow, Arnim. 1995. Lexical decomposition in syntax. In Urs Egli, Peter E. Paue, Christoph Shwarze, Arnim von Stechow & Götz Weinold (eds.), *The lexicon in the organization of language*, 81–118. Amsterdam and Philadelphia: John Benjamins.
- von Stechow, Arnim. 1996. The different readings of *wieder* ‘again’: A structural account. *Journal of Semantics* 13. 87–138.
- von Stechow, Arnim. 2003. How are results represented and modified? remarks on Jäger & Blutner’s anti-decomposition. In Ewald Lang, Claudia Fabricius-Hansen & Catherine Maienborn (eds.), *Modifying adjuncts*, 517–454. Berlin: Mouton.
- Valle Arevalo, Daniel. 2017. *Grammar and information structure of san alejandro kakataibo*. Austin, TX: The University of Texas at Austin dissertation.
- Valle Arevalo, Daniel, John Beavers & Andrew Koontz-Garboden. 2017. States and change-of-state in kakataibo: The role of the root. Paper to be presented at the Society for the Study of the Indigenous Languages of the Americas.
- Van Valin, Robert D. & Randy J. LaPolla. 1997. *Syntax: Structure, meaning, and function*. Cambridge: Cambridge University Press.
- Watkins, Laurel J. & Parker McKenzie. 1984. *A grammar of kiowa* Studies in the Anthropology of North American Indians. Lincoln / London: University of Nebraska Press.
- Wechsler, Stephen. 2005. What is right and wrong about little-v. In Mila Vulchanova & Tor A. Åfarli (eds.), *Grammar and beyond — essays in honour of lars hellan*, 179–195. Oslo: Novus Press.
- Wood, Jim & Alec Marantz. 2015. The interpretation of external arguments.
<http://ling.auf.net/lingbuzz/002487>.
- Wunderlich, Dieter. 1997. Cause and the structure of verbs. *Linguistic Inquiry* 28. 27–68.

States and Changes-of-State: A Cross-Linguistic Study of The Roots of Verbal Meaning

Supplemental Materials on Hypotheticals and Synonyms

1 No Effect on Results when Removing Hypotheticals

In the main paper we discussed the use of hypothetical forms, which were derived from available data using grammatical devices that specific grammatical resources gave for deriving forms when a form was unattested in our resources. All statistical tests performed in the main paper were done with hypotheticals included in the data. Here we present the same tests with hypothetical data excluded. Excluding hypotheticals did not change the significance of the results.

In particular, PC and result roots differed significantly in whether a stative form was attested on a Mann–Whitney U test as in Fig. 1 (PC median = 96.14%, result median = 1.59%, $U = 1266.5$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed). The root subclasses generally patterned in much the same

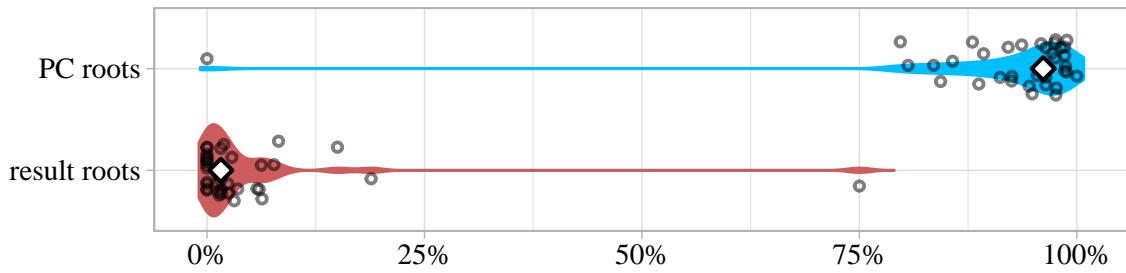


Figure 1: Percentage of Languages With Underived States by Root Class Coded by Translation with Hypotheticals Excluded

way when hypotheticals were excluded, as in Fig. 2. When result states were reclassified as simple states unless clearly derived from a verb, the significance of the results were maintained even without hypotheticals, as in Fig. 3, and this did not change the significance of the distinction (PC median = 89.99%, result median = 28.02%, $U = 1295$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed).

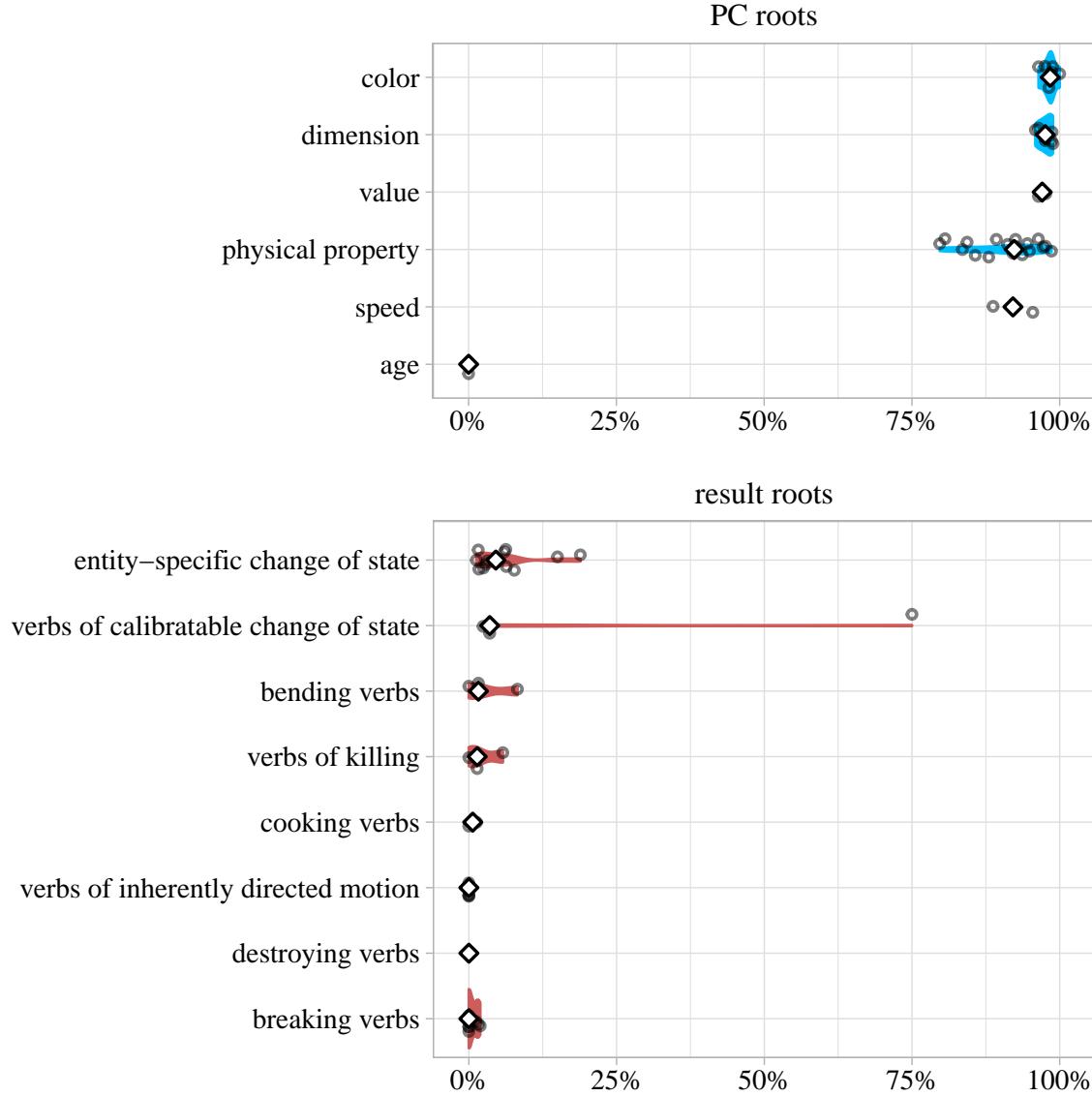


Figure 2: Percentage of Languages With Underived States by Root Subclass Coded by Translation with Hypotheticals Excluded

Turning to verbal markedness, PC roots had significantly more marked verbal paradigms than result roots when considering only paradigms for which we could definitively make a markedness determination, as in Fig. 4 (PC median = 72.38%, result median = 26.38%, $U = 1291.5$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed). The significance of the results also did not change under other assumptions about incomplete paradigms, as in Fig. 5 for when we assumed missing verbs were unmarked (PC median = 79.01%, result median = 25.44%, $U = 1294$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed), Fig. 6 for when we assumed missing verbs were marked (PC median = 44.45%, result median = 17.55%, $U = 1295$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed), and Fig. 7 for when we assumed missing PC root verbs were unmarked and missing result root verbs were marked (PC median = 44.10%, result median = 26.65%, $U = 1168.5$, $n_1 = n_2 = 36$, $p < 0.001$ one-tailed). In sum, the presence of hypotheticals in the data had no impact on the results.

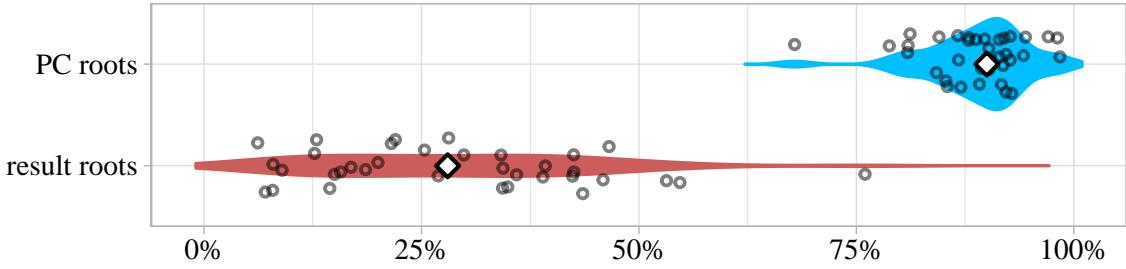


Figure 3: Percentage of Languages With Underived States by Root Class Coded by Morphology with Hypotheticals Excluded

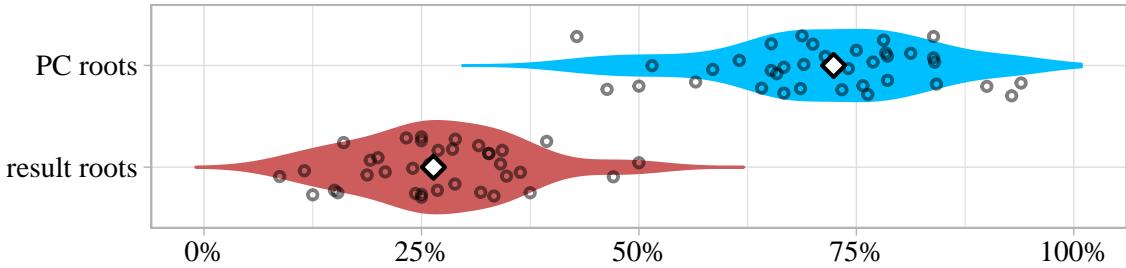


Figure 4: Percentage of Languages With Marked Verbal Paradigms by Root Class For Complete Paradigms with Hypotheticals Excluded

2 No Effect on Results Owing to Random Synonym Choice

Whenever a root had more than one translation equivalent in a language, we chose one synonym uniformly at random in the main paper. To ensure that this did not introduce bias into our results, we repeated our analysis 2,000 times — 1,000 times with hypothetical forms included, 1,000 times without hypotheticals. Figures 8–13 show the distributions over all Monte Carlo runs for each of our data conditions including hypotheticals, while Figures 14–19 show the distributions for all of our data conditions without hypotheticals. The distributions are broadly similar to the single-run distributions reported in the main paper (hypothetical forms included) and in §1 above (hypothetical forms excluded). Figures 20–25 and Figures 26–31 show a different view of the Monte Carlo data, by plotting the distribution of PC root and result root medians across 1,000 Monte Carlo runs with hypotheticals and 1,000 Monte Carlo runs without hypotheticals respectively. Variation in these medians is minimal and, crucially, all PC root medians are higher than the corresponding result root medians.

To decisively ensure that neither the inclusion of hypothetical forms nor the random selection of synonyms had an effect on our results, we performed the Mann–Whitney U tests described in the main paper for each of the 1,000 Monte Carlo runs with and without hypotheticals separately. Figures 32 and 33 supply the greatest p -value observed across all runs for each data condition. All p -values are well below the $p < 0.001$ significance level.

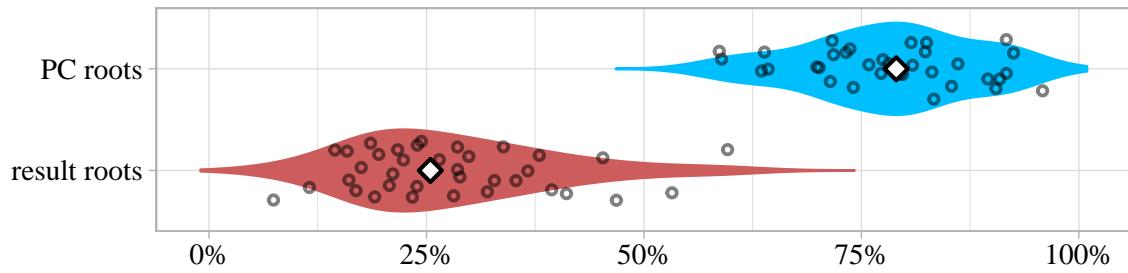


Figure 5: Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Marked with Hypotheticals Excluded

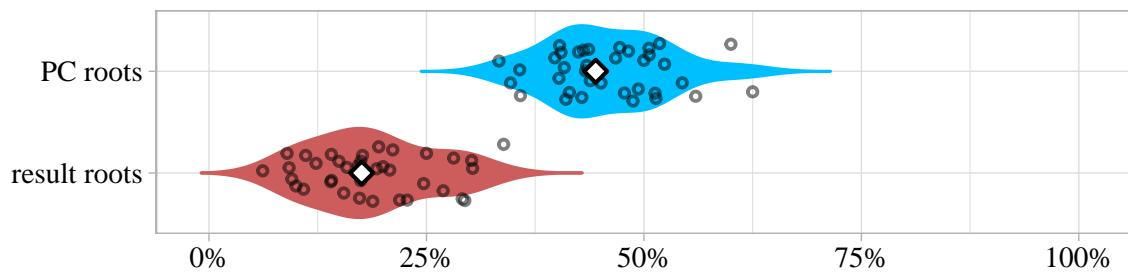


Figure 6: Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Unmarked with Hypotheticals Excluded

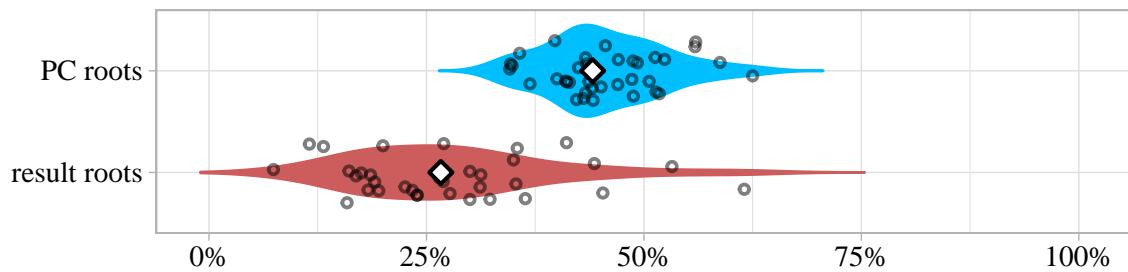


Figure 7: Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing PC Forms are Unmarked and Missing Result Forms are Marked with Hypotheticals Excluded

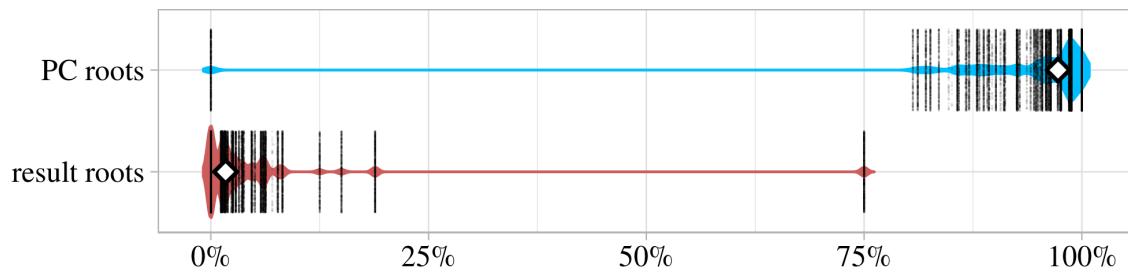


Figure 8: Percentage of Languages With Underived States by Root Class Coded by Translation, from 1,000 Runs with Hypotheticals Included

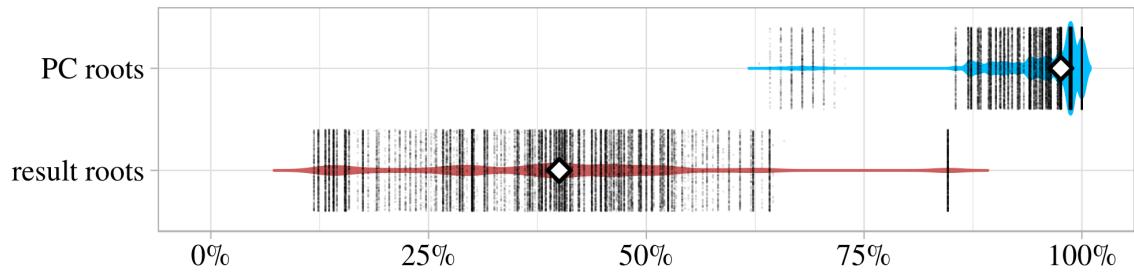


Figure 9: Percentage of Languages With Underived States by Root Class Coded by Morphology, from 1,000 Runs with Hypotheticals Included

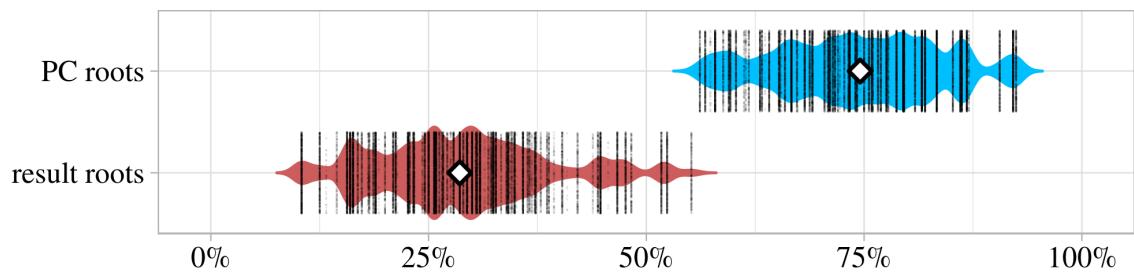


Figure 10: Percentage of Languages With Marked Verbal Paradigms by Root Class For Complete Paradigms, from 1,000 Runs with Hypotheticals Included

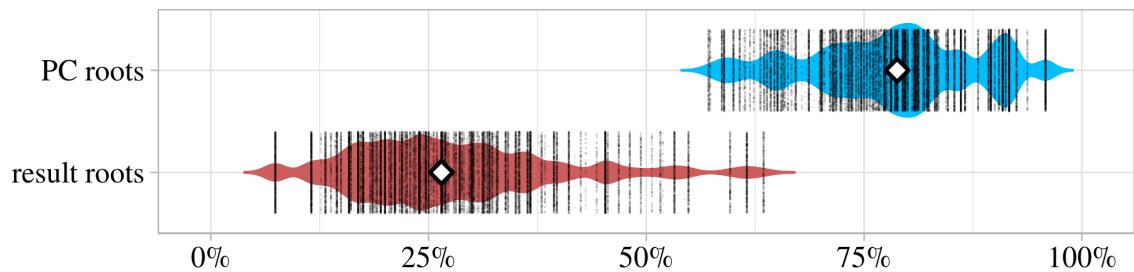


Figure 11: Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Marked, from 1,000 Runs with Hypotheticals Included

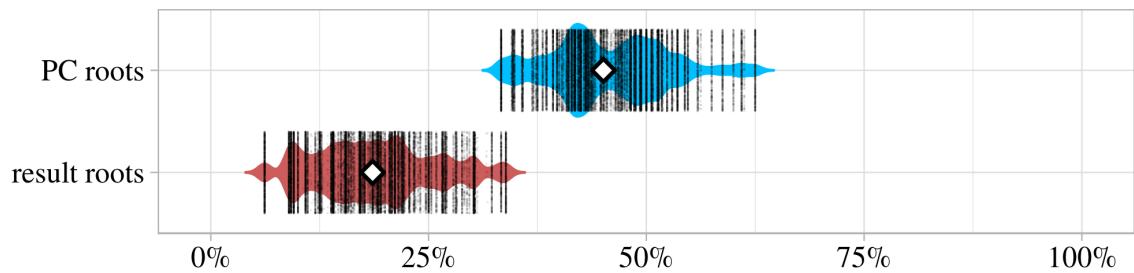


Figure 12: Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Unmarked, from 1,000 Runs with Hypotheticals Included

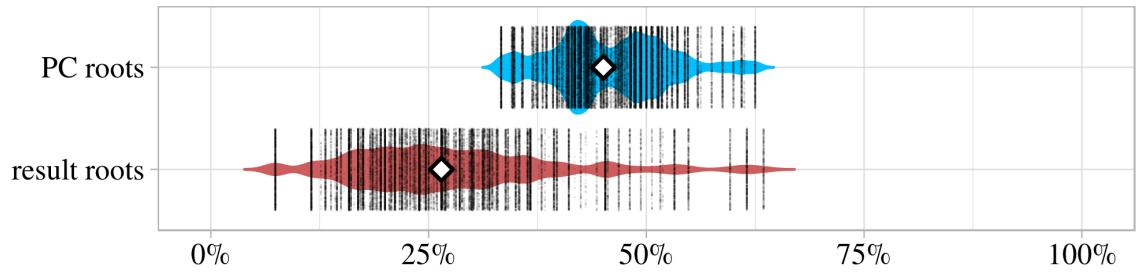


Figure 13: Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing PC Forms are Unmarked and Missing Result Forms are Marked, from 1,000 Runs with Hypotheticals Included

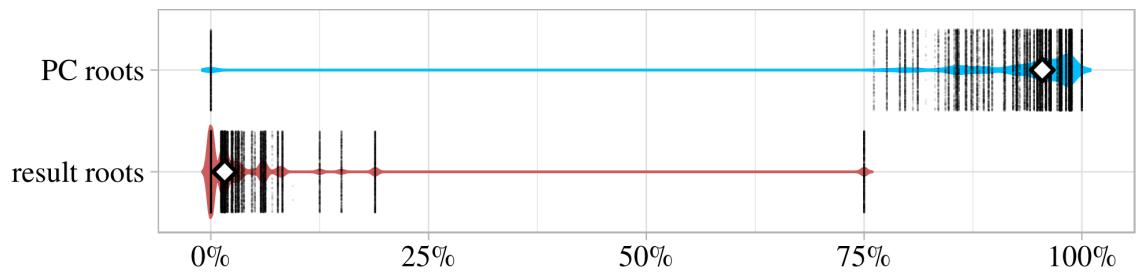


Figure 14: Percentage of Languages With Underived States by Root Class Coded by Translation, from 1,000 Runs with Hypotheticals Excluded

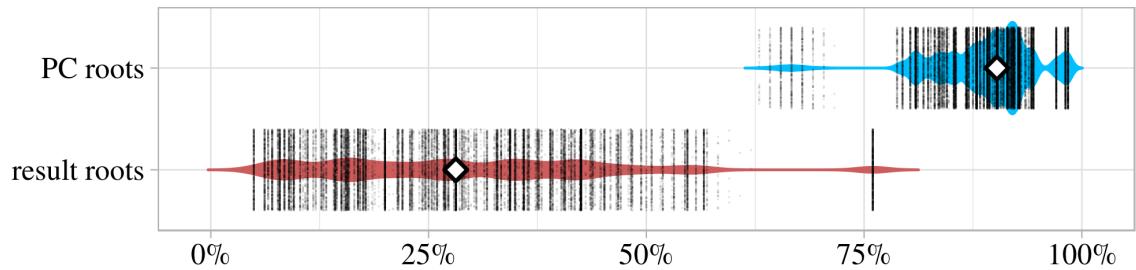


Figure 15: Percentage of Languages With Underived States by Root Class Coded by Morphology, from 1,000 Runs with Hypotheticals Excluded

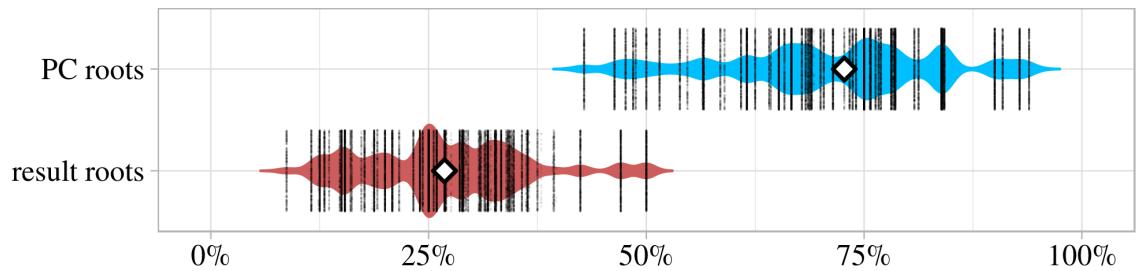


Figure 16: Percentage of Languages With Marked Verbal Paradigms by Root Class For Complete Paradigms, from 1,000 Runs with Hypotheticals Excluded

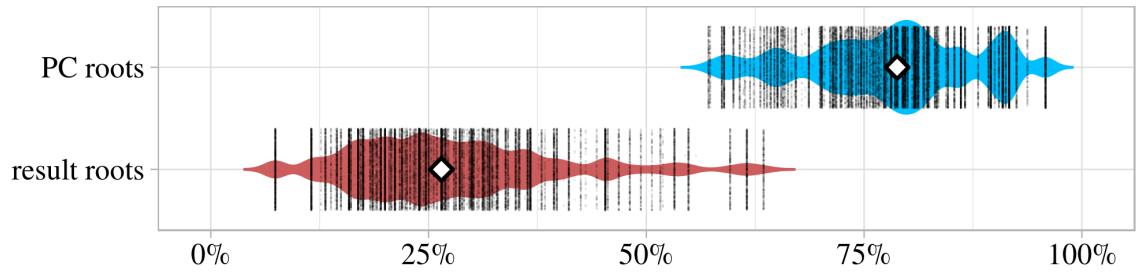


Figure 17: Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Marked, from 1,000 Runs with Hypotheticals Excluded

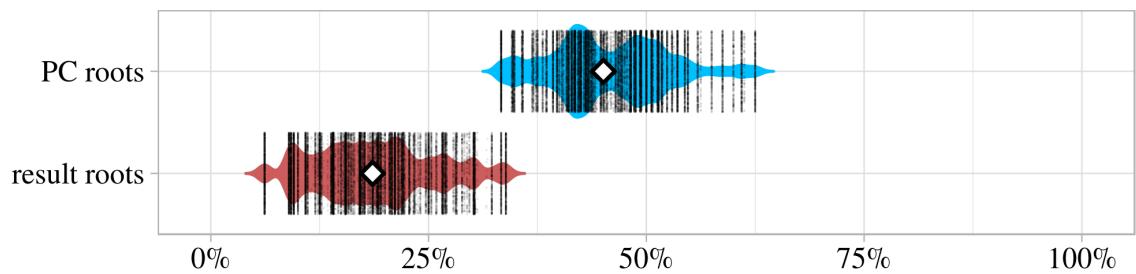


Figure 18: Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Unmarked, from 1,000 Runs with Hypotheticals Excluded

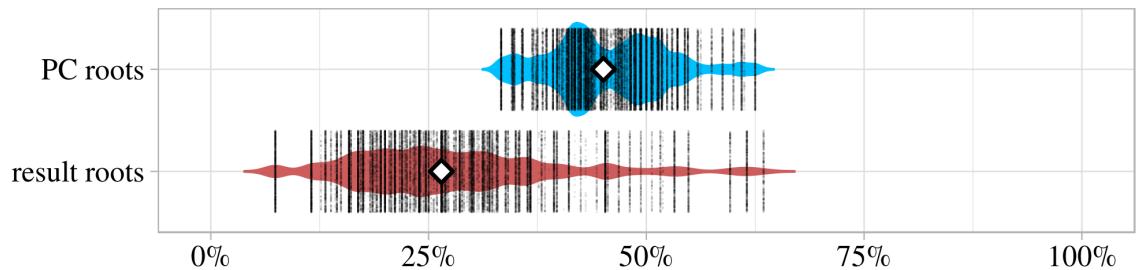


Figure 19: Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing PC Forms are Unmarked and Missing Result Forms are Marked, from 1,000 Runs with Hypotheticals Excluded

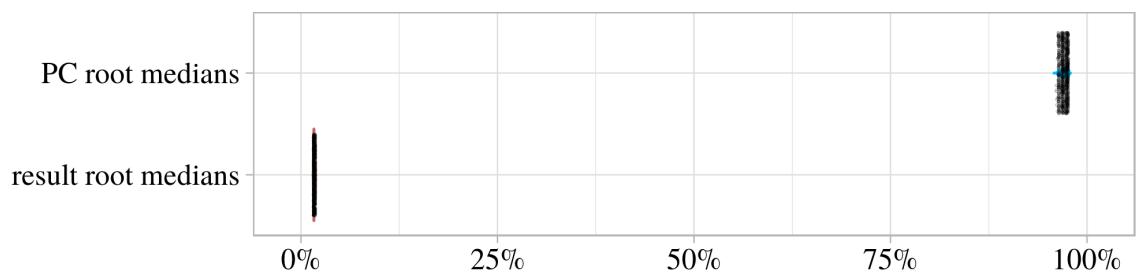


Figure 20: Medians of the Percentage of Languages With Underived States by Root Class Coded by Translation, from 1,000 Runs with Hypotheticals Included

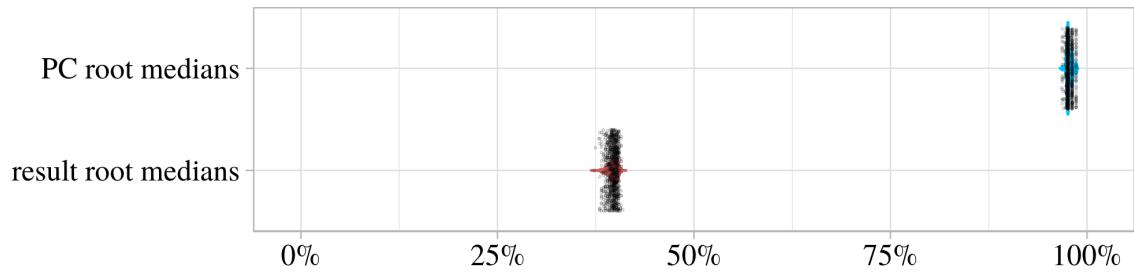


Figure 21: Medians of the Percentage of Languages With Underived States by Root Class Coded by Morphology, from 1,000 Runs with Hypotheticals Included

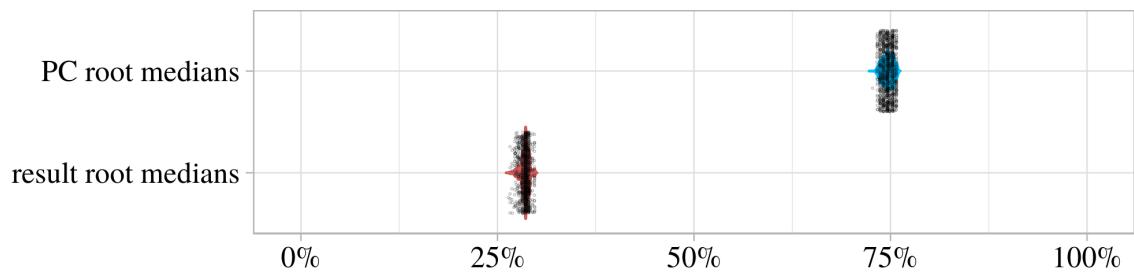


Figure 22: Medians of the Percentage of Languages With Marked Verbal Paradigms by Root Class For Complete Paradigms, from 1,000 Runs with Hypotheticals Included

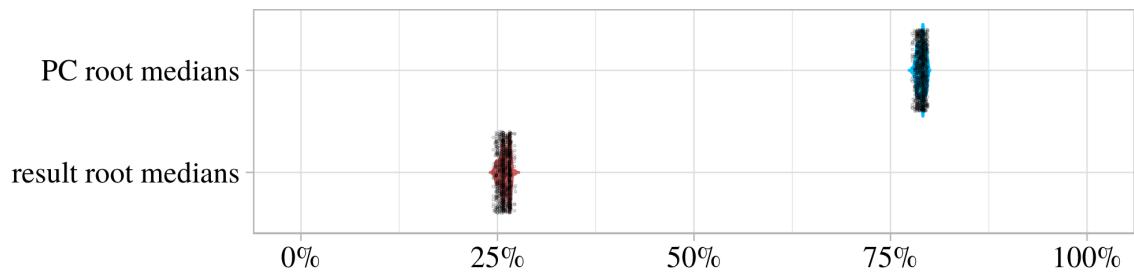


Figure 23: Medians of the Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Marked, from 1,000 Runs with Hypotheticals Included

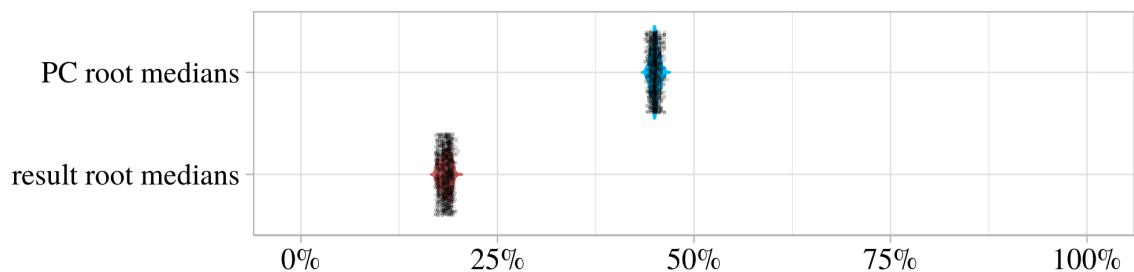


Figure 24: Medians of the Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Unmarked, from 1,000 Runs with Hypotheticals Included

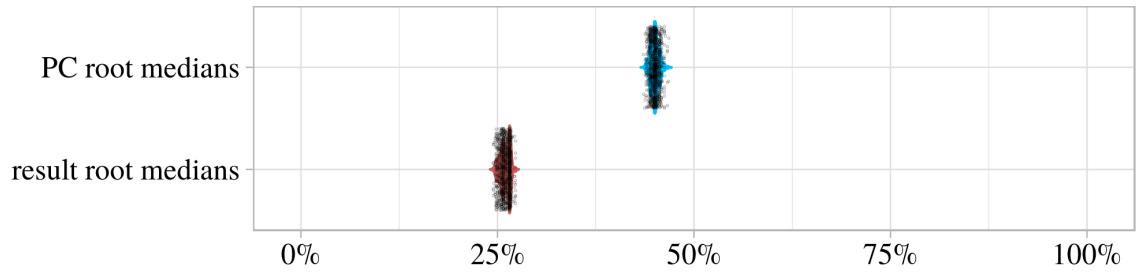


Figure 25: Medians of the Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing PC Forms are Unmarked and Missing Result Forms are Marked, from 1,000 Runs with Hypotheticals Included

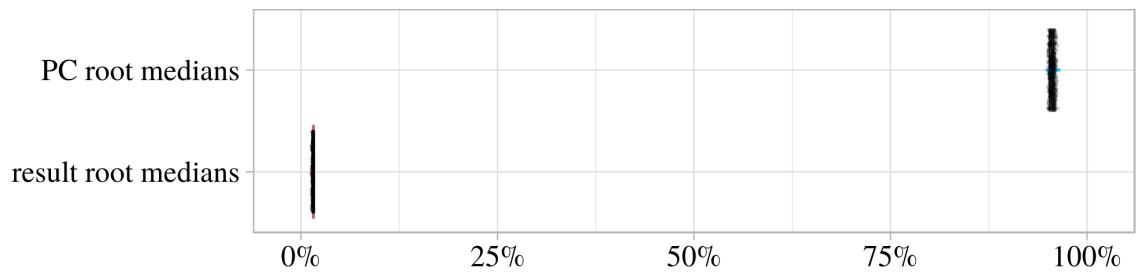


Figure 26: Medians of the Percentage of Languages With Underived States by Root Class Coded by Translation, from 1,000 Runs with Hypotheticals Excluded

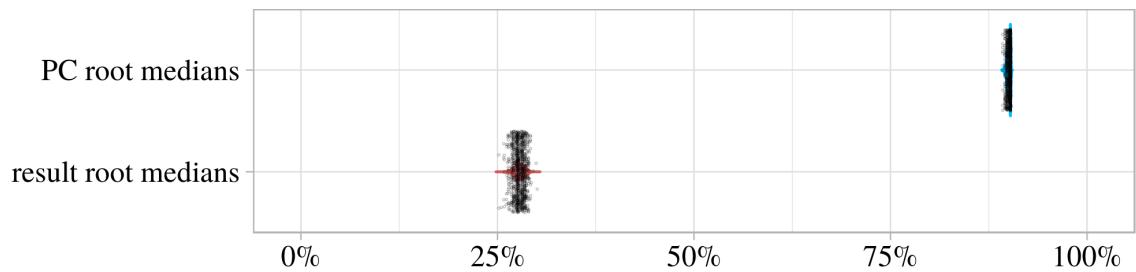


Figure 27: Medians of the Percentage of Languages With Underived States by Root Class Coded by Morphology, from 1,000 Runs with Hypotheticals Excluded

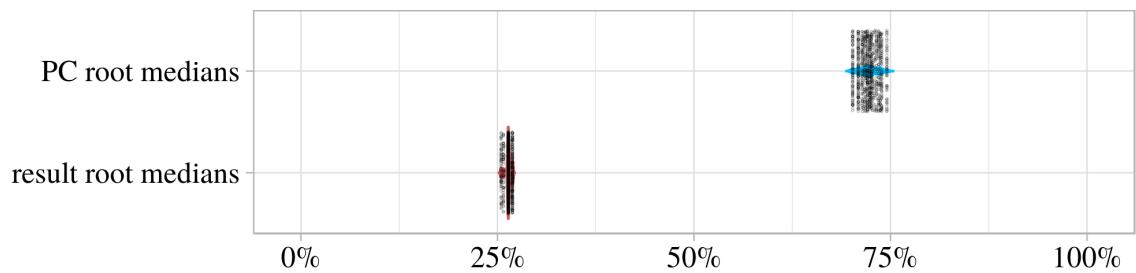


Figure 28: Medians of the Percentage of Languages With Marked Verbal Paradigms by Root Class For Complete Paradigms, from 1,000 Runs with Hypotheticals Excluded

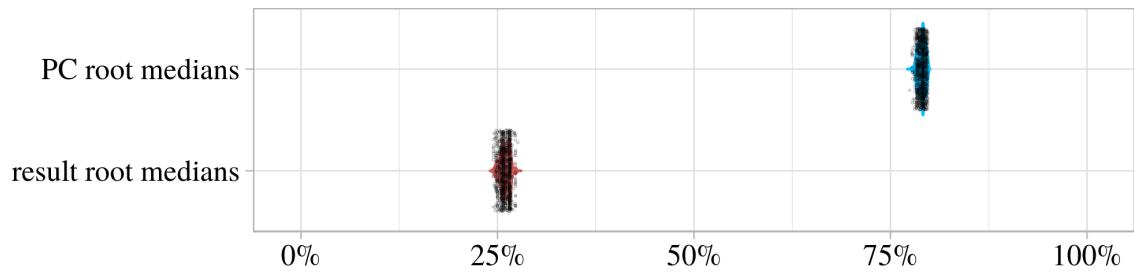


Figure 29: Medians of the Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Marked, from 1,000 Runs with Hypotheticals Excluded

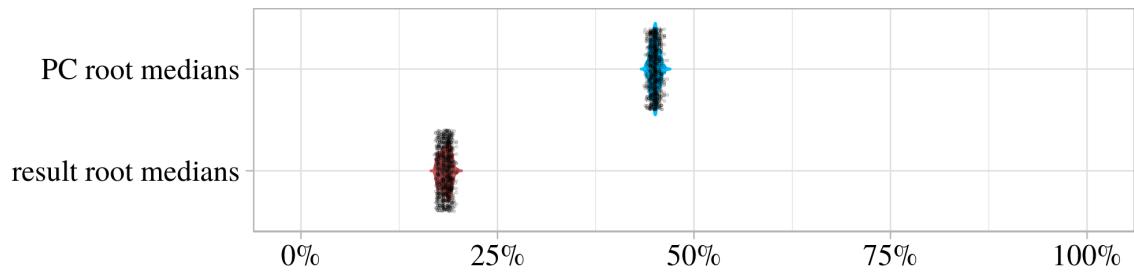


Figure 30: Medians of the Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Unmarked, from 1,000 Runs with Hypotheticals Excluded

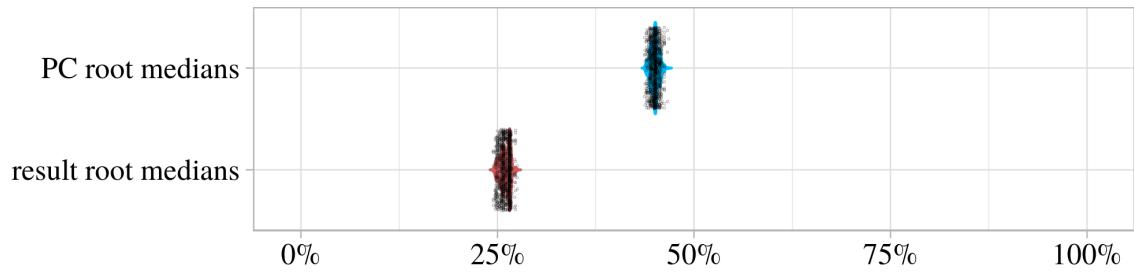


Figure 31: Medians of the Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing PC Forms are Unmarked and Missing Result Forms are Marked, from 1,000 Runs with Hypotheticals Excluded

Data condition (with hypotheticals included)	max. p-value
Percentage of Languages With Underived States by Root Class Coded by Translation	1.74×10^{-12}
Percentage of Languages With Underived States by Root Class Coded by Morphology	1.78×10^{-13}
Percentage of Languages With Marked Verbal Paradigms by Root Class For Complete Paradigms	1.52×10^{-13}
Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Marked	1.95×10^{-13}
Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Unmarked	2.13×10^{-13}
Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing PC Forms are Unmarked and Missing Result Forms are Marked	9.24×10^{-9}

Figure 32: Greatest p -values Observed in One-Tailed Mann-Whitney U Tests (Null Hypothesis: PC Percentages Not Larger than Result Percentages) Across 1,000 Monte Carlo Runs with Hypotheticals Included

Data condition (with hypotheticals excluded)	max. p-value
Percentage of Languages With Underived States by Root Class Coded by Translation	1.41×10^{-12}
Percentage of Languages With Underived States by Root Class Coded by Morphology	1.66×10^{-12}
Percentage of Languages With Marked Verbal Paradigms by Root Class For Complete Paradigms	2.39×10^{-12}
Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Marked	1.95×10^{-12}
Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing Forms are Unmarked	2.13×10^{-12}
Percentage of Languages With Marked Verbal Paradigms by Root Class Assuming Missing PC Forms are Unmarked and Missing Result Forms are Marked	8.37×10^{-12}

Figure 33: Greatest p -values Observed in One-Tailed Mann-Whitney U Tests (Null Hypothesis: PC Percentages Not Larger than Result Percentages) Across 1,000 Monte Carlo Runs with Hypotheticals Excluded

States and Changes-of-State: A Cross-Linguistic Study of The Roots of Verbal Meaning

Supplemental Materials on Language References

References

2000. *Universal 21st century precise English-Korean Korean-English phrase dictionary*. New Westminster: Raven Publishing.
2002. *A Dictionary of the Yoruba Language*. Ibadan: University Press PLC.
2005. *Collins Chinese dictionary*. Glasgow, Scotland: HarperCollins.
- Abdel-Massih, Ernest T. 1971. *A Reference Grammar of Tamazight (Middle Atlas Berber)*. Ann Arbor: Center for Near Eastern and North African Studies, the University of Michigan.
- Akdikmen, Resuhi. 1986. *Langenscheidt's Standard Turkish Dictionary*. New York: Langenscheidt.
- Alderson, A. D. and Fahir Ärz, eds. 1987. *The Concise Oxford Turkish Dictionary*. Oxford: Clarendon Press.
- Ali, Mohammed and Andrzej Zaborski. 1990. *Handbook of the Oromo language*, vol. 30 of *Athiopistische Forschungen*. Stuttgart: F. Steiner.
- Anderson, Anne. 1971. *Plains Cree Dictionary in the "y" Dialect*. Edmonton: White Buffalo Friendship Centre.
- Andrews, Henrietta. 1993. *The Function of Verb Prefixes in Southwestern Otomí*. No. 115 in Publications in Linguistics. Arlington: The Summer Institute of Linguistics and The University of Texas at Arlington.
- Andrews, L. 1854. *Grammar of the Hawaiian Language*. Honolulu: The Mission Press.
- Aronson, Howard I. 1990. *Georgian: A Reading Grammar*. Bloomington, IN: Slavica.
- Aulestia, Gorka. 1989. *Basque-English dictionary*. University of Nevada Press.
- Aulestia, Gorka and Linda White. 1990. *English-Basque dictionary*. University of Nevada Press.
- Awde, Nicholas. 2002. *Swahili-English English-Swahili dictionary*. New York: Hippocrene Books.
- Awde, Nicholas and Thea Khitarishvili. 1997. *Georgian-English, English-Georgian dictionary and phrasebook*. Richmond, Surrey: Curzon Press.
- Baltsan, Hayim. 1992. *Webster's New World Hebrew dictionary*. New York: Prentice Hall.
- Bamgbose, Ayo. 1966. In J. H. Greenberg and J. Spencer, eds., *A Grammar of Yoruba*, no. 5 in West African Language Monograph Series. London: Cambridge University Press.
- Bavin, Edith. 1982. Morphological and syntactic divergence in lango and acholi. In R. Vossen and M. Bechhaus-Gerst, eds., *Nilotic studies: proceedings of the International Symposium on Languages and History of the Nilotic Peoples*, vol. 10 of *Kölner Beiträge zur Afrikanistik*. D. Reimer.
- Becker, Benjawan Poomsan. 2002. *Thai-English English-Thai Dictionary*. Bangkok; Berkeley: Paiboon Pub.
- Beffa, Marie-Lise and Roberte Hamayon. 1975. *Éléments de grammaire mongole*. Paris: Dunod.
- Ben Taleb, Brahim. 2012. *Dictionnaire français-tamazigt, 40.000 mots (Amawal tamazigt-français: ccix-iw mon maître : le grand dictionnaire berbère)*. Éditions Aît Mouloud.
- Berman, Ruth Aronson. 1978. *Modern Hebrew Structure*. University Publishing Projects, Ltd.
- Bernard, Harvey Russell. 1963. *An Otomí Dictionary: with context exemplification*. Master's thesis, Graduate College of the University of Illinois, Urbana.

- Bhat, D.N.S. and M.S Ningomba. 1997. *Manipuri Grammar*. No. 04 in LINCOM Studies in Asian Linguistics. Munchen: LINCOM EUROPA.
- Boukhris, Fatima. 2008. *La nouvelle grammaire de l'amazighe*. Rabat: Institut royal de la culture amazighe. Centre de l'aménagement linguistique.
- Bouquiaux, Luc. 1978. *Dictionnaire sango-français = Bàkàrî sāngō-fàráñzì*. Paris: Société d'études linguistiques et anthropologiques de France.
- Bowden, Ross. 1997. A dictionary of kwoma, a papuan language of north-east new guinea. *Pacific Linguistics* 134.
- Bowen, T.J. 1858. *Grammar and Dictionary of the Yoruba Language*. New York: The Smithsonian Institution.
- Boyle, John Andrew. 1966. *Grammar of Modern Persian*. Wiesbaden: Otto Harrassowitz.
- Brice, Nathaniel. 2005. *A romanized Hindūstānī and English dictionary*. New Delhi: Asian Educational Services.
- Bright, William. 1957. The karok language. *University of California Publications in Linguistics* 13.
- Bright, William and Susan Gehr. 2005. *Karuk dictionary*. Happy Camp, CA: LBD Publishers.
- Britton, A. Scott. 2005. *Guaraní concise dictionary: Guaraní-English, English-Guaraní*. New York: Hippocrene Books.
- Bromley, H. Myron. 1981. A grammar of lower grand valley dani. *Pacific Linguistics* 63.
- Bruce, Leslie P. 1979. *A grammar of Alambak (Papua New Guinea)*. Ph.D. thesis, Australian National University.
- Calendino, Francisco. 1987. *Diccionário Mapuche Básico*. Buenos Aires: Centro Universitario Salesiano del Sur Argentino.
- Canonici, Noverino N. 1996. *Zulu grammatical structure*. Durban: Department of Zulu Language and Literature, University of Natal.
- Capell, Arthur. 1941. *A New Fijian Dictionary*. Sydney: Australasian Medical Pub. Co.
- Chaduteau, Georges-Antoine. 2006. *Sango, langue nationale de Centrafrique: dictionnaire français-sango, lexique sango-français, grammaire pratique du sango*. Sancerre: Dictionnaires d'aujourd'hui.
- Chang, Suk-Jin. 1996. *Korean*. Philadelphia: John Benjamins.
- Chapman, Shirley and Meinke Salzer. 1998. *Dicionário bilíngue nas línguas paumari e portuguesa*. Porto Velho, RO: Sociedade Internacional de Linguística.
- Chen, Janey. 1970. *A practical English-Chinese pronouncing dictionary; English, Chinese characters, romanized Mandarin and Guangzhou*. Rutland, Vt.: C.E. Tuttle Co.
- Cherchi, Marcello. 1996. *A study in Modern Georgian morphosyntax: A hierarchy-based analysis with special reference to 'indirect verbs' and 'passives of state'*. Ph.D. thesis, The University of Chicago.
- Chu, Chauncey Cheng-hsi. 1983. *A reference grammar of Mandarin Chinese for English speakers*. New York: P. Lang.
- Colegio de lenguas y literatura indígenas. 1997. *Diccionário español-otomí*. Biblioteca de los pueblos indígenas. Toluca: Instituto mexiquense de cultura.
- Cornyn, William Stewart and John K. Musgrave. 1958. *Burmese glossary*. Series A: Texts, no. 5. New York: American Council of Learned Societies.
- Courtz, Hendrik. 2008. *A Carib grammar and dictionary*. Toronto, ON, Canada: Magoria Books.
- Crazzolara, Joseph Pasquale. 1955. *A study of the Acooli language grammar and vocabulary*.

- Oxford University Press.
- Dabir-Moghaddam, Mohammad. 1982. *Syntax and Semantics of Causative Constructions in Persian*. Ph.D. thesis, University of Illinois at Urbana-Champaign.
- Dahl, Anne. 1997. *Random House German-English English-German dictionary*. New York: Random House.
- Dahlstrom, Amy. 1991. *Plains Cree Morphosyntax*. New York: Garland Publishing.
- Day, Christopher. 1973. *The Jacalteco Language*, vol. 12 of *Indiana University Publications, Language Science Monographs*. Bloomington: Indiana University Press.
- de Barral, Basilio Maria. 2000. *Diccionario warao-castellano, castellano-warao*. Caracas: Universidad Católica Andrés Bello: Hermanos Menores Capuchinos.
- Dedrick, John M. and Eugene H. Casad. 1999. *Sonoran Yaqui Language Structures*. Tucson: University of Arizona Press.
- Delano, Isaac O. 1965. *A Modern Yoruba Grammar*. Ibadan: Thomas Nelson and Sons Ltd.
- Dench, Alan Charles. 2001. *Martuthunira wordlist*. South Hedland, W.A.: Wangka Maya Pilbara Aboriginal Language Centre.
- Diki-Kidiri, Marcel. 1998. *Dictionnaire orthographique du sängö*, vol. 1 of *Yanga ti kidoro*. Bangui; Reading: BBA.
- Dixon, Robert M. W. and Alexandra Y. Aikhenvald. 1999. *The Amazonian languages*. Cambridge, UK: Cambridge University Press.
- Doke, Clement M. 1954. *Textbook of Zulu Grammar*. Cape Town: Longmans.
- Doke, Clement M. 1958. *English-Zulu dictionary*. Johannesburg: Witwatersrand University Press.
- Ducroz, Jean Marie and Marie Claire Charles. 1978. *Lexique soney (songay)-français : parler kaado du Gorouol*. Paris: éditions L'Harmattan.
- Dunn, John Asher. 1995. *Sm'algyax: A Reference Dictionary and Grammar for the Coast Tsimshian Language*. Seattle: University of Washington Press.
- Dunn, Michael John. 1999. *A Grammar of Chukchi*. Ph.D. thesis, Australian National University.
- Dutton, Tom. 2003. A dictionary of koiari, papua new guinea, with grammatical notes. *Pacific Linguistics* 543.
- Echols, John M. and Hassan Shadily. 1961. *An English-Indonesian dictionary*. Ithaca: Cornell University Press.
- Echols, John M. and Hassan Shadily. 1990. *Kamus Indonesia Inggris: An Indonesian-English Dictionary*. Jakarta: Penerbit PT Gramedia.
- Elbert, Samuel H. and Mary Kawena Pukui. 1979. *Hawaiian Grammar*. Honolulu: The University Press of Hawaii.
- Eren, Hasan, Nevzat Gözaydin, Ismail Parlatır, Talât Tekin, and Hamza Zülfikar. 1988. *Türkçe Sözlük, (cilt 1, A-J & cilt 2, K-Z)*. Ankara: Türk Dil Kurumu.
- Evans, Nicholas. 1992. *Kayardild dictionary and thesaurus : a vocabulary of the language of the Bentinck Islanders, North-West Queensland*. Parkville, Vic., Australia: University of Melbourne, Dept. of Linguistics and Language Studies.
- Evans, Nicholas. 1995. *A Grammar of Kayardild*. Berlin: Mouton de Gruyter.
- Faarlund, Jan Terje. 2012. *A Grammar of Chiapas Zoque*. New York: Oxford University Press.
- Fakinlede, Kayode J. 2003. *English-Yoruba, Yoruba-English modern practical dictionary*. New York: Hippocrene Books.
- Falla, P.S., ed. 1984. *The Oxford English-Russian dictionary*. Oxford: Clarendon Press.
- Faltz, Leonard M. 1998. *The Navajo Verb: A Grammar for Students and Scholars*. Albuquerque:

- University of New Mexico Press.
- Fayer, Mischa H., Aron Pressman, and Anastasia F. Pressman. 1957. *Simplified Russian grammar*. New York: Pitman.
- Ferrel, Raleigh. 1982. *Paiwan dictionary*. Canberra: Department of Linguistics and Research School of Pacific Studies, Australian National University.
- Foley, William A. and Robert D. Van Valin. 1984. *Functional syntax and universal grammar*. Cambridge; New York: Cambridge University Press.
- Folli, Raffaella, Heidi Harley, and Simin Karimi. 2004. Determinants of event type in persian complex predicates. *Lingua* (115):1365–1401.
- Forbes, Duncan. 1866. *A dictionary, Hindustani & English: accompanied by a reversed dictionary, English and Hindustani*. London: W.H. Allen & co.
- Franklin, Karl James. 1971. A grammar of kewa, new guinea. *Pacific Linguistics* 16.
- Franklin, Karl J. and Joice Franklin. 1978. A kewa dictionary, with supplementary grammatical and anthropological materials. *Pacific Linguistics* 53.
- Gadžiev, Magomed M. 1940. *Rus č’alanni lezgi č’alan slovar’ načal’nyj skoladiz* [Russian-Lezgian dictionary for elementary school]. Maxačkala.
- Gadžiev, Magomed M. 1950. *Russko-lezginskij slovar’* [Russian-Lezgian dictionary]. Maxačkala: Izdatel’stvo Dagestanskogo Filiala AN SSSR.
- Gadžiev, Magomed M. 1956. *Russko-lezginskij škol’nyj slovar’* [Russian-Lezgian school dictionary]. Maxačkala: Dagučpedgiz.
- Gallagher, Steve. 2008. *Bariai Dictionary*. Summer Institute of Linguistics.
- Gallagher, Steve and Peirce Baehr. 2005. *Bariai grammar sketch*. Summer Institute of Linguistics.
- Goertz, Grandon, Katy Lenté, Stefanie Adams, Jalon Begay, and Melvatha Chee. 2007. *Use of causatives in Navajo: Syntax and morphology*. Albuquerque: University of New Mexico, ms.
- Goossen, Irvy W. 1995. *Diné Bizaad: Speak, Read, Write Navajo*. Flagstaff: Salina Bookshelf.
- Goutsos, Dionysis, Angie Voela, Charilaos Panagiotakopoulos, and Christopher Brewster. 1997. *Collins English-Greek dictionary: [a new generation of English-Greek dictionaries]*. Glasgow: HarperCollins Publishers.
- Gragg, Gene B. 1982. *Oromo dictionary*, vol. 12 of *Monograph (Michigan State University, Committee on Northeast African Studies)*. East Lansing, Michigan: African Studies Center, Michigan State University.
- Gregores, Emma and Jorge A. Suárez. 1967. *A Description of Colloquial Guaraní*. The Hague: Mouton.
- Grinevald-Craig, Colette. 1990. *Rama kuup. A Rama Grammar*. Eugene; Managua: University of Oregon / CIDCA.
- Guzman, Maria Odulio de. 1976. *New Tagalog-English, English-Tagalog dictionary*. Manila: National Book Store.
- Gvarjaladze, Thamar and Isidore Gvarjaladze. 1975. *Inglisur-k’art’uli leksikoni, English-Georgian dictionary*. Tbilisi: Sabchota Sakartvelo.
- Haacke, Wilfrid H. G. and Eliphas Eiseb. 2002. *A Khoekhoegowab dictionary with an English-Khoekhoegowab index*. Windhoek, Namibia: Gamsberg Macmillan.
- Haas, Mary R. and George V. Grekoff. 1964. *Thai-English student’s dictionary*. Standford, California: Stanford University Press.
- Hagman, Roy Stephen. 1977. *Nama Hottentot Grammar*. Bloomington: Indiana University Press.

- Hale, Ken, Pamela Munro, and Paul Platero. 2001. *Aspects of Navajo verb morphology and syntax: The inchoative*. Window Rock Navajo Language Academy Linguistics Workshop.
- Haltod, Mattai, John Gombojab Hangin, Serge Kassatkin, and F. D. Lessing, eds. 1960. *Mongolian-English Dictionary*. Los Angeles: University of California Press.
- Hammink, Julianne E. 2006. *Verb incorporation in Guarani causative constructions*. Master's thesis, University of Texas at El Paso.
- Hansen, K. C. and L. E. Hansen. 1974. *Pintupi dictionary*. Darwin, Australia: Summer Institute of Linguistics, Australian Aborigines Branch.
- Harris, Alice C. 1981. *Georgian syntax: A study in relational grammar*. Cambridge: Cambridge University Press.
- Harrison, Roy, Margaret Harrison, and Cástulo H. García. 1981. *Diccionário Zoque de Copainalá*. Tlalpan, Mexico: Summer Institute of Linguistics.
- Haspelmath, Martin. 1993a. *Causatives and Transitivity*, chap. More on the typology of inchoative/causative verb alternations, pages 87–120. Amsterdam: John Benjamins.
- Haspelmath, Martin. 1993b. *A Grammar of Lezgian*. Berlin: Mouton de Gruyter.
- Haspelmath, Martin. 2008. Causatives and anticausatives (syntactic universals and usage frequency at the leipzig spring school on linguistic diversity). Handout.
- Heath, Jeffrey. 1998. *Dictionnaire songhay-anglais-français. Tome I, Koyra chiini*. Langues d'Afrique, 4. Paris: Harmattan.
- Heath, Jeffrey. 1999. *A Grammar of Koyraboro (Koroboro) Senni: the Songhay of Gao, Mali*, vol. 19 of *Westafrikanische Studien*. Köln: Köppe.
- Hecht, Elanor Franckle and Erasmo Sáenz Carrete. 1998. *Diccionario Hak'xub'al-Kastiya español-jacalteko: un diccionario de hablantes*. Mexico: Potrerillos editores.
- Heine, Bernd. 1981. *The Waata Dialect of Oromo*. Berlin: Reimer.
- Hewitt, B. G. 1995. *Georgian: A structural reference grammar*. Amsterdam: John Benjamins.
- Hewitt, George. 2005. *Georgian: A learner's grammar*. New York: Routledge. 2nd edition.
- Hillery, P.J. 1994. *Georgian: The Kartvelian Literary Language*. Languages Information Centre.
- Hirose, Tomio. 2003. *Origins of predicates: evidence from Plains Cree*. Outstanding dissertations in linguistics. New York: Routledge.
- Hives, H. E. 1952. *A Cree grammar: being a simplified approach to the study of the language of the Cree Indians*. Toronto: The Missionary Society of the Church of England in Canada.
- Hoff, B. J. 1968. *The Carib Language: Phonology, Morphology, Texts and Word Index*, vol. 55 of *Verhandelingen van het Koninklijk Instituut voor Taal-, Land- en Volkenkunde*. The Hague: M. Nijhoff.
- Holton, David, Peter Mackridge, and Irene Philippaki-Warburton. 2004. *Greek: An Essential Grammar of the Modern Language*. London: Routledge.
- Hopi Dictionary Project. 1998. *Hopi dictionary = Hopiikwa lavaytutuveni: a Hopi-English dictionary of the Third Mesa dialect with an English-Hopi finder list and a sketch of Hopi grammar*. Tucson: University of Arizona Press.
- Horden, John. 1881. *A grammar of the Cree language, as spoken by the Cree Indians of North America*. London: Society for Promoting Christian Knowledge.
- Hualde, José Ignacio and Jon Ortiz de Urbina. 2003. *A grammar of Basque*, vol. 26 of *Mouton Grammar Library*. New York: Mouton de Gruyter.
- Huang, Po-fei. 1954. *IFEL Vocabulary of Spoken Chinese*. New Haven, Connecticut: Yale University.

- Huguin, Paul. 1990. *Essai de grammaire comparée sango-français*. Bangui: Impr. Saint Paul.
- Hunter, James. 1875. *A lecture on the grammatical construction of the Cree language*. London: Society for Promoting Christian Knowledge.
- Ingham, Bruce. 2001. *English-Lakota Dictionary*. Richmond, England: Curzon.
- Jacobsen, Wesley M. 1992. *The Transitive Structure of Events in Japanese*. Tokyo: Kurosio Publishers.
- Jacobson, Steven A. 1990. *A practical grammar of the St. Lawrence Island/Siberian Yupik Eskimo language*. Fairbanks: Alaska Native Language Center, College of Liberal Arts, University of Alaska.
- Jacobson, Steven A. 2012a. *Yup'ik Eskimo dictionary*, vol. 1. Fairbanks, AK: Alaska Native Language Center, University of Alaska Fairbanks.
- Jacobson, Steven A. 2012b. *Yup'ik Eskimo dictionary*, vol. 2. Fairbanks, AK: Alaska Native Language Center, University of Alaska Fairbanks.
- Jacobson, Steven A. and Elizaveta A. Dobrieva. 2004. *Naukan Yupik Eskimo dictionary*. Fairbanks, Alaska: Alaska Native Language Center.
- Jarman, Beatriz Galimberti and Roy Russell, eds. 2001. *The Oxford Spanish dictionary: Spanish-English/English-Spanish*. Oxford; New York: Oxford University Press.
- Johnson, Hedi Anna. 2000. *A Grammar of San Miguel Chimalapa Zoque*. Ph.D. thesis, University of Texas at Austin, Austin.
- Judson, Adoniram. 1953. *Burmese-English dictionary*. Rangoon: Baptist Board of Publications.
- Kachru, Y. 1980. *Aspects of Hindi Grammar*. New Delhi: Manohar.
- Karim, Piar. 2013. *Middle voice construction in Burushaski: From the perspective of a native speaker of the Hunza dialect*. Master's thesis, University of North Texas, Denton.
- Kim, Jung-sup. 2010. *Korean conversation dictionary for foreigners : English-Korean*. Elizabeth, New Jersey: Hollym.
- Kim, Kyunghwan. 1994. *The syntax and semantics of causative constructions in Korean (Volumes I and II)*. Ph.D. thesis, The University of Chicago.
- Kimball, Geoffrey D. 1991. *Koasati Grammar*. Lincoln: University of Nebraska Press.
- Kimball, Geoffrey D. 1994. *Koasati Dictionary*. Lincoln: University of Nebraska Press.
- Kirkeby, Willy A. 2000. *English-Swahili Dictionary*. Dar es Salaam: Kakepela.
- Kitching, A.L. 1932. *An outline grammar of the Acholi language*. London: Sheldon Press.
- Kleeman, Julie and Harry Yu, eds. 2004. *The Oxford Chinese dictionary*. Cambridge; New York: Oxford University Press.
- Kornfilt, Jaklin. 1997. *Turkish*. Descriptive Grammars. Routledge.
- Kramer, A. L. N. and Willie Koen. 2014. *Tuttle concise Indonesian dictionary : Indonesian-English, English-Indonesian*. Tokyo: Tuttle Publishing.
- Kullavanijaya, Pranee. 1974. *Transitive Verbs in Thai*. Ph.D. thesis, University of Hawaii.
- Kwee, John B. 1965. *Teach Yourself Indonesian*. London: English Universities Press.
- Lane, Charles. 1841. *A dictionary, English and Burmese*. Calcutta: Ostell and Lepage.
- Lawrence, Marshall. 2006. *Oksapmin dictionary*. SIL International Publications.
- Lee, Hansol H. B. 1989. *Korean grammar*. Oxford; New York: Oxford University Press.
- Lee, Jennifer R. 1993. *Ngawurranungurumagi Ngininingawila Ngapangiraga. Tiwi-English Dictionary*. Darwin: Summer Institute of Linguistics.
- Lidz, Jeffrey. 1998. Valency in kannada: Evidence for interpretive morphology. *University of Pennsylvania Working Papers in Linguistics* 5(2):37–63.

- Llamzon, Teodoro A. 1976. *Modern Tagalog : a functional-structural description*. The Hague: Mouton.
- Loughnane, R. 2009. *A grammar of Oksapmin*. Ph.D. thesis, The University of Melbourne, Melbourne.
- Luvsandorj, Amarsanaa, ed. 2006. *Oxford-Mongolian English-Mongolian dictionary*. London: Oxford University Press.
- Lynch, John. 2000. A grammar of anejom̑. *Pacific Linguistics* 507.
- Lynch, John and Philip Tepahae. 2001. Anejom̑ dictionary: diksonari blong anejom̑: nitasviitai a nijitas antas anejom̑. *Pacific Linguistics* 510.
- Macaulay, Monica. 2005. *Verb First: On the syntax of verb-initial languages*, chap. The syntax of Chalcatongo Mixtec: Preverbal and postverbal, pages 341–366. John Benjamins Publishing Company.
- Macaulay, Monica Ann. 1996. *A Grammar of Chalcatongo Mixtec*. University of California Publications in Linguistics.
- Macdonald, R. Ross. 1976. *Indonesian Reference Grammar*. Washington, D. C.: Georgetown University Press.
- Mace, John. 2003. *Persian grammar : for reference and revision*. London; New York: Routledge-Curzon.
- MacGillivray, Donald. 1921. *A Mandarin-romanized dictionary of Chinese, including new terms and phrases*. Shanghai: Presbyterian Mission Press.
- Macura, Paul. 1990a. *Elsevier's Russian-English Dictionary*, vol. Part 1, a-zvukosignál. Amsterdam: Elsevier Science Publishers.
- Macura, Paul. 1990b. *Elsevier's Russian-English Dictionary*, vol. Part 2, zvukosignál'nyj-opogánivat'. Amsterdam: Elsevier Science Publishers.
- Macura, Paul. 1990c. *Elsevier's Russian-English Dictionary*, vol. Part 3, opogánivat'sya-revmatologíčeskij. Amsterdam: Elsevier Science Publishers.
- Macura, Paul. 1990d. *Elsevier's Russian-English Dictionary*, vol. Part 4, revmatolígiya-yášurnyj. Amsterdam: Elsevier Science Publishers.
- Makharoblidze, Tamar. 2012. *The Georgian verb*. Munich: LINCOM Europa.
- Malandra, Alfred. 1957. *English-Lwoo dictionary*. Museum Combonianum, 9. Bologna: [Nigrizia].
- Mangione, Louis Stephen. 1982. *The syntax, semantics, and pragmatics of causative, passive and 'ba' constructions in Mandarin*. Ph.D. thesis, Cornell University.
- Martin, Samuel E. 1994. *Martin's Concise Japanese Dictionary*. Boston: Tuttle Publishing.
- McGrath, Donovan and Lutz Marten. 2003. *Colloquial Swahili*. London: Routledge.
- McGregor, R. S. 1993. *Outline of Hindi Grammar*. Delhi: Oxford University Press.
- McGregor, William. 1994. *A Functional Grammar of Gooniyandi*. Amsterdam: John Benjamins.
- Mednikova, E. M. and Yu. D. Apresyan, eds. 1993a. *Novyj bol'soj anglo-russkij slovar' v trjox tomakh, okolo 250 000 slov* [New English-Russian dictionary in three volumes, about 250,000 words], vol. Tom [Volume] I, A-F. Moscow: Russkyj Yazyk.
- Mednikova, E. M. and Yu. D. Apresyan, eds. 1993b. *Novyj bol'soj anglo-russkij slovar' v trjox tomakh, okolo 250 000 slov* [New English-Russian dictionary in three volumes, about 250,000 words], vol. Tom [Volume] II, G-Q. Moscow: Russkyj Yazyk.
- Mednikova, E. M. and Yu. D. Apresyan, eds. 1993c. *Novyj bol'soj anglo-russkij slovar' v trjox tomakh, okolo 250 000 slov* [New English-Russian dictionary in three volumes, about 250,000 words], vol. Tom [Volume] III, R-Z. Moscow: Russkyj Yazyk.

- Mejlanova, Unejzat A. 1964. *Očerki lezginskoj dialektologii [Studies in Lezgian dialectology]*. Moscow: Nauka.
- Michelson, Karin and Mercy Doxtator. 2002. *Oneida-English/English Oneida dictionary*. Toronto; Buffalo: University of Toronto Press.
- Migeod, F.W.H. 1914. *A grammar of the Hausa language*. London: K. Paul, Trench, Trübner & co., ltd.
- Miller, Wick R. 1965. *Acoma grammar and texts*, vol. 40 of *University of California Publications in Linguistics*. Berkeley: University of California Press.
- Minor, Eugene E. and A. Minor, Dorothy. 1987. *Vocabulario Bilingüe: Huitoto-Español y Español-Huitoto (Dialecto Minica)*. Bogotá: Editorial Townsend.
- Minor, Eugene E., Dorothy A. Minor, and Stephen H. Levinsohn. 1982. *Gramática pedagógica Huítoto*. Bogotá: Summer Institute of Linguistics.
- Misra, Mathura Prasada. 1990. *A trilingual dictionary: being a comprehensive lexicon in English, Urdu, and Hindi exhibiting the syllabication, pronunciation, & etymology of English words with their explanation in English, and in Urdu and Hindi in the roman character*. New Delhi: Asian Educational Services.
- Mohammed, M.A. 2001. *Modern Swahili Grammar*. Nairobi: East African Educational Publishers.
- Mpiranya, Fidèle. 2015. *Swahili Grammar and Workbook*. London: Routledge.
- Munshi, Sadaf and Piar Karim. Unknown. A grammatical sketch of hunza burushaski.
- Murane, Elizabeth. 1974. *Daga Grammar: From Morpheme to Discourse*, vol. 43 of *Summer Institute of Linguistics Publications in Linguistics and Related Fields*. Norman: Summer Institute of Linguistics.
- Murane, Elizabeth and John Murane. 2007. *Daga-English dictionary*.
- Muudee, Mahdi Hamid. 1995. *Hamid Muudee's Oromo dictionary : English-Oromo*. Atlanta, GA: Sagalee Oromoo Pub. Co.
- Nancy, LeClaire and George Cardinal. 1998. *Alberta elders' Cree dictionary - Alpera ohci kehte-hayak nehiyaw otwestamâkewasinahikan*. Edmonton: The University of Alberta Press.
- Newman, Paul. 2000. *The Hausa Language: An Encyclopedic Reference Grammar*. New Haven: Yale University Press.
- Newman, Paul. 2007. *A Hausa-English Dictionary*. New Haven: Yale University Press.
- Newman, Roxanna Ma. 1990. *An English-Hausa Dictionary*. New Haven: Yale University Press.
- Nguyễn, Văn Khôn. 1967. *English-Vietnamese dictionary : anh-viet tù-diên*. Saigon: Nhà Sach Kha-trí.
- Noss, Richard B. 1964. *Thai Reference Grammar*. Washington: Foreign Service Institute, Department of State, United States Government.
- Odonga, Alexander Mwa. 2005. *Two-English dictionary*. Kampala: Fountain Publishers.
- Okell, John. 1969. *A Reference Grammar of Colloquial Burmese (two volumes)*. London: Oxford University Press.
- Osborn, Henry A. 1967. Warao 3: Verbs and suffixes. *International Journal of American Linguistics* 33:46–64.
- Osborne, C. R. 1974. *The Tiwi Language*, vol. 55 of *Australian Aboriginal Studies*. Canberra: Australian Institute of Aboriginal Studies.
- Oulhaj, Lahcen and Muhammad Shafiq. 2000. *Grammaire du tamazight: éléments pour une standardisation*. Rabat: Center Tarik ibn Zyad pour les études et la recherche.
- Owens, Jonathan. 1985. *A Grammar of Harar Oromo (Northeastern Ethiopia)*, vol. 4 of *Kuschi-*

- tische Sprachstudien, Cushitic Language Studies.* Hamburg: Helmut Buske Verlag.
- Ozieva, Albina, Maree Airlie, Olga Stott, and Marina Hepburn. 1994. *HarperCollins Russian Dictionary.* HarperCollins.
- Pallegoix, Jean-Baptiste. 1896. *Dictionnaire Siamois-Français-Anglais.* Bangkok: Imprimerie de la Mission Catholique.
- Panganiban, Jose Villa. 1969. *Concise English-Tagalog dictionary.* Rutland, Vt.: Tuttle.
- Parker, Philip M. 2008. *Webster's Guaraní - English Thesaurus Dictionary.* ICON Group.
- Payne, Doris Lander. 1985. *Aspects of the Grammar of Yagua: A Typological Perspective.* Ph.D. thesis, University of California Los Angeles, Los Angeles.
- Penchoen, Thomas G. 1973. *Tamazight of the Ayt Ndhir*, vol. 1 of *Afroasiatic Dialects.* Los Angeles: Undena Publishing.
- Perrott, D. V. 1965. *Concise Swahili and English Dictionary.* London: Hodder & Slaughton.
- Phillips, Vivianne. 1996. *Up-rooting the prefix maha- in Malagasy.* Master's thesis, McGill University, Montreal.
- Poulos, G. and Sonja E. Bosch. 1997. *Zulu*, vol. 50 of *Languages of the world.* Munchen; Newcastle: LINCOM Europa.
- Powlison, Paul S. 1995. *Nijaymi Niquejadamusiy May Niquejadamuju: Diccionário Yagua-Castellano.* No. 35 in Serie Lingüística Peruana. Ministerio de Educacion, Instituto Lingüístico de Verano.
- Pring, Julian Talbot. 1995. *The Pocket Oxford Greek Dictionary.* New York: Oxford University Press.
- Pukui, Mary Kawena and Samuel H. Elbert. 1986. *Hawaiian dictionary : Hawaiian-English, English-Hawaiian.* Honolulu: University of Hawaii Press.
- Pukui, Mary Kawena, Samuel H. Elbert, and Esther T. Mookini. 1992. *New pocket Hawaiian dictionary: with a concise grammar and given names in Hawaiian.* Honolulu: University of Hawaii Press.
- Quitout, Michel. 1997. *Grammaire berbère: rifain, tamazight, chleuh, kabyle.* Paris: L'Harmattan.
- Rajaonarimanana, Narivelo and Pierre Verin. 1997. *Dictionnaire français-malagache.* Paris: Langues et Mondes, L'AsiathÁlque.
- Ramos, Teresita V. 1971. *Tagalog dictionary.* Honolulu: University of Hawaii Press.
- Ramstedt, G. J. 1968. *A Korean Grammar*, vol. 82 of *Memoirs of the Finno-Ugric Society.* Oosterhout, The Netherlands: Anthropological Publications.
- Randriamasimanana, Charles. 1981. *A Study of the Causative Constructions of Malagasy.* Ph.D. thesis, University of Southern California.
- Rasolofo, Andoveloniaina. 2006. *Malagasy Transitive Clause Types and Their Functions.* Ph.D. thesis, University of Oregon.
- Real Academia Española. 2017. Diccionario de la lengua española. <http://www.rae.es>.
- Reeve, W. 1979. *Dictionary: Kannada and English.* New Delhi: Asian Educational Services.
- Richardson, James. 1885. *A new Malagasy-English Dictionary.* Antananarivo: The London Mission Society.
- Rigby, Nora and Robin Schneider. 1989. *Dictionary of the Rama Language.* Berlin: Dietrich Reimer Verlag.
- Robert, Paul. 1996a. *Le grand Robert de la langue française, dictionnaire alphabétique et analogique de la langue française de Paul Robert*, vol. Tome I, A-Bio of *Dictionnaires Le Robert.* Paris.

- Robert, Paul. 1996b. *Le grand Robert de la langue française, dictionnaire alphabétique et analogique de la langue française de Paul Robert*, vol. Tome II, Bip-Cout of *Dictionnaires Le Robert*. Paris.
- Robert, Paul. 1996c. *Le grand Robert de la langue française, dictionnaire alphabétique et analogique de la langue française de Paul Robert*, vol. Tome III, Couv-Ento of *Dictionnaires Le Robert*. Paris.
- Robert, Paul. 1996d. *Le grand Robert de la langue française, dictionnaire alphabétique et analogique de la langue française de Paul Robert*, vol. Tome IV, Entr-Gril of *Dictionnaires Le Robert*. Paris.
- Robert, Paul. 1996e. *Le grand Robert de la langue française, dictionnaire alphabétique et analogique de la langue française de Paul Robert*, vol. Tome V, Grim-Lil of *Dictionnaires Le Robert*. Paris.
- Robert, Paul. 1996f. *Le grand Robert de la langue française, dictionnaire alphabétique et analogique de la langue française de Paul Robert*, vol. Tome VI, Lim-O of *Dictionnaires Le Robert*. Paris.
- Robert, Paul. 1996g. *Le grand Robert de la langue française, dictionnaire alphabétique et analogique de la langue française de Paul Robert*, vol. Tome VII, P-Raisi of *Dictionnaires Le Robert*. Paris.
- Robert, Paul. 1996h. *Le grand Robert de la langue française, dictionnaire alphabétique et analogique de la langue française de Paul Robert*, vol. Tome VIII, Raiso-Sub of *Dictionnaires Le Robert*. Paris.
- Robert, Paul. 1996i. *Le grand Robert de la langue française, dictionnaire alphabétique et analogique de la langue française de Paul Robert*, vol. Tome IX, Suc-Z of *Dictionnaires Le Robert*. Paris.
- Roberts, Charles. 1905. *An English-Zulu dictionary; with the principles of pronunciation and classification fully explained*. London: K. Paul, Trench, Trübner & Co.
- Robertson, Richard G. 1969. *Robertson's Practical English-Thai Dictionary*. Rutland, Vermont: Charles E. Tuttle Company.
- Romeo, Nicoletta. 2008. *Aspect in Burmese: meaning and function*. Amsterdam: J. Benjamins Pub. Co.
- Sacleux, Charles. 1959. *Dictionnaire Français-Swahili*. Paris: Institut d'Ethnologie.
- Saksena, Anuradha. 1979. *The Grammar of Hindi Causatives*. Ph.D. thesis, University of California, Los Angeles.
- Saksena, Anuradha. 1980. Causative relations in hindi. *General Linguistics* 20(1):23–38.
- Samarin, William J. 1967. *A Grammar of Sango*. The Hague: Mouton.
- Samuelson, R. C. A. 1925. *Zulu grammar*. Durban, South Africa.
- Savage, G.A.R. 1955. *The essentials of Lwo (Acoli)*. Nairobi: East African Literature Bureau.
- Schiffman, Harold F. 1983. *A Reference Grammar of Spoken Kannada*. Seattle and London: University of Washington Press.
- Schütz, Albert J. 1985. *The Fijian Language*. Honolulu: University of Hawaii Press.
- Schwarzwald, Ora R. 2001. *Modern Hebrew*. Muenchen: LINCOM EUROPA.
- Seiss, Melanie. 2013. *Murrinh-Patha Complex Verbs: Syntactic Theory and Computational Implementation*. Ph.D. thesis, Universitat Konstanz.
- Shaul, David L., Felipe S. Molina, and Herminia Valenzuela. 1999. *Yoeme-English, English-Yoeme Standard Dictionary (Yaqui)*. New York: Hippocrene Books.

- Singh, Rajendra and Rama Kant Agnihotri. 1997. *Hindi morphology: a word-based description*. Delhi: Motilal Banarsi Dass Publishers.
- Smeets, Ineke. 2008. *A Mapuche Grammar*. Berlin and New York: Mouton de Gruyter.
- Smith, Rachel, Gaëlle Amiot-Cadey, and Rob Scriven, eds. 2010. *Collins Turkish Dictionary*. Glasgow: HarperCollins.
- Sneddon, James N. 1996. *Indonesian: a Comprehensive Grammar*. London and New York: Routledge.
- Snóxall, R.A. 1958. *A Concise English-Swahili Dictionary*. Nairobi: Oxford University Press.
- Sridhar, S.N. 1990. *Kannada*. Descriptive Grammars. London and New York: Routledge.
- Stebbins, Tonya. 2004. Polysemy, homonymy and sense modulation in sm'algayax. *International Journal of Lexicography* 17(1):1–32.
- Stewart, John Alexander. 1955. *Manual of Colloquial Burmese*. London: Luzac.
- Street, John C. 1963. *Khalkha Structure*, vol. 24 of *Indiana University Publications, Uralic and Altaic Series*. Bloomington: Indiana University Press.
- Sudmuk, Cholthicha. 2005. *The syntax and semantics of serial verb constructions in Thai*. Ph.D. thesis, The University of Texas at Austin.
- Taber, Charles R. and William J. Samarin. 1965. *A dictionary of Sango*. Hartford, Ct.: Hartford Seminary Foundation.
- Taïfi, Miloud. 1991. *Dictionnaire tamazight-français (parlers du Maroc central)*. Paris: L'Harmattan-Awal.
- Takebayashi, Shigeru. 2003. *Pocket Kenkyusha Japanese dictionary*. Oxford: Oxford University Press.
- Talibov, Bakur. B. and Magomed M. Gadžiev. 1966. *Lezginsko-russkij slovar'* [Lezgian-Russian dictionary]. Moscow: Sovetskaja Enciklopedija.
- Tanimori, Masahiro. 1994. *Handbook of Japanese Grammar*. Boston: Tuttle Publishing.
- Thompson, Katrina Daly and Antonia Folárrina Schleicher. 2001. *Swahili Learners' Reference Grammar*. Madison, WI: NALRC Press.
- Thornell, Christina. 1997. *The Sango Language and its Lexicon*, vol. 32 of *Travaux de l'institut de linguistique de Lund*. Lund, Sweden: Lund University Press.
- Tiee, Henry Hung-Yeh. 1986. *A reference grammar of Chinese sentences with exercises*. Tucson: University of Arizona Press.
- Tindall, Henry. 1857. *A grammar and vocabulary of the Namaqua-Hottentot language*. Cape Town: G.J. Pike's Machine Printing Office.
- Topping, Donald M. 1973. *Chamorro Reference Grammar*. Honolulu: University of Hawaii Press.
- Topping, Donald M., Pedro M. Ogo, and Bernadita C. Dungca. 1975. *Chamorro-English Dictionary*. Honolulu: The University Press of Hawaii.
- Torikashvili, John. 1992. *Georgian-English, English-Georgian dictionary*. New York: Hippocrene Books, 1st edn.
- Tsujimura, Natsuko. 1990. Ergativity of nouns and case assignment. *Linguistic Inquiry*.
- Tun Nyein, U. 1957. *The Student's English-Burmese dictionary*. Rangoon: ABMSU Central Concos.
- Velazquez Castillo, Maura. 2001. *The grammar of possession: inalienability, incorporation, and possessor ascension in Guarani*. Amsterdam: John Benjamins.
- Vitale, Anthony J. 1981. *Swahili Syntax*. Dordrecht: Foris.
- Ward, Ida C. 1952. *An introduction to the Yoruba language*. Cambridge: W. Heffer.

- Warotamasikkhadit, Udom. 1972. *Thai Syntax*. The Hague: Mouton.
- Watkins, Edwin Arthur. 1938. *A dictionary of the Cree language, as spoken by the Indians in the provinces of Quebec, Ontario, Manitoba, Saskatchewan and Alberta*. Toronto, ON: The Church of England in Canada.
- Watkins, Laurel J. and Parker McKenzie. 1984. *A grammar of Kiowa*. Studies in the Anthropology of North American Indians. Lincoln / London: University of Nebraska Press.
- Weber, David. 1983. Relativization and nominalized clauses in huallaga (huánuco) quechua. *University of California Publications in Linguistics* 103.
- Weber, David John. 1989. A grammar of huallaga (huánuco) quechua. *University of California Publications in Linguistics* 112.
- Weber, David John, Félix Cayco Zambrano, Teodoro Cayco Villar, and Marlene Ballena Dávila. 2008. *Rimaycuna: Quechua de Huánuco (Diccionário del quechua del Huallaga con índices castellano e inglés)*, vol. 48 of *Serie Lingüística Peruana*. Lima: Instituto Lingüístico de Verano, 2nd edn.
- Willson, Stephen R. 1999. Basic burushaski vocabulary. In *Studies in Languages of Northern Pakistan*, vol. 6 of *Studies in Languages of Northern Pakistan*. National Institute of Pakistan Studies and Summer Institute of Linguistics.
- Wolfart, H. Christoph. 1973. *Plains Cree: A Grammatical Study*, vol. 63.5 of *Transactions of the American Philosophical Society, New Series*. Philadelphia: American Philosophical Society.
- Wolfart, H. Christoph and Freda Ahenakew. 1998. *The Student's dictionary of Literary Plains Cree*. Winnipeg, Manitoba: Algonquian and Iroquoian Linguistics.
- Wolfart, H. Christoph and Janet Carroll. 1981. *Meet Cree*. Edmonton: University of Alberta Press. 2nd edition.
- Wollaston, Arthur Naylor. 1922. *An English-Persian dictionary compiled from original sources*. London: J. Murray.
- Yeon, Jaehoon and Lucien Brown. 1991. *Korean: a comprehensive grammar*. London; New York: Routledge.
- Young, Robert W. and William Morgan. 1972. *The Navaho Language*. Salt Lake City: Deseret Book Company.
- Young, Robert W., William Morgan, and Sally Midgette. 1992. *Analytic Lexicon of Navajo*. Albuquerque: University of New Mexico Press.
- Young, Robert W., William Morgan, and Sally Midgette. 1994. *The Navajo Language: A Grammar and Colloquial Dictionary (Revised Edition)*. Albuquerque: University of New Mexico Press.
- Yumitani, Chutatip Chiraporn. 1998. *The Acquisition of the Causative Alternation in Thai*. Ph.D. thesis, University of Kansas.
- Zhukova, Alevtina N. and Tokusu Kurebito. 2004. *A basic topical dictionary of the Koryak-Chukchi languages*. Japan: Research Institute for Languages and Cultures of Asia and Africa, Tokyo University of Foreign Studies.